

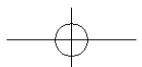
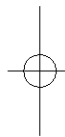
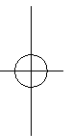


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ISAAC NEWTON IN THE EIGHTEENTH CENTURY

edited by
Stephen D Snobelen



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ISAAC NEWTON IN THE EIGHTEENTH CENTURY

EDITORIAL

The diversity of themes covered in this special issue of *Enlightenment and Dissent* reflect both the multivarious nature of Isaac Newton's involvement and legacies in the eighteenth-century and the richness of contemporary scholarship on Newton and Newtonianism. The current burgeoning and diversity of Newton scholarship can be attributed to several developments in historiography and, more specifically, the opening up of research on Newton beyond his science and mathematics (a trend now several decades old), along with a practical matter: the steadily increasing assortment of Newton's once-inaccessible writings available in professional transcripts through the work of the Newton Project.

The many themes covered in this volume range from history of science and philosophy to literature and religion. They include the reception of Newton's *Opticks* in France; a new analysis of Newton's manuscript 'Paradoxical Questions'; the relationship of Newton's thought to that of Locke, Hume and Reid; the presence of Newtonianism in Pope's *Essay on Man*; early views of Newton among the members of the Académie Royale des Sciences; Hume's critique of Newtonianism; a survey of the anti-heresy laws that serve as a backdrop to Newton's religious beliefs; and the often-misunderstood matter of the degree to which Newton's thought was appropriated by eighteenth-century Deists. Readers familiar with *Enlightenment and Dissent* will be happy to find themes in this volume that have traditionally been covered in this journal (Dissent, Deism and radical religion) as well as others that relate to Newton, Newtonianism and the long eighteenth century beginning with the 1690s.

This volume is a truly international production. The eight contributors hail from France, Spain, Holland, Belgium, the United States and Canada. They comprise young scholars as well as those more established in their careers. This volume contains not only new research, but also new insight into Newton and new translations from primary source documents. It is hoped

that this special issue of *Enlightenment and Dissent* will make an important contribution to the study of Isaac Newton and, in particular, his place in eighteenth-century science, philosophy and religion.

Finally, a few words of gratitude are in order. A visiting fellowship at the Centre for Studies in Religion and Society during the 2007-2008 academic year afforded me time to begin conceptualizing this special issue and assembling its contributors. Thanks are due to the many referees who subjected the papers to rigorous scrutiny and offered invaluable advice that helped us ensure the high quality and sophistication of the articles that readers will find in the pages of this volume. I am also grateful to the two regular editors of this journal both for inviting me to take on the exciting and rewarding role of guest editing this number of *Enlightenment and Dissent* and for generously offering their help and counsel along the way as the issue took shape. Lastly, I would like to thank the contributors, not only for patiently enduring two levels of editorial oversight, but also for their hard work in developing studies that will further our understanding of Isaac Newton in the eighteenth century.

Stephen D Snobelen

**TWO EIGHTEENTH-CENTURY TRANSLATORS OF NEWTON'S *OPTICKS*:
PIERRE COSTE AND JEAN-PAUL MARAT**

Jean-François Baillon

Introduction

Newton's *Opticks*, first published in London in 1704, is a rare case of a major scientific treatise being translated twice in the same language within a relatively brief period of time.¹ Marat's anonymously-published translation of 1787 was offered in replacement of Pierre Coste's initial effort, first published in 1720. A comparison of the two texts has already been attempted and is not very revealing. Each version has its own merits and shortcomings and none deserves the opprobrium sometimes cast upon them, for reasons which have little to do with their merits as translations *per se*.

Take, for instance Algarotti's judgment on the earlier one: 'M. Coste, who among all translators has distinguished himself by his exactness and fidelity, made an infinite number of mistakes in his French translation of Newton's *Opticks* because he was not thoroughly knowledgeable in the matter.'² True to the announcements made in the 'Translator's Preface', Coste's translation is more precise and closer to the letter of the text: 'It may be rightly demanded from me that I convey in my translation that exactness and that clarity which, together with a penetration and a perspicuity without equal, characterize so well the Author's mind; and I

¹ The present article is a revised version of an article initially published in French as 'Retraduire la science: le cas de l'*Optique* de Newton, de Pierre Coste (1720) à Jean-Paul Marat (1787)', in *Traduire la science: hier et aujourd'hui*, ed. Pascal Duris (Pessac, 2008), 69-83. I have provided my own translations of all the original French quotations.

² 'M. Coste, qui entre tous les traducteurs s'est distingué par son exactitude et sa fidélité, pour n'avoir pas eu une entière connoissance de la matière, a fait une infinité de fautes dans sa traduction Française de l'*Optique* de Newton' (to Count Jean Marie Mazzuchelli, 17 March 1751, in Francesco Algarotti, *Œuvres*, VII, [Berlin, 1772], 290).

Translators of Newton's Opticks: Pierre Coste and Jean-Paul Marat

dare say that I have spared neither time nor care to achieve it.³ Marat's is more fluent although some of the liberties taken with the exact wording of Newton's original may appear problematic to twenty-first century standards. In keeping with the Enlightenment agenda and in a quasi-metaphorical language that curiously echoed the rhetoric of Marat's political pamphlets, such as his 1774 *The chains of slavery*, his publisher paradoxically accused Coste of making Newton's work more obscure by sticking to its letter: 'he has slavishly copied all the turns of phrase of the original and retained, as a kind of mannerism, countless repetitions; such negligence is often overlooked by a writer of genius, fully absorbed by his subject, but it is not to be tolerated in a translation: thus he has rendered, in terms which are constantly inappropriate and often confused, the sublime notions of the Author.'⁴ In his own 'Translator's notice', which sometimes contains the same wording as the 'Publisher's preface', Marat concisely expounds similar arguments in favour of the liberties he has taken.⁵ Another accusation, only to be found in the 'Publisher's preface', referred to Coste's incompetence as a natural philosopher.⁶ As we will see later, this may well have been the case, but the second printing of his translation of the *Opticks* was very much a collaborative work in which several key figures belonging to Newton's circle were involved, not to mention Newton himself, as was the case even with the first printing. Thus Marat's accusation seems ill-advised. As will appear in this study, however, the very notion of an original text of Newton's *Opticks* is slightly problematic as the printing of a French translation in the early 1720s can be understood as part of a wider work in progress consisting

³ '[O]n a droit d'exiger de moi que je fasse passer dans ma Traduction cette justesse & cette clarté qui jointes à une pénétration & une sagacité incomparables caractérisent si bien l'Esprit de l'Auteur; & j'ose assurer que je n'ai épargné ni temps ni soin pour en venir à bout' (Isaac Newton, *Traité d'Optique* [Amsterdam, 1720], iv).

⁴ '[I]l a servilement copié les tours de phrase de l'original, & conservé, avec une sorte d'affectation, une multitude de redites; négligences qui échappent souvent à un Écrivain de génie plein de son objet, mais qui sont insupportables dans une Traduction: de sorte qu'il a rendu, en termes toujours impropres et souvent inintelligibles, les sublimes idées de l'Auteur' ('Préface de l'Éditeur', Isaac Newton, *Optique* [Paris, 1787], x).

⁵ Newton, *Optique* (Paris, 1787), xv-xx.

⁶ Newton, *Optique* (Paris, 1787), x.

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in the expansion and adaptation of the 1704 text to various contexts of readership. Whatever the case may be, ascribing manipulative intentions to Marat's practice as such remains highly hypothetical, especially in an age when readers of translations of natural philosophical works would not necessarily expect strict philological standards to apply – although only a full-length study, well beyond the scope of the present article, may satisfy us in this respect.

Beyond such general considerations, one may well wonder about the interest of opening the case after so many years. This article is based on the claim that those translations were actually two acts of scientific communication each of which fulfilled specific purposes. In point of fact the history of each translation reveals a rather different logic at work. Coste's translation was published in Newton's own lifetime and should be read as part of a strategy of diffusion of Newton's theory of light and colours at a rather delicate moment in the development of intellectual interaction between England and the Continent. According to A Rupert Hall, Newton's international glory in his own lifetime was due to the French translation of his *Opticks*.⁷ As for Marat's translation, it was the work of a man who tried to make a name for himself in Parisian and provincial scientific circles by promoting a purportedly revolutionary theory of light and colours that rejected the Newtonian framework. Paradoxically enough, this publication of a new translation of the *Opticks* came from a self-styled opponent of Newtonian science and it was supposed to be more faithful to the original text – indeed what translator ever claimed otherwise?

Coste's Translation

Strictly speaking, Coste's translation was not the first attempt at producing a French version of Newton's treatise. One earlier attempt that was never published survives in manuscript.⁸ There were two editions of

⁷ A Rupert Hall, *Philosophers at war: the quarrel between Newton and Leibniz* (Cambridge, 1980), 252.

⁸ Henry Guerlac, *Newton on the Continent* (Ithaca and London, 1981), 76. More about this early translation later.

Translators of Newton's Opticks: Pierre Coste and Jean-Paul Marat

Coste's text – the 1720 Amsterdam edition printed by Pierre Humbert and the 1722 Paris edition printed by Montalant. Newton himself entrusted abbé Pierre Varignon, a member of the Académie des Sciences, with the supervision of the latter edition. Varignon, who had attended Sébastien Truchet's experiments, had been asked by the Académie to review the first French edition of the *Opticks* (i.e., the 1720 Amsterdam edition) before he assumed responsibility for the Paris edition – a publication in which the *Chancelier de France*, Henri François Daguesseau, took a personal interest.⁹ On Varignon's request, Newton drew a sketch for the engraving which was to serve as frontispiece for the two planned volumes. He chose the experiment with the two prisms, the *experimentum crucis*, and added a motto: '*Nec variat lux fracta colorem*'.¹⁰

Born in Uzès, Pierre Coste (1668-1747) shared the fate of many French Huguenots and pursued his studies in exile in Geneva, Lausanne, Zurich and Leiden. He wrote a *Discours sur la philosophie où l'on voit en abrégé l'histoire de cette science* (1691; Latin text 1705), and published translations from Latin and Italian before he turned to Locke's English prose with *Some thoughts concerning education* (1693), which he translated in 1695 as *De l'éducation des enfans*. Arriving in England in 1697, he became tutor of the children of Sir Francis and Lady Damaris Masham, Locke's patron. Locke then used him as his secretary and the two men went on working together until Locke's death in 1704. Besides Locke's educational works, which Coste revised several times to integrate Locke's own additions and revisions, Coste translated two of his major works – the *Essay concerning human understanding* and *The reasonableness of Christianity*. In the 1715 edition of his translation of the latter text, he added a *Dissertation de son cru, où l'on établit le vrai et l'unique moyen de réunir tous les chrétiens, malgré la différence de leurs sentiments* and *La religion des dames*, translated from *The ladies' religion*, an anonymous 1698 treatise attributed to the theologian William Stephens. In short, the man who was entrusted with the translation of Newton's *Opticks* in the late 1710s was anything but a dabbler in

⁹ Richard S Westfall, *Never at rest: a biography of Isaac Newton* (Cambridge, 1980), 795.

¹⁰ 'Light does not change colour when it is refracted' (Westfall, *Never at rest*, 796).

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intercultural communication or linguistic adaptation – he was quite an experienced translator who had dealt with rather difficult philosophical texts and had had the opportunity to reflect upon his own practice, as can be seen in his own ‘Avertissement du traducteur’ preceding his translation of *The reasonableness of Christianity* and above all in the many footnotes offering what amounts to a commentary of some of the difficulties of the *Essay concerning human understanding*. According to Coste’s major biographer, ‘he did not see himself as a mere translator – he was actually an interpreter of ideas and his translations often shed light on the original texts’.¹¹

Coste then became tutor of the children of Edward Clarke, Locke’s friend and first addressee of his letters on education. At the same time, he went on doing translations (Francesco Redi’s *De animaliculis*, Shaftesbury’s *Sensus communis* and works by ancient authors such as Xenophon and Horace). As a Huguenot in exile in England, he formed part of that network of cultural intermediaries, translators and vulgarisers, journalists and printers who were responsible for the success of the early English Enlightenment throughout Europe.¹² The decision to have Newton’s *Opticks* translated into French by Coste is believed to have been due to the initiative of the Princess of Wales.¹³ Strangely enough for a prolific translator, this was to be Coste’s last translation. In later years, his most lasting contribution was his work as editor of Montaigne’s *Essais* (1724), Theophrastus’s *Characters* (1733) and La Fontaine’s *Fables* (1743). He died in Paris in 1747.

According to an early biography of Coste, he was appointed tutor of Shaftesbury’s son, then aged four, in 1714 and around this date he translated ‘a few pieces of Mr Newton’ (presumably in the context of the controversy with Leibniz) for the Princess of Wales.¹⁴ Still according to

¹¹ ‘Coste ne se voyait pas simplement comme traducteur: il était effectivement interprète d’idées et souvent ses traductions éclaircissent les originaux’ (Margaret E Rumbold, *Traducteur huguenot: Pierre Coste* [New York, Paris and London, 1991], 75).

¹² Jean-François Baillon, ‘Early eighteenth-century Newtonianism: the Huguenot contribution’, *Studies in History and Philosophy of Science*, 35 (2004), 533-48.

¹³ Rumbold, *Traducteur huguenot*, 75.

¹⁴ The original phrase is ‘quelques pièces de M. Newton’ (Charles de la Motte, ‘La Vie de Coste’ [c. 1747], in *John Locke, Que la religion chrétienne est très-raisonnable*, ed. Héléne Bouchilloux and Maria-Cristina Pitassi [Oxford, 1999], 254).

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the same biographer, 'Mr Newton entreated him to translate his *Opticks*, which Mr Coste could not resolve himself to endeavour, because he did not know mathematics, but Mr de Moivre, who was among his friends and even more, among Mr Newton's, promised to assist him in this part, but he did not keep his word, which greatly pained Mr Coste, who did not want to send his work to the printer. Yet in the end he was persuaded to comply, especially as he had taken the job by order of the Princess of Wales, and as Mr Desaguliers promised to review his translation'.¹⁵

However, Coste was no natural philosopher and the translation which was eventually published in two successive editions was the result of a process of revision by several members of Newton's circle, especially Jean-Theophilus Desaguliers and Abraham de Moivre, who also belonged to the Huguenot diaspora in England. De Moivre only intervened on the second edition, the 1722 Paris printing.¹⁶

The Agenda Behind Coste's Translation

Newton's own interest in the translation of his treatise of light and colours should be understood in a wider context, determined by three major preoccupations: first, the priority dispute with Leibniz over the discovery of the calculus and, after the latter's death in 1716, his disciples; second, his publication of successive editions of the *Opticks* (including the English and Latin ones); and, lastly, his preparation of new editions of the *Principia* (in 1713 and 1726). Newton's correspondence between 1718 and 1722 testifies to the very great care he lavished on the French translation of his *Opticks* – the latter being his only scientific text printed in French within his lifetime, the translation of the *Principia* by Mme du

¹⁵ 'M. Newton l'engagea à traduire son Optique, ce que M. Coste ne pouvoit se resoudre à entreprendre parce qu'il n'entendoit pas les Mathematiques, mais M. de Moivre qui étoit de ses amis et encore plus de M. Newton, promit de l'aider dans cette partie, mais il ne tint pas parole, ce qui chagrina beaucoup M. Coste, qui ne vouloit pas envoyer sa copie pour l'imprimer. Il le fit pourtant à force de sollicitations, d'autant plus qu'il l'avoit entreprise par ordre de la Princesse de Galles, et que M. De Sagulliers promit de revoir sa traduction' (C de la Motte, 'La Vie de Coste', 255).

¹⁶ *The correspondence of Isaac Newton*, ed. H W Turnbull et al. (7 vols., Cambridge, 1959-77), VII, xxxvi. On the subject of the Huguenot diaspora's contribution to the construction of a particular version of Newtonianism authorized by Newton himself, see Jean-François Baillon, 'Early eighteenth-century Newtonianism'.

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Châtelet being published posthumously in 1759. By the late 1710s, the *Opticks* was, with the *Principia*, Newton's only scientific text whose printing he personally supervised and therefore the one which he was most likely to use in his strategy to win over the favourable opinion of fellow natural philosophers on the Continent.¹⁷ Due to the efforts of an increasing number of followers, Newtonian natural philosophy came to replace Cartesianism as the dominant account of the physical world, although it is only fair to add that many versions of Newtonianism gradually emerged. As one recent study has shown, the debate on the interpretation of Newton's natural philosophy in the early decades of the eighteenth century was crucial in the shaping of the French Enlightenment.¹⁸

The translation which was published in 1720 includes references to the experiments conducted by Desaguliers in 1715 to counter accusations by Edme Mariotte. While it is true that the 1704 *Opticks* was published at a time when Newton himself was no longer significantly enriching and developing his theory, the book was not merely a repetition of earlier theses and experiments. Thus between the first English edition (1704) and the last English edition published in his lifetime (1721), Newton kept adding material in the form of increasingly numerous and long Queries in the last section of Book III. This controversial 'appendix' developed considerations which went far beyond the mere theory of light and colours and included hypotheses on the inner structure of matter, attraction and the primitive religion.¹⁹

¹⁷ A Rupert Hall, 'Newton in France: a new view', *History of Science*, 13 (1975), 238.

¹⁸ J B Shank, *The Newton wars and the beginning of the French Enlightenment* (Chicago and London, 2008). I thank Steve Snobelen for pointing out this important reference to me. On the existence of several versions of Newtonianism in the eighteenth century, see Robert E Schofield, 'An Evolutionary Taxonomy of Eighteenth-Century Newtonianisms', *Studies in Eighteenth-Century Culture*, 7 (1978) 175-92.

¹⁹ Stephen D Snobelen, 'La Lumière de la Nature: Dieu et la Philosophie Naturelle dans l'*Optique* d'Isaac Newton', *Lumières*, 4 (2004), 65-104; cf. also Jean-François Baillon, 'Théologie newtonienne et théorie de la vision: quels contextes pour les éditions de l'*Optique* de Newton de 1704 à 1722?', *Bulletin de la Société d'Etudes Anglo-américaines XVII-XVIII*, 62 (2006), 129-41.

Translators of Newton's Opticks: Pierre Coste and Jean-Paul Marat

The translations published in 1720 and 1722 formed part of the support given to Newtonianism by English and Continental supporters in a context which was still strongly determined by the controversy against Leibniz. The project to produce a translation went back to the late 1710s, that is shortly after the death of the German philosopher in 1716. The controversy was carried on well beyond that date, especially through the publication of two editions of the *Recueil de diverses pièces*, a collection of letters exchanged by Leibniz and Samuel Clarke over the theological and metaphysical consequences of attraction, together with a number of related documents concerning the quarrel opposing supporters of Newton and supporters of Leibniz. The edition supervised by Clarke, who was very close to Newton, was published in 1717; the one published by the French Huguenot Pierre Des Maizeaux came out in 1720. Both were reprinted many times in the eighteenth century. A foreign correspondent of the *Académie Royale des Sciences* since 1699, Newton only communicated with the illustrious assembly in 1713,²⁰ the year when the second edition of the *Principia* was published, with its answer to Leibniz contained in the famous General Scholium. The 'Translator's Preface' of the 1720 French edition of the *Opticks* contains a development about the nature of gravity which can be interpreted as an answer to some criticisms by Leibniz and other opponents of Newton's theories: 'Lastly [Newton] here gives us his conjectures about Gravity, from whence it obviously appears that he never regarded Gravity as an essential property of Bodies. One may also see from what he says about *Attraction*, that this Principle is anything but what the Schoolmen termed an *Occult Quality*'.²¹

The first English edition of 1704 was published with two small Latin mathematical works on the calculus (*Enumeratio linearum tertii ordinis* and *Tractatus de quadratura curvarum*) and so was the first Latin translation of 1706. A third English text was printed in 1721 between the first and second French editions. These were times when Newton's theories of light and colours had very little impact on the Continent.

²⁰ Hall, 'Newton in France: a new view', 237.

²¹ Newton, *Traité d'optique* (Amsterdam, 1720), xiii. These lines are reprinted word for word in the 1722 edition.

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Desaguliers's 1715 experiments changed the situation and created an interest – with the publication of the second Latin edition of the *Opticks*, Truchet, who was an honorary member of the *Académie Royale des Sciences*, was curious to repeat the experiments once criticised by Mariotte in *De la nature des couleurs* (1681), a refutation which had been sufficient to invalidate Newton's theory in the eyes of most French natural philosophers then.²² This time Truchet was successful. In an undated letter probably sent in 1721, Truchet thanked Newton for sending him a copy of the 1720 *Traité d'optique* and explained that, with the help of a copy of the English text and assisted by the translation of Étienne-François Geoffroy, he managed to reproduce most of the experiments described in the treatise, in the presence of a public which included the Cardinal of Polignac, who opposed Newton's theory on the grounds of 'its conformity with the fundamental tenets of the Physics of Epicurus'.²³ Geoffroy, to whom Hans Sloane, the Secretary of the Royal Society of London, sent a copy of the first edition of the English *Opticks* in 1705, was none other than the author of a kind of digest-translation of Newton's treatise which was read before the *Académie Royale des Sciences* over ten different sessions between August 1706 and June 1707.²⁴ Geoffroy was in regular correspondence with Sloane in the first years of the eighteenth century.²⁵ The fact that the first translation of the *Opticks* into French was published in Amsterdam testifies to the early success of Newtonianism in Holland, especially due to the efforts of Desaguliers and Wilhelm Jacob's Gravesande.

The project of a Paris edition, eventually completed in 1722, proceeded from a totally different strategy, that is, the conquest of a public which was, *a priori*, hostile to Newton, in a country given over to the Cartesians and Leibnizians, despite the presence of a few supporters of Newton's theory of light and colours such as Geoffroy, the Chevalier de Louville

²² Westfall, *Never at rest*, 794-5; *Correspondence of Newton*, VII, 116.

²³ *Éloge de Polignac* by Dortous de Mairan (Paris, 1747), quoted in *Correspondence of Newton*, VII, 117 n. 5.

²⁴ Hall, 'Newton in France', 241-2.

²⁵ Hall, 'Newton in France', 237.

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and Nicolas Malebranche.²⁶ Indeed, the two translator's prefaces do not fail to point out the first experimental victories of Newtonian science in France. Prior to the first edition, Newton had prepared the ground, as it were, by having a copy of his *Optique* (i.e., the first French edition) sent to the abbé Bignon, the President of the *Académie Royale des Sciences*, through the abbé Varignon.²⁷ In 1719, he sent Bernard le Bovier de Fontenelle one copy of the English *Opticks*, with a letter concerning questions of scientific method.²⁸ He also sent Varignon five copies of the 1719 edition of the Latin text. In a letter dated 15 July 1719, Varignon informed Newton that he presented one copy to the *Académie*, one to Johann Bernoulli, one to Fontenelle and one to Rémond de Monmort.²⁹ Between 1714 and 1722, Varignon interceded on Newton's behalf with several Continental philosophers. Clearly, sending copies of various editions of the *Opticks* in various languages was part of an attempt to win their favour at a time when the ashes of the dispute with Leibniz were still warm. In October 1721, Varignon wrote to Bernoulli to announce that three copies of the forthcoming Paris edition of the *Traité d'optique* were intended for him by Newton himself.³⁰ In a letter dated 11 November 1722, Fontenelle, who was a supporter of Descartes, thanked Newton for sending a copy of the second French edition of the *Optique*, and confessed that he appreciated being mentioned in Coste's Preface, which included a modification of the initial version of 1720 specifically for that purpose.³¹ De Moivre, who took part in the revision of Coste's translation for the Paris edition of 1722, played a similar conciliatory role in 1721 and again in 1722.³² As for Coste himself, in 1716 he translated into French a letter sent by Newton to Leibniz through the assistance of abbé Antonio Conti.³³

²⁶ Ibid.

²⁷ Françoise Bléchet, 'L'abbé Bignon, président de l'Académie royale des sciences', in *Règlement, usages et science dans la France de l'absolutisme*, ed. Christiane Demeulenaere-Douyère and Eric Brian (London, Paris and New York, 2002), 66.

²⁸ Here are some of the remarks by Newton: 'Here I cultivate the experimental philosophy as that which is worthy to be called philosophy, and I treat hypothetical philosophy, not as knowledge, but by means of queries' (quoted in Westfall, *Never at rest*, 792).

²⁹ *Correspondence of Newton*, VII, 50-3; Westfall, *Never at rest*, 787.

³⁰ Varignon to Bernoulli, 10/11 October 1721, *Correspondence of Newton*, VII, 167-70.

³¹ *Correspondence of Newton*, VII, 216.

³² Westfall, *Never at rest*, 791.

³³ Westfall, *Never at rest*, 776.

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Such a strategy proved fruitful since, in May 1720, Varignon told Newton about the intention of a Paris bookseller, François Montalant, to get a French translation of the *Opticks* printed on the basis of the 1720 Dutch edition. In the same letter, Varignon suggested that he would agree to the bookseller's project.³⁴ The latter, however, would not consist in a mere reprinting of the earlier version: the 1720 text was to be revised by De Moivre, who was appointed by Newton himself. Such competition was not to Coste's taste, as he explained in a letter dated 16 August 1721: 'I am used coarsely enough in not having had the perusal of the corrections of Mr. de Moivre before they were printed, by the slanders of Mr. Des Maizeaux, an effect of that denial as I foretold it, & in not having the perusal of one third at least of the corrections of M. de Moivre'.³⁵ In the end, Newton had to intervene to convince Varignon to take Coste's suggestions into account.³⁶ In a letter to Newton dated 24 July 1722 sent with some proof pages, Varignon insisted on De Moivre's contribution, Coste, having declared himself incompetent on the strictly scientific aspects of the treatise, confessed that the changes suggested by the two joint translators were rarely at variance. Whenever that was the case, Varignon used the Latin edition as final criterion.³⁷ Other difficulties, due to the bookseller's own lack of goodwill, occasioned some further delays, which required the intervention of *Chancelier* Daguesseau, the latter seizing the opportunity to praise Newton for his optical works.³⁸ All of this makes it difficult for anyone who reads the final result to disentangle the individual contributions of the various translators involved in what was very much a joint enterprise, if not a fully co-operative process.

Beyond carefully chosen turns of phrase, what we would call the public relations aspect of the project was far from being a minor issue. One of the subjects which recurred in the letters exchanged by Newton and Varignon was the choice of an illustration for the frontispiece of each of the two volumes for what was meant to be a prestigious publication:

³⁴ *Correspondence of Newton*, VII, 90-1.

³⁵ *Correspondence of Newton*, VII, 147-8.

³⁶ Cf. letters from Varignon to Newton, 7 September 1721, *Correspondence of Newton*, VII, 152-6 and Newton to Varignon, 26 September 1721, *ibid.*, 160-6.

³⁷ *Correspondence of Newton*, VII, 206-10.

³⁸ Daguesseau to Newton, 17 September 1721, *Correspondence of Newton*, VII, 157-8.

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instead of the two small duodecimo volumes of the earlier edition, Montalant offered a lavish quarto format running over nearly 600 pages. On Varignon's suggestion, Newton thought of an illustration which was likely to sum up the essence of his theory.³⁹ Newton's choice quickly fell on the now famous 'crucial experiment', which hinges on the use of two prisms. Varignon unreservedly approved this choice since he saw in the *experimentum crucis* the ultimate proof of the immutability of colours, which was one of the fundamental points of the whole theory.⁴⁰ Newton himself had termed the two-prisms experiment '*experimentum crucis*' in a famous letter to Henry Oldenburg dated 6 February 1672, before he detailed its contents in an article published in the same year in the *Philosophical Transactions of the Royal Society of London*; but the initiative to use the phrase again in the service of Newtonian propaganda after 1714 was due to Desaguliers, who offered visitors of the Royal Society a totally redesigned presentation of the original experiment.⁴¹ Varignon and Newton gave much thought to the vignette representing the experiment. On 17 April 1722, Varignon suggested to Newton some minor alterations designed to make the image both more legible and more efficient.⁴² In a letter dated 22 October 1722, Newton thanked the artist Jacques-Antoine Arlaud for the special care given to the engraving.⁴³ As a matter of fact the choice of that vignette as 'visual summary' of the theory reinforced the notion that it could be immediately read into the phenomena themselves, or in other words that the experiment with the two prisms gave a direct and incontrovertible insight into both differential refrangibility and the homogeneity of coloured rays – two tenets that were to be challenged by Marat and, later, by Goethe.⁴⁴

³⁹ Newton to Varignon, 26 September 1721, *Correspondence of Newton*, VII, 160-6.

⁴⁰ Varignon to Newton, 28 November 1721, *Correspondence of Newton*, VII, 178-80.

⁴¹ Newton to Oldenburg, 6 February 1672, *Newton*, ed. I Bernard Cohen and Richard S Westfall (New York and London, 1995), 173; Simon Schaffer, 'Glass Works', in *Newton*, ed. Cohen and Westfall, 216.

⁴² *Correspondence of Newton*, VII, 199-201.

⁴³ *Correspondence of Newton*, VII, 212-13.

⁴⁴ Dennis L Sepper, *Goethe contra Newton. Polemics and the project for a new science of color* (Cambridge, 1988), 130-57.

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From the 1720s, editions and translations of scientific texts by Newton accompanied the development of Newtonianism – in all its varieties – throughout Europe, both as instrument and reflection of that development: *A treatise of the system of the world* (1728); *Optical lectures* (1728); *The mathematical principles of natural philosophy* (Andrew Motte’s English translation, 1729); *The method of fluxions and infinite series* (John Colson’s English translation, 1736); *La méthode des fluxions et des suites infinies* (Buffon’s French translation, 1740); *Sir Isaac Newton’s two treatises of the quadrature of curves, and analysis by equation of an infinite number of terms* (John Stewart’s English translation, 1745); *Principes mathématiques de la philosophie naturelle* (Mme du Châtelet’s French translation, 1759). The success of Newtonian science owed a great deal to the support given by commentators and vulgarizers: G I ’sGravesande, *Matheseos universalis elementa* (Lyons, 1727); Henry Pemberton, *A view of Sir Isaac Newton’s philosophy* (London, 1728; an Italian translation was published in Venice in 1733, a French one in Amsterdam and Leipzig in 1755); Francesco Algarotti, *Il newtonianismo per le dame* (Naples, 1737; a French translation was published by Montalant in 1738; Elizabeth Carter’s English translation was published in London in 1739); W J ’sGravesande, *An explanation of the Newtonian philosophy* (Londres, 1735); James Hodgson, *The doctrine of fluxions* (London, 1736); Robert Smith, *A compleat system of opticks* (London, 1738; Dutch translation, 1753; German translation, 1755, French translation, 1767); Voltaire, *Réponse à toutes les objections principales que l’on a faites en France contre la philosophie de Neuton* (Paris, 1739); and Colin Maclaurin, *An account of Sir Isaac Newton’s philosophical discoveries* (London, 1748; French translation Lavirotte, Paris, 1749). Such commentaries and expositions favoured the spread of Newtonian ideas, supported by the public relations work consisting of conducting public experiments, such as those of Francis Hauksbee, Sr., Desaguliers and, later, Stephen Demainbray, whose tours of Europe helped to reinforce the authority of Newton’s physics (particularly the experiments of Hauksbee and Desaguliers, in the context of the dispute with Leibniz in the 1710s).⁴⁵ In 1715, Desaguliers conducted experiments before

⁴⁵ Schaffer, ‘Glass Works’, 215.

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visitors from Holland, Italy and France, and they were later successfully reproduced in Paris and elsewhere.⁴⁶ And yet this was not a linear process as the spread of Newtonianism encountered opposition throughout the eighteenth century. What has sometimes been termed ‘anti-Newtonianism’ found distinguished spokesmen in England as well as in France – and elsewhere: in the years after the French translations of the *Opticks* were published, Newton had to face the criticisms of Giovanni Rizzetti (1675-1751), who was later to publish *De luminis affectionibus specimen physico mathematicum* (Treviso, 1727) and *Saggio dell'antinevtonianismo sopra le leggi del moto e dei colori* (Venice, 1741)⁴⁷ and of Nicolas Hartsoeker, the author of a *Recueil de plusieurs pièces de physique, où l'on fait voir l'invalidité du système de Mr Newton* (Utrecht, 1722). The success encountered by the Newtonian paradigm did not go unquestioned – not just over metaphysical principles, as had been the case concerning the controversial claim of matter acting upon matter at a distance after the publication of the *Principia* in 1687, but mainly, as we will see, over very practical details and experimental procedure. It was within such a context of increasing distrust of some of Newton's claims in his optical experiments that Marat's own translation was produced and made sense.

After Coste's translation: the contested legacy of Newton

Throughout the eighteenth century, all the major aspects of Newtonian science were under attack: infinitesimal calculus whose very principles were questioned by George Berkeley in *The Analyst* (1733), astronomy criticised by Étienne-Simon de Gamaches in his *Astronomie physique* (1740) and above all the theory of colours, which encountered numerous opponents: Louis-Bertrand Castel, author of a *Vrai système de physique générale de M. Isaac Newton* (1743); Jacques Gautier d'Agoty and his *Chroa-génésie, ou génération des couleurs, contre le système de Newton* (1749) and Celaestinus Cominale, who published the two parts of his

⁴⁶ Schaffer, ‘Glass Works’, 216.

⁴⁷ Westfall, *Never at rest*, 796 and note 48. See also Pierre Amalric, ‘Marat et l'optique’, in *Marat homme de science?*, ed. Jean Bernard, Jean-François Lemaire and Jean-Pierre Poirier (Paris, 1993), 123-8.

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Antiaerotonianismi between 1754 et 1756. More generally speaking, several historians of scientific culture in the eighteenth century have noticed a waning of Newton's authority after the turn of the 1750s if not earlier.⁴⁸

One of the most questionable – and one of the most discussed – tenets of Newton's theory was the affirmation that it was impossible to suppress chromatic aberration in the making of telescopes. On the basis of experiments 7 and 8 of Proposition III of Part II of Book I of the *Opticks*, the Newtonian theory of colours 'had acquired such authority that, for more than thirty years, nobody thought of questioning its conclusions'.⁴⁹ Indeed in the closing paragraph of that passage, Newton himself rather triumphantly wrote: 'And these Theorems being admitted into *Opticks*, there would be scope enough of handling that Science voluminously after a new manner; not only by teaching those things which tend to the perfection of Vision, but also by determining mathematically all kinds of Phaenomena of Colours which could be produced by Refractions'. Reminding his reader that the heterogeneity of coloured rays was the key to every phenomenon, he added: 'by the successes I met with in the Trials, I dare promise, that to him who shall argue truly, and then try all things with good Glasses and sufficient Circumspection, the expected Event will not be wanting'.⁵⁰ In England, the credit given to that theory threatened to become an epistemological obstacle, as it impeded the publication of the empirical findings of Chester More Hall in 1733.⁵¹ Gradually, towards the mid-eighteenth century, the empirical and theoretical research of John Dollond, Leonhard Euler, Samuel Klingenstermia, James Short and a few

⁴⁸ See for instance Henry Guerlac, 'Newton's Changing Reputation in the Eighteenth century', in his *Essays and papers in the history of modern science* (Baltimore and London, 1977), 69-81 and Marjorie Hope Nicolson, *Newton demands the muse: Newton's Opticks and the eighteenth century poets* (Princeton, 1946), 137.

⁴⁹ Maurice Daumas, *Les Instruments scientifiques aux XVIIe et XVIIIe siècles* (Paris, 1953; repr. Paris 2003), 203.

⁵⁰ Newton, *Opticks*, 3rd ed. (London, 1721), 114-15 (part of proposition III, 'To define the Refrangibility of the several sorts of homogeneous Light answering to the several Colours', *ibid.*, 109-15).

⁵¹ Marie-Antoinette Tonnelat, 'Diffusion de l'optique newtonienne', in *Histoire Générale des Sciences*, II, ed. René Taton (Paris, PUF, 1958), 501.

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others eventually unveiled Newton's misconceptions.⁵² In 1757, the optician Dollond reproduced Newton's experiments with results which led him to believe that it was possible to correct chromatic aberration.⁵³

On a more abstract level, the shortcomings of Newton's theory were to be examined by some of his own followers: Roger Joseph Boscovich in his *Dissertatio de lumine* (Rome, 1749) and Leonhard Euler in *Lettres à une princesse d'Allemagne* (Berne, 1775).⁵⁴ Euler explored those matters in *Nova theoria lucis et colorum* (1746) and 'Essai d'une explication physique des couleurs engendrées sur des surfaces extrêmement minces' (1752) but he remained within the Newtonian paradigm – one of the leading contemporary Newton scholars, Alan Shapiro, described Euler's work as inscribed in the 'Newtonian framework'.⁵⁵

Other contributions challenging some Newtonian theses were the works of neo-Cartesian natural philosophers like Étienne-François Dutour, who published several memoirs under the title of 'Considérations optiques' in the *Journal de Physique* between 1773 and 1776. These were published anonymously, the author claiming that he was aware he was attacking 'the famous Newton' ('le célèbre Newton').⁵⁶

From 1776 on, the attack came from the chemists, who argued against the Newtonian theory of coloured bodies. Such was the case of Christophe Opoix, the author of 'Observations physico-chimiques sur les couleurs' (1776). Yet Opoix took inspiration from Newton's own remarks in the Queries of the *Opticks* (Q. 22/30 and 23/31).⁵⁷ A particularly interesting case is that of the Geneva natural philosopher Jean Senebier, who published a memoir 'Sur le phlogistique' in the *Journal de Physique* (1776-1777), followed by a treatise entitled *Mémoires physico-chimiques* (Geneva, 1782). Yet Senebier, who developed experiments on

⁵² Daumas, *Les Instruments scientifiques*, 204-5.

⁵³ Tonnelat, 'Diffusion de l'optique newtonienne', 502.

⁵⁴ Tonnelat, *ibid.*, 506-7.

⁵⁵ Alan E Shapiro, *Fits, passions, and paroxysms. Physics, method, and chemistry and Newton's theories of colored bodies and fits of easy reflection* (Cambridge, 1993), 234-7.

⁵⁶ Shapiro, *Fits, passions, and paroxysms*, 237.

⁵⁷ Shapiro, *Fits, passions, and paroxysms*, 242-5.

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photosynthesis and on the sensitivity of silver salts to light, also referred to the same passages from the *Opticks* and offered a new interpretation of the experiments Newton described (Book II, Prob. III, Prop. V).⁵⁸ Rather than undermining Newton's theory, Senebier modified by including a chemical hypothesis on the nature of bodies, which supports Shapiro's claim that chemists like Opoix or Senebier were upholding what remained basically a legitimate Newtonian position and did not step outside the framework of a Newtonian description of a universe of corpuscles, forces and affinities.⁵⁹

At the time when Marat's new translation of the *Opticks* was published, Newton's theory of light therefore enjoyed a rather ambiguous status. While it was widely acclaimed as the 'official' scientific doctrine in England and in France, repeated attacks had revealed some weak points and insufficiencies, without undermining its founding paradigms. Such a paradoxical allegiance defined the kind of double-bind which characterised Marat's whole relationship to Newton's work.

Jean-Paul Marat, translator and traitor

Like Coste, Jean-Paul Marat (1743-1793) was familiar with the English language. In the 1770s, he lived in England, where he took part in its literary life by publishing several books in English: *An Essay on the human soul* (1772); *A philosophical essay on man* (1773); *The chains of slavery* (1774); *An essay on gleans, wherein the defects of the actual method of treating those complaints of the urethra are pointed out, and an effectual way of curing them indicated* (1775); and *An enquiry into the nature, cause and cure of a singular disease of the eyes, hitherto unknown, and yet common, produced by the use of certain mercurial preparations* (1776). According to Charles Coulston Gillispie, the latter work testified to a relatively acceptable degree of familiarity with optical theory on Marat's part.⁶⁰

⁵⁸ On Senebier's part in the discovery of photosynthesis, see Sacha Tomic, Michelle Cussenot and Erwin Dreyer, 'La lumière et les plantes: la découverte de la "photosynthèse", 1779-1804', in *La Lumière au siècle des Lumières et aujourd'hui*, ed. Jean-Pierre Changeux (Paris, 2005), 145-61.

⁵⁹ Shapiro, *Fits, passions, and paroxysms*, 257.

⁶⁰ Charles Coulston Gillispie, *Science and polity in France at the end of the Old Regime* (Princeton, 1980), 295.

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However, in the 1780s, Marat's efforts to promote an alternative theory were confronted with the hostility of academic institutions. This hostility was not altogether surprising, given the success of the strategy of conquest of Newton and his exponents in the academies. One example of such hostility can be found in the words of abbé Bertholon, who commented upon Marat's claims against Newton's theories: 'Who might that man be thus to dare stand on a level with the immortal Newton – he who, for more than forty years, made experiment after experiment on optics? The said Marat uses bad prisms and looks upon his twisted results as evidence against Newton'.⁶¹ Marat was visibly confronted with the official Newtonianism reinforced by the dissemination of Newtonian theories, itself a result of the complex process of translation and vulgarization hinted at above. In France, some of the men responsible for this success were D'Alembert, who wrote the entry on colours in the *Encyclopédie*, and the abbé Nollet, whose public experiments illustrated the power of the Newtonian theories. But the successive editions of the *Opticks* were themselves no small instrument in this phenomenon since, according to Shapiro, the *Opticks* may have been the most widely-read scientific text in the eighteenth century.⁶²

For convenience's sake, it is advisable to examine Marat's scientific ambitions in two parts: first, his failed attempt to convince the *Académie Royale des Sciences* of the relevance of his optical experiments (*circa* 1779-1780); then his marginally more successful attempt to conquer the provincial academies. His attempt to approach the *Académie Royale des Sciences* was immediately checked by the hostility of Lavoisier since, according to the latter, the experiments conducted by Marat 'do not seem

⁶¹ 'Quel est cet homme pour oser poser avec l'immortel Newton? Lui qui, pendant plus de quarante ans, a fait des expériences sur l'optique. Le sieur Marat se sert de mauvais prismes et regarde ses résultats vicieux comme preuves contre Newton' – quoted in Olivier Coquard, *Jean-Paul Marat* (Paris, 1993), 142; letter of 1780 also quoted *ibid.*, 148-9: 'Marat is a madman who thought he could hope to be famous by attacking many great men and by offering paradoxes which have seduced nobody, because experiment is the only touchstone' ('Cet homme est un fou qui a cru viser à la célébrité en attaquant beaucoup de grands hommes, et en donnant des paradoxes qui n'ont séduit personne, parce que l'expérience est la vraie pierre de touche').

⁶² Shapiro, *Fits, passions, and paroxysms*, 229.

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to prove what the author imagines they establish' and 'they are generally opposed to what is most widely known in optics'.⁶³ Undeterred, Marat soon published his *Découvertes sur la lumière constatées par une suite d'expériences nouvelles réalisées sous les yeux de MM. les commissaires de l'Académie des Sciences*, thus provoking Lavoisier's official disavowal.⁶⁴

The Academicians' reluctance to take Marat's claims seriously was considered by Jacques-Pierre Brissot de Warville as an illustration of the poor state of the academies, which were closed to any criticism of the official doctrine. According to Brissot, who was Marat's friend for a long time before he became one of his political adversaries after 1789, Marat was a brave natural philosopher whose enthusiasm for experiment had been received with contempt by an institution which was a mere bastion of Newtonian orthodoxy.⁶⁵ In his treatise *De la vérité* (Neufchâtel, 1782), Brissot revealed the contents of a long conversation he had with Pierre-Simon Laplace, in which the latter expressed his staunch hostility to Marat's views whereas he was ignorant of their specific tenor.⁶⁶ Laplace justified his refusal to attend the experiments organised by Marat or even to read his memoirs on the grounds that mere calculation proved that Newton was right.⁶⁷ In the account of his conversation with Laplace, Brissot described Marat as a hero who 'has bravely overthrown the idol of academic worship and substituted to the errors of Newton on the matter of light a system of well-established and well-connected facts' ('courageusement renversé l'idole du culte académique et substitué aux erreurs de Newton sur la lumière un système de faits bien prouvés, bien enchaînés').⁶⁸ The position held by Lavoisier and Laplace was relayed by Nicolas de Condorcet: 'The Académie's only mistake was initially to seem ready to acknowledge experiments which were offered as new but

⁶³ *Registres de l'Académie des Sciences*, 10 May 1780, quoted in Coquard, 161-2.

⁶⁴ Coquard, *Marat*, 162.

⁶⁵ Roger Hahn, *L'Anatomie d'une institution scientifique: L'Académie des Sciences de Paris, 1666-1803* (Paris, 1993), 217-18.

⁶⁶ Hahn, *L'Anatomie d'une institution scientifique*, 218.

⁶⁷ Gillispie, *Science and polity in France*, 315.

⁶⁸ Quoted in Jean-Pierre Poirier, 'Marat et l'Académie des sciences: le différend avec Lavoisier', in *Marat homme de science?*, 46.

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which were already known and whose only claim to novelty was the systematic jargon used by the author to cover them up'.⁶⁹ Indeed this sudden rejection was quite surprising given the early endorsement by several members of the Académie of Marat's experimental procedures in an official report that Marat was careful to reproduce as a kind of preface to the printed text of his so-called discoveries, although the same members insisted that such support did not extend to the theoretical conclusions he derived from a limited number of experiments.⁷⁰

Influenced by Marat, Brissot eventually came to believe that there was a conspiracy in the *Académie Royale des Sciences*.⁷¹ as he would later confess in *Les charlatans modernes* (1791), Marat believed himself to be the victim of a cabal, which gave Newton's theories dogmatic support of a kind which had little to do with the dynamics of scientific discovery:

Although lately several of Newton's mistakes in optics have been quite well demonstrated, they will probably be still taught for another century in schools (*collèges*) – and this is no surprise; but as to colleges (*lycées*), institutions which can only thrive on the search for innovations which combine solidity with pleasantness, I cannot refrain to be astonished that the doctrines of different refrangibility, different reflexivity, and all the subsequent erroneous opinions, be still inculcated there.⁷²

Marat then approached the provincial academies – Bordeaux, Lyons, Montpellier and Rouen – a choice which can be accounted for partly by biographical circumstances and partly by Masonic solidarity. These were

⁶⁹ 'Le seul tort de l'Académie a été d'avoir d'abord eu l'air d'accueillir des expériences données comme nouvelle mais qui étaient connues, et qui n'avaient de neuf que le jargon systématique dont l'auteur les avait revêtues' (BI, MS. 876, ff. 95-6, cited in R Hahn, *L'Anatomie d'une institution scientifique*, 223-4).

⁷⁰ 'Extraits des registres de l'Académie Royale des Sciences. Rapport de MM. Le Comte de Maillebois, de Montigny, Le Roy et Sage, du dix-sept avril mil sept cent soixante-dix-neuf' (17 April 1779), Jean-Paul Marat, *Découvertes de M. Marat ... sur le feu, l'électricité et la lumière constatées par une suite d'expériences nouvelles* (Paris, 1779), i-v.

⁷¹ Robert Darnton, *La fin des Lumières: Le mesmérisme et la Révolution* (Paris, 1995), 97-9.

⁷² *Les charlatans modernes ou lettres sur le charlatanisme académique* (Paris, 1791), 18, note 1, quoted in Newton, *Optique*, ed. Michel Blay, 494, note 238.

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all rather prestigious academies. The question published by the Rouen Academy for the year 1786 bore on optical matters and Marat won the first prize. The success of Marat's dissertation was actually engineered by Dom Gourdin, a personal friend of Marat, who praised it in a review he anonymously published at the time: 'Admittedly this theory runs against everything Newton ever claimed and it has not been made utterly obvious yet but it seems to rely on numerous and varied facts'.⁷³ In a later manuscript, Dom Gourdin revealed, 'It was in order to give him occasion to develop his system against Newton's optics that I went to the expense of an extraordinary prize in 1786'.⁷⁴ Marat again won the prize of the Rouen *Académie* in 1787, on a question which he may have devised himself: 'Are experiments concerning the modern doctrine of latent heat conclusive?' ('Les expériences sur lesquelles porte la doctrine moderne de la chaleur latente sont-elles décisives?'). In 1788 his *Mémoire sur l'irisation des lames de verre, des bulles de savon et autres matières diaphanes extrêmement minces* was to be rewarded by the same Academy.⁷⁵

Marat was less happy in his attempts in Lyons (1785) and Montpellier (1786), which were both failures. The question published by the Lyons Académie by the Duc de Villeroy, both city governor and Marat's friend, was presumably the latter's suggestion. Villeroy's letter to the Lyons Académie, probably drafted by Marat himself, mentions recent attacks against Newton's theory: 'Since Newton's experiments have changed the course of optics, the making of optical instruments used in astronomy and in navigation and of all dioptrical instruments has been based on the theory of different refrangibility. Now this theory has just been vigorously attacked; and it is material to decide whether such an attack is not ill-

⁷³ 'Il est vrai que cette théorie est absolument opposée à celle de Newton et que cette théorie n'est point encore portée jusqu'à l'évidence, mais elle semble appuyée sur des faits nombreux et variés' (quoted in Coquard, *Marat*, 169).

⁷⁴ 'C'est pour lui donner lieu de développer son système contre l'optique de Newton que j'ai fait les frais d'un prix extraordinaire en 1786' (Coquard, *Marat*, 170).

⁷⁵ Coquard, *Marat*, 210.

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founded – for until it is guided by certain principles, its productions can only depend on blind submission and must always be imperfect'.⁷⁶

While the memoirs were in the process of being selected, Dom Gourdin was gently lobbying the members of the Lyons Académie in favour of his friend Marat in the form of a letter to its permanent secretary, Mr de La Tourette: 'They say that in England they are no longer in favour of the Newtonian theory'.⁷⁷ Marat even received the last-minute support of the crystallographer Romé de L'Isle, who wrote to La Tourette: 'I must confess that Newton has astronomers, geometers and calculators on his side, but today what physicist would take the defence of the English philosopher? In one word, Sir, as truth is one and as Mr Marat's experiments are wholly destructive of the Newtonian theory, either we must establish the falsity of these latter experiments, or we must readily admit that Newton was wrong'.⁷⁸

At the Montpellier Académie, the first prize went to the memoir of Honoré de Flaugergues, who supported Newton's theory: 'Mr Flaugergues's dissertation on the rainbow will deserve the attention of every physicist; in it he has rigorously established the Newtonian theory, which he had already vigorously upheld in a book on the different refrangibility of heterogeneous rays, to which the present dissertation may be offered as a continuation, and which was rewarded by the Lyons

⁷⁶ 'Depuis que les expériences de Newton ont fait changer de face à l'optique, la construction des lunettes d'astronomie, de marine et de tous les instruments de dioptrique, est fondée sur la théorie de la différente réfrangibilité. Cette théorie vient d'être attaquée avec force; et il importe de savoir si c'est avec fondement: car tant que l'on ne sera pas éclairé par des principes sûrs, ses productions ne peuvent dépendre que d'une routine aveugle, et doivent toujours être imparfaites' (letter of 28 February 1784 to M. de La Tourette, quoted in Coquard, 'Marat et les académies de province', in *Marat homme de science?*, 79).

⁷⁷ 'Il paroît qu'en Angleterre on abandonne la théorie newtonienne' (quoted in Coquard, 'Marat et les académies de province', 83).

⁷⁸ 'Newton a pour lui, j'en conviens, les astronomes, les géomètres et les calculateurs, mais quel physicien voudrait aujourd'hui prendre la défense du philosophe anglais? En un mot, monsieur, comme la vérité est une et que les expériences de M. Marat sont entièrement destructives de la théorie newtonienne, ou il faut démontrer le faux de ces dernières expériences, ou il faut convenir de bonne foi que Newton s'est trompé' (letter from January 1788, quoted in Coquard, *Marat*, 176).

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Academy of sciences, letters and fine arts'.⁷⁹ Simultaneously Marat, who published his *Notions élémentaires d'optique* in 1784, also failed in two attempts to seduce foreign academies, in Spain (1783) and in Berlin (1785).

Marat's attack on Newton's theories was neither new nor original. In 1740, in his *Optique des couleurs*, father Castel rejected the claims of the Newtonians and insisted that Newton's theory should be abandoned wholesale. According to Castel, the experiments Newton conducted with the help of prisms fell short of yielding the results he described in the *Opticks*, and his legendary insistence on phenomena led him to pass off as ultimate reality what was actually mere appearance.

However, Marat 'inscribed his own theory within the Newtonian perspective in more ways than one'.⁸⁰ According to Michel Blay, the criticism of the Newtonian theory developed by Marat was 'more epistemological than physical'.⁸¹ In Kuhnian terms, we might say that Marat's criticism does not imply the adoption of a new paradigm but only a revision of the frame-theory within an unchanged paradigm, that is, the paradigm of attraction combined with that of white light.⁸² In his research on electricity, Marat 'tries to demonstrate that all known electrical phenomena could be derived from attraction between particles'.⁸³ According to Gillispie, the theoretical models implemented by Marat were 'naively Newtonian' and a close reading of his works reveals a

⁷⁹ 'La dissertation de M. Flaugergues sur l'arc-en-ciel méritera l'attention de tous les physiciens; il y a rigoureusement démontré la théorie de Newton qu'il avait déjà défendue avec force dans un ouvrage sur la différente réfrangibilité des rayons hétérogènes, auquel cette dissertation peut servir de suite, et qui a été couronnée par l'Académie des sciences, belles-lettres et arts de Lyon' (review of the prizes, quoted in Coquard, *Marat*, 179).

⁸⁰ Coquard, *Marat*, 143.

⁸¹ Michel Blay, 'Marat théoricien de l'optique et critique de Newton', in *Scientifiques et sociétés pendant la Révolution et l'Empire* (Paris, 1990), 95.

⁸² Michel Blay, 'Sur quelques enjeux théoriques de la lumière et des couleurs chez Jean-Paul Marat', in *Marat homme de science?*, 139-40.

⁸³ Arthur Molella, 'Marat et ses recherches physiques sur l'électricité', in *Marat homme de science?*, 100.

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complex combination of dependence on and hostility towards Newton,⁸⁴ which eventually places Marat within the tradition of many eighteenth-century critics of Newton and confirms the viability of the fundamental Newtonian paradigms up until the end of the century. For Marat, coloured rays were not endowed with a specific refrangibility but with a 'deviability' of their own – in other words, as they were getting close to an edge, they were attracted to it according to a constant deviation coefficient, which defined each fundamental colour. Unlike Newton, Marat would only identify three fundamental or primary colours, whereas Castel, although generally critical of the Newtonian theory, agreed on Newton's total of seven, for reasons which bore little relation to empirical science. One may even add that Marat's whole approach, which consisted in addressing Newton's theory with a critical eye, was deeply faithful to the spirit of Newton's method, both in its experimental dimension – insofar as Newton did not find the expected results in the experiments he reproduced from the standard Cartesian account – and in the tentative philosophy of the final Queries of Book Three of the *Opticks* (in which Newton drew the general outline of a research programme which was meant to complement as well as redress some of the results offered in the previous pages). Finally, despite their lack of originality and their boastful tone, Marat's criticisms were far from absurd, especially considering the very real difficulties linked to the concrete reproduction of the experiments described by Newton and repeated by Mariotte or by Desaguliers in different contexts.⁸⁵

Marat's New Translation

In view of the preceding study of Marat's scientific career, one may be tempted to believe that his new translation of Newton's *Opticks* in 1787, whose quality has sometimes been praised by recent Newton scholars (such as Michel Blay, who edited a reprinting of the text in 1989), may have proceeded from rather ambiguous motivations. Thus according to Brissot's testimony, 'Marat was eager to get official praise from the

⁸⁴ Gillispie, *Science and polity in France*, 309, 314.

⁸⁵ Schaffer, 'Glass Works', 215.

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Académie des sciences, and his eagerness suggested to him a stratagem which cost him much effort. He set out to offer a new translation of *Newton's Optical Principles*. It was the best way of destroying them, for I have no doubt but that he should have impaired them'.⁸⁶ In a later note, Marat dated his translation work from 1785.⁸⁷ Gillispie claims that Marat was keenly aware of the impact of the material aspect of books, whatever their content. The publication of his French translation of the *Opticks* was in itself a meaningful gesture: even as Marat saw that his academic ambitions were countered by the Newtonian orthodoxy embodied by Lavoisier, Laplace and other *académiciens*, he published his own translation of the very symbol of the theory which shut him out from the institution, and he chose to do so by having it printed in a fairly prestigious edition. However, according to his biographer, 'Brissot is mistaken when he claims that Marat distorted Newton's work. His translation was certainly not literal, much less so than that published by Coste in 1720 or that published by Varignon in 1722. Yet it was incomparably clearer and easier to read'.⁸⁸ Gillispie does not think otherwise: 'It is a free rendering, somewhat abbreviated in wording though not in content, and it gains thereby in readability, for Newton could be prolix'.⁸⁹

Yet we may suppose that by publishing a new translation Marat expected his readers to reproduce the experiments described by Newton and, like Newton had done before with the Cartesian account, to realize that the theory which was supposed to be based on those experiments was actually without foundation. As Marat wrote in the note that preceded his translation, 'Perhaps by enabling judicious readers to judge Newton better, one is really working for the glory of the man'.⁹⁰ He also claimed

⁸⁶ 'Marat était acharné à vouloir obtenir un éloge de l'Académie des sciences, et cet acharnement lui suggéra l'idée d'une ruse qui lui coûta un travail immense. Il entreprit de donner une nouvelle traduction des *Principes d'optique de Newton*. C'était la meilleure manière de les détruire, car je ne doute pas qu'il les eût altérés' (*Mémoires de Brissot* [2 vols., Paris, 1830], I, 358, quoted in Coquard, *Marat*, 143).

⁸⁷ Coquard, *Marat*, 144.

⁸⁸ Coquard, *Marat*, 144.

⁸⁹ Gillispie, *Science and polity in France*, 321.

⁹⁰ Newton, *Optique*, vol. I, xxi.

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that his translation was not initially meant for publication and that his main reason for having it printed was for the benefit of the later generations of natural philosophers.⁹¹ Besides, Newton's text did not come alone but was complemented by a critical commentary of Marat's own devising. Marat's translation was followed by 'Particular observations' ('Observations particulières') concerning 'the feeble or defective parts of Newton's theory' ('les parties faibles ou défectueuses de la théorie de Newton') and 'the advances made in optics since that great man' ('les progrès que l'optique a faits depuis ce grand homme').⁹² Marat mentioned the works of abbé Rochon, Euler, Dollond, Clairaut, d'Alembert, Boscovich, and Klingenstierna. The 'judicious readers' may be those who will feel inclined to conduct the experiments for themselves and who, realizing that Newton's theoretical conclusions were sometimes ill-founded, will be able to develop their own hypotheses. We should remember that Marat justified his refusal of a literal translation of the kind Coste produced by the fact that Newton's style was a hindrance to the ends one was entitled to expect from that sort of treatise: 'Such a way of writing may be appropriate for a fertile and self-possessed Genius, but it is little propitious to the advancement of Science, even less so to the progress of an elementary treatise' ('notice du traducteur', xvii). I will not dwell here upon Marat's implicit claim concerning Newton's relationship to the writing of science and the allegedly spontaneous and unrhetorical nature of his discourse. Suffice it to say that one of Marat's constant principles was the cardinal Enlightenment value of progress: his translation was to be an improvement both on Coste's illegible rendering and on Newton's spontaneous – and therefore repetitive and ill-ordered – outbursts of scientific intuition.

The publication of a new translation, together with an extensive critical commentary, may therefore be interpreted as an attempt to free Newton's

⁹¹ 'Ainsi cette traduction, entreprise pour mon usage particulier, n'étoit pas destinée à voir le jour: je ne me suis même déterminé à la rendre publique, qu'en faveur des jeunes gens qui courent la carrière des Sciences' (Newton, *Optique*, vol. I, xv). Needless to say, such a claim does not sound particularly convincing in the light of Marat's effort to supplant Coste's allegedly defective work.

⁹² Newton, *Traité d'optique* (1787), vol. II, 281-300.

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text from the deadly halo of respect which had come to turn it into a museum piece rather than an experimental treatise, thus calling readers to read beyond the letter of the text. By doing this Marat was following a tradition of readers who were more respectful of the spirit of the Newtonian philosophy than of its letter. Ironically enough, one of the first such readers was to be Marat himself: in his *Mémoires académiques, ou Nouvelles découvertes sur la lumière* (1788), which purported to change the course of the history of optics and to prove Newton's conclusions wrong on every important aspect of his experimental study of the phenomena of light, Marat claimed that he was using 'a new translation of Newton's *Optics* – a clear and faithful translation which has deserved the approval of the Académie des Sciences'.⁹³ However, despite the rather boastful tone used by Marat to introduce his own discoveries, he did not claim to undermine 'the results of Newton's experiments [but only] the consequences he drew from them'.⁹⁴ A similar path was to be followed by later commentators of Newton such as Thomas Young or even Goethe.⁹⁵ Such a conclusion is not without an impact on the judgment one may wish to pass upon Newton's influence or legacy in the eighteenth century. If one defines the Newtonian theory of light and colours primarily as a dogmatic body of doctrine which should be accepted or rejected on the basis of experiment, then clearly some of its limitations were made apparent quite early. On the other hand, if we choose to define it first of all as a set of paradigms and experimental protocols likely to provide a framework for future research, we might prefer to talk about the *Opticks*

⁹³ 'Je me suis servi d'une traduction nouvelle de l'Optique de Newton; traduction claire et fidèle qui a mérité la sanction de l'Académie des Sciences' (Marat, *Mémoires académiques, ou Nouvelles découvertes sur la lumière, relatives aux points les plus importants de l'optique* [Paris, 1788], 9).

⁹⁴ '[O]n ne révoque pas en doute les résultats des expériences de Newton; mais on attaque les conséquences qu'il en a tirées' (Marat, *Mémoires académiques*, 8).

⁹⁵ On Young, see Geoffrey Cantor, 'Anti-Newton', in *Let Newton Be! A new perspective on his life and works*, ed. John Fauvel, Raymond Flood, Michael Shortland and Robin Wilson (Oxford, 1989), 210. Young's attempt to go beyond the letter of Newton's theory relied, like Marat's, upon the *Queries of the Opticks* (although Young also relied on Newton's 1672 and 1675 optical works). On Goethe, see Sepper, *Goethe contra Newton*.

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as a treatise that offered several generations of Enlightenment natural philosophers throughout Europe the means of its own criticism, thus inscribing the principle of its (Popperian) falsifiability at the heart of its very scientific approach.

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**NEWTON'S 'PARADOXICAL QUESTIONS CONCERNING THE MORALS &
ACTIONS OF ATHANASIUS AND HIS FOLLOWERS' AND ITS
INTELLECTUAL ORIGINS***

Raquel Delgado Moreira

Composed during a period of Unitarian debate, the ostensibly objective, dispassionate 'Paradoxical Questions concerning the morals and actions of Athanasius and his followers' was Newton's contribution to the polemical subjects of the life and works of Athanasius, Bishop of Alexandria (c. 296-373 AD) and of his responsibility for the appearance of idolatry in early Christianity – the idolatry that the Church of Rome would perpetuate.¹ The 'Paradoxical Questions' also embodied Newton's

* This paper is an elaboration of a part of my doctoral dissertation 'Epistemology and rhetorical strategies in Newton's theological writings' (Imperial College London, 2006), which I wrote under the supervision of Rob Iliffe, whom I wish to thank. I also want to thank Ciriaca Morano Rodríguez and her team (CSIC, Spain) for having provided me, at the time of the composition of the chapter on which this paper is based, with an unpublished partial translation from Latin into Spanish of Yahuda MS 2.2. Moti Feingold, Stephen Clucas, Sarah Hutton, Stephen Snobelen and two anonymous reviewers have read previous versions of this paper and provided helpful comments. All faults remain of course my own. I want to thankfully acknowledge The Darwin Trust of Edinburgh for its financial support during the time at which a substantial part of the research for this paper was carried out.

¹ The word 'Unitarian' was first used by a disciple of John Biddle, Henry Hedworth (1626-1705) in *Controversy ended* (London, 1672/3), 53-4 and 56-7. 'Hedworth evidently picked up this term from the Transylvanian Unitarians whom he met in Holland, and found it more acceptable than the term Socinian, which recent controversies had made odious' (Earl M Wilbur, *A history of Unitarianism, vol. 2: in Transylvania, England, and America* [Cambridge, Mass., 1952], 199). The term 'Unitarian' was therefore widely used to refer to anti-Trinitarian positions during the 1680s and 1690s and it is in this sense that I use it throughout this paper. The term designates however no single sect or church, not even a single doctrinal system. As pointed out by Stephen Trowell, the Unitarians themselves were divided among those who thought that they had a place within the Church of England and those for whom Anglicanism was unacceptable at the core and forming a separate Church was the only available route. S 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.

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incursion into the discourse of the litigator, his expert use of the evidence to tell apart the frauds fabricated by Athanasius and his followers from 'true' history and his formulation of each question in the manner of the relatively old-fashioned *quaestio disputata* genre.²

The lack of unity of the Church of England was the subject of continuous debate and political and religious negotiation during the Restoration period. As Samuel Parker put it, the term 'Protestancy' had become an indefinite term which in 1681 stood for: 'Hobbian Protestants, Muggletonian Protestants, Socinian Protestants, Quaker Protestants, Rebel Protestants, Protestants of 41, and Protestants of 48. All or most of which are as different as Popery it self from the true Protestancy of the Church of England'.³ Although willingly isolated from the rapidly-changing world of the English Restoration, and virtually immune to the consequences of the official religious policy, Newton was surely acutely aware of the repeated attempts to restore the Church of England to its pre-Restoration unity and of the internal debates between those who thought that persecution, comprehension or toleration (or perhaps both if

² See Rob Iliffe, 'Prosecuting Athanasius: Protestant Forensics and the Mirrors of Persecution', *Newton and Newtonianism*, ed. James E Force and Sarah Hutton (Dordrecht, 2004), 113-54, especially 135-9. Newton used the method of the *quaestio disputata*, although to a much lesser extent, in parts of his *Certain philosophical questions*. Karin Verelst pointed at the *quaestio* structure of the 'Paradoxical Questions' before I did, in an article that, to the best of my knowledge, remains unpublished. Karin Verelst, 'On form and content in Newton's work. Epistemological dualism as an editorial strategy: a case study'. For a thorough discussion of the structure of the 'Paradoxical Questions' and the use of the *quaestio* in other parts of Newton's archive, see Delgado, 'Epistemology and rhetorical strategies', chapter 4. On the genre of the *quaestio disputata* see among others Rosalie L Colie, *Paradoxia epidemia: the Renaissance tradition of paradox* (Princeton, 1966); Bernardo Bazàn et al., ed., *Les questions disputées dans les facultés de théologie, de droit et de médecine* (Turnhout, 1985); and Brian Lawn, *The rise and the decline of the Scholastic 'Quaestio Disputata'* (Leiden, 1993).

³ Samuel Parker, *The case of the Church of England, briefly and truly stated* (London, 1681), 263-4, cited by Gordon Schochet, 'Samuel Parker, religious diversity, and the ideology of persecution', in *The margins of orthodoxy: heterodox writing and cultural response, 1660-1750*, ed. Roger D Lund (Cambridge, 1995), 119.

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applied to the right people) held the key to the problem of dissent.⁴ The decade of the 1690s saw a revival of the debates about the nature of the Godhead, which for the first time extended to all kinds of Anglicans or heretics, and which translated into a pamphlet war, which, as Martin Greig has put it, was sometimes ‘not about the Trinity at all’.⁵ A number of other factors may have contributed to the sharpening of the controversy during this decade. The Bishop Edward Stillingfleet pointed in a series of works to the unitarian implications of John Locke’s influential epistemology.⁶ By the beginning of the 1690s prominent latitudinarians like John Tillotson or even Gilbert Burnet, who had carefully avoided engaging in debates about particular doctrines, entered the debate.⁷

The ‘Paradoxical Questions’ drafts reflect Newton’s own increasing interest in offering the details of the history of the corruption of the Church. As in most of his theological private papers, Newton (perhaps carefully) avoided referring to any contemporary authors or the events that surrounded him at the time of the composition of his work on Athanasius, so that dating the manuscript on internal evidence is not possible. Although the temporal evolution of Newton’s heresy is very difficult to track, late 1674, when Newton was granted a dispensation which exempted the Chair that he occupied from the for him onerous duty of taking holy orders, is routinely and most probably rightly considered the *terminus ad quem* for Newton’s adoption of his anti-Trinitarian creed. Exactly when he turned to Athanasius’s conduct is more difficult to decide. While parts of some of Newton’s earlier works on the history of the Church date from the 1670s, Richard S Westfall’s decision to date the ‘Paradoxical Questions’ drafts to the year of the Popish Plot (1678) or shortly afterwards, particularly in the face of his own admission never to have found a reference to the plot among Newton’s papers, lacks

⁴ Martin Greig, ‘Gilbert Burnet and the problem of nonconformity in Restoration Scotland and England’, *Canadian Journal of History*, 33 (1997), 1-24, *passim*.

⁵ Martin Greig, ‘The reasonableness of Christianity? Gilbert Burnet and the Trinitarian Controversy of the 1690s’, *Journal of Ecclesiastical History*, 44 (1993), 632.

⁶ Iliffe, ‘Prosecuting Athanasius’, 124-5.

⁷ John Marshall, ‘Locke, Socinianism, “Socinianism”, and Unitarianism’, in *English philosophy in the age of Locke*, ed. M A Stewart (Oxford, 2000), 111.

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justification. More recent estimates, like those of Rob Iliffe or Scott Mandelbrote, plausibly offer the late 1680s and early 1690s as the composition period. Newton would have been concerned by the threat that the ascension to the throne of James II represented and the prospects of toleration for private Catholic worship.⁸ It is also possible that Newton's focus on Athanasius constituted a private reaction to the reissue of the Unitarian debate and that the appearance of hagiographical works about Athanasius, like William Cave's *The life of Athanasius Bishop of Alexandria* (1683), constituted the target against which Newton was silently and privately arguing.⁹

The 'Paradoxical Questions concerning the morals and actions of Athanasius and his followers' is a seriously disordered draft piece, currently held by the William Andrews Clark Memorial Library (UCLA) in Los Angeles.¹⁰ A later more polished draft of the first part of this manuscript, that bears the same title, is extant and is now Keynes MS 10 at King's College, Cambridge. My purpose here is to analyze the 'Paradoxical Questions' against the background of the rebirth of the debate about the Trinity in the 1690s and to see how it relates to it, from the point of view of the contents of Newton's manuscript and from the point of view of its structure. As we shall see, the characteristics of Newton's text defy a simple classification. This essay will show that Newton knew and used contemporaneous anti-Trinitarian literature to reinforce heretical conclusions to which he probably had come with the fundamental help of his patristic studies.¹¹ This is however not in contradiction with the location of Newton's manuscript within the temporal and intellectual frame of the anti-Trinitarian debates of the 1680s and 1690s. This is how his work would have been publicly assessed if it had seen the light then. But as was often the case, here too Newton toyed

⁸ Scott Mandelbrote, "'That this nothing can be plainer': Isaac Newton reads the Fathers", in *Die Patristik in der Frühen Neuzeit*, ed. Günter Frank et al. (Stuttgart, 2006), 286.

⁹ Iliffe, 'Protestant Forensics', 115-6

¹⁰ Classmark **N563M3 P222, hereafter WACL MS.

¹¹ This is a possibility which Rob Iliffe and Scott Mandelbrote have raised too (Iliffe, 'Protestant Forensics', 125; Mandelbrote, "'That this nothing can be plainer'", esp. 288, 290, 296).

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with the conventions of the very typical genres within which he worked, to end up producing an atypical text. This is not an isolated event. When systematically analyzing for my doctoral dissertation some of Newton's unpublished theological pieces and the background against which I suspected they had been produced, I was again and again confronted by the 'uncomfortable' fact, that even though finding literary models from which Newton could have drawn inspiration was never difficult, his texts turned out, almost invariably, to challenge the very models which he had probably set out to imitate. In this respect, the 'Paradoxical Questions' is no exception.

Newton's piece used the legal language and the originally medieval *quaestio disputata* structure, probably to convey the air of impartiality with which he wanted to invest his historical narration to discriminate between real and bogus proofs. He emphasized hard evidence rather than 'poetry' or 'romance', but his frequent indignation betrayed his rhetoric. Humanistic techniques, in which Newton was well trained, shine through his historical approach to exegesis and the strategies that he applied to the detection of spurious texts, as well as his close attention to philological and historical detail.¹² For all this detail, Newton's 'objectivity' and 'individuality' (as was also the case with many of the pro-Athanasian arguments) were nothing but calculated poses.¹³

* * * * *

The first part of this paper looks into the social and intellectual background to which Newton's piece might have been reacting. The second section focuses on some of the questions which best exemplify Newton's argument and its structure in the 'Paradoxical Questions'. The third section tries to look beyond the *obvious* influence of the Unitarian debates and supports the view that Newton's engagement with the Early Church Fathers was determinant for his work on the history of the early

¹² Anthony T Grafton, *Defenders of the text: the traditions of scholarship in an age of science, 1450-1800* (Cambridge, Mass., 1991), 30.

¹³ A contrived attitude towards the evidence was a common place characteristic of the fourth-century theological disputes. See Wiles, *Archetypal heresy: Arianism through the centuries* (Oxford, 1996), *passim*.

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Church and its corruption. An earlier piece on idolatry, today part of the Yahuda collection, provides additional evidence that Newton's patristic study was a major source for Newton's heresy. Although when composing the 'Paradoxical Questions' Newton was surely aware of the Unitarian debates and to an extent inspired by them, I argue that Newton's familiarity with anti-Trinitarian literature, be that Socinian or Arian, does not exhaust the possible sources for his pieces on Athanasius.¹⁴

¹⁴ In the last decade of the seventeenth century the terms 'Arian' and 'Socinian' were only rarely adequately distinguished. They both were used to refer to those who held unorthodox ideas about the essence of the Godhead. William Freke's and John Wallis's conscious distinction was exceptional at the time. The precise nature of Newton's own heresy has been a polemical object of study. For Richard S. Westfall, Newton was an Arian 'in the original sense of the term' (Westfall, *Never at rest: a biography of Isaac Newton* [Cambridge, 1980], 315). Arianism was a fourth-century movement which opposed the Nicene Creed. Its name derives from 'Arius', the priest excommunicated at the Council of Nicaea. Arians thought that, contrary to what the Nicene Creed said, the Son had not been begotten, but created *ex nihilo*, and that it was neither co-eternal, nor consubstantial with the Father, but a lesser God. See also Thomas C Pfizenmaier, 'Was Isaac Newton an Arian?', *Journal of the History of Ideas* 58 (1997), 57-80. Stephen D Snobelen has formulated associations with Socinianism, an originally subordinationist and Scripture-centred movement that grew in large part out of Faustus Socinus's writings and that denied the pre-existence of Christ and held him to be worthy of worship only because he had sacrificed himself for God by dying on the cross. Socinianism is far from being a uniform religious movement. Not all those who called themselves or were called 'Socinians' shared their doctrinal system, first formulated in the Racovian Catechism. The situation was made even more confused by the fact that the term 'Socinianism' was often used at the time to refer to other types of heresy that had little or nothing to do with 'Socinianism' and by the fact that many varieties of Socinianism existed over time (Snobelen, 'Isaac Newton, Socinianism and "the one supreme God"', in *Socinianism and Arminianism: Antitrinitarians, Calvinists and cultural exchange in seventeenth-century Europe*, ed. Martin Mulso and Jan Rohls [Leiden, 2005], 241-98). I think that Frank E Manuel's warning against the dangers of 'pigeonholing' Newton's anti-Trinitarianism still holds (Manuel, *The religion of Isaac Newton* [Oxford, 1974], 58) and that, as Rob Iliffe has most recently put it, Newton's anti-Trinitarianism was 'clearly subordinationist, but with discernible Arian and Socinian strands' (Iliffe, 'Prosecuting Athanasius', 125).

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Unitarian debates and Unitarian treatises: some background to the 'Paradoxical Questions'

In the last decade several historians have reminded us that Restoration England was a persecuting society. Newton's loathing of religious persecution, a distinguishing mark of nonconformity, is noticeable everywhere in his 'Paradoxical Questions'. There Newton made very clear that the more tolerant emperors, like Constantius II (317-361 AD) or Valens (328-378 AD), had never been persecutors *for religious motives*; in any case, pretending that one could penetrate the mysteries of anyone's heart as regards religious conscience was considered by Newton not only absurd but anti-Christian. Accusations like those which said that the members of the Council of Tyre and Jerusalem had dissembled, therefore, amounted to little less than nonsense.¹⁵ For persecutors, religion was not a private and individual business, but was believed to have a great impact on the public good, whatever that might be.¹⁶ Unsurprisingly, and like most Dissenters of the time, Newton promoted tolerance and, ultimately, a clear differentiation between civil and religious authority. Consequently, he was a fervent admirer of the primitive Church that preceded the corruption bolstered by Athanasius and his friends. He believed that only in the second and third centuries had the ideas about freedom of conscience and separation between Church and State, which were so dear to him and the other anti-Trinitarians, been understood.¹⁷

The strictest punishments recommended by law for those who denied the orthodox explanation of the hierarchy of the persons of the Godhead were only rarely enforced. Anti-Trinitarians in Newton's day were not burnt, although they were often fined or imprisoned. However, the profound dislike that the English felt towards them during the time of the Interregnum and Restoration could only be compared with the hatred of popery. Even though very few could have been described as truly Arians until the beginning of the eighteenth century, the last person to be burnt in Britain in 1612 was said to be an 'Arian', although more detailed

¹⁵ Iliffe, 'Prosecuting Athanasius', 116; WACL MS, f. 12r; Keynes MS 10, f. 7r.

¹⁶ Schochet, 'Samuel Parker', 128.

¹⁷ Iliffe, 'Prosecuting Athanasius', 116, 150 and *passim*.

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accounts attributed ten different heresies to him.¹⁸ Deniers of the given interpretation of the Trinity could be burnt, according to the statute books, until as late as 1678. The Blasphemy Act of 1648 prescribed punishment with the pains of death 'without benefit of Clergy'.¹⁹ It is thus hardly surprising that no real Unitarian debate took place in the first half of the seventeenth century. In fact, as stated by Earl Morse Wilbur, 'for well-nigh a generation before and after the death of James', overt anti-Trinitarianism did not exist, although 'the leaven was quietly working beneath the surface'.²⁰ John Biddle's seminal works are a proof that this was so. Biddle devoted his life to demonstrating the absurdity of the Holy Trinity because, among other reasons, it contradicted the prescriptions of the Gospel on how to pray and honour God. Summoned by the Parliament in 1646, Biddle denied publicly the divinity of the Holy Spirit. Despite his incarceration, some of his treatises appeared in press in the second half of the fifties and their second editions in the nineties helped feed the new Unitarian debate.²¹

Before 1687, and save Biddle's, anti-Trinitarian works in the British Isles appeared only rarely in press. Maurice Wiles has argued that this is presumably the reason why George Bull's defense of the Nicene Creed (1685) was directed against Cristoph Sand's *Nucleus historiae ecclesiasticae* (a learned work published in the Netherlands in 1669 that tried to incorporate the teachings of Arius into the history of the church and with which Newton was familiar).²² It was the Declaration of Indulgence of 1687, together with legislation in the beginning of William and Mary's reign (1689), that inaugurated a period of freer religious

¹⁸ Wiles, *Archetypal heresy*, 63. This person was Edward Wightman. The last person to be executed for heresy in Britain, Thomas Aikenhead, was hanged in 1697.

¹⁹ Snobelen, 'Isaac Newton, heretic', 393; Iliffe, 'Prosecuting Athanasius', 117-18. For more detail on anti-Unitarian law in Britain, see the paper by Snobelen in this volume.

²⁰ Wilbur, *A history of Unitarianism*, vol. 2, 180.

²¹ Biddle, *Twelve arguments drawn out of the Scripture* (London, 1646); *A confession of faith, touching the Holy Trinity according to Scripture* (London, 1648).

²² Wiles, *Archetypal Heresy*, 66-7. Wiles referred to Bull's *Defensio fidei Nicænae, ex Scriptis, quæ extant Catholicorum doctorum, qui intra tria prima Ecclesiæ Christianæ secula floruerunt, etc.* (London, 1685).

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debate. These events paved the way for the appearance of a stream of anti-Trinitarian publications.²³ James II had granted all his subjects the free exercise of their religion. Even though he did not hide his wish that all become Catholic, the king revoked all laws that punished nonconformity. It was his hope that this would prove more effective in achieving his political and religious ends than persecution had.²⁴ Still, the orthodox cause continued to impose itself through the so-called Toleration Act of 1689, which allowed public worship by Dissenters, with the important exceptions of Catholics and those who denied in writing or preaching the doctrine of the Holy Trinity.²⁵ The critics of the Trinity received a further blow through the Blasphemy Act of 1698, which prevented all those who defended anti-Trinitarian notions from occupying any public office, and sentenced to imprisonment all those who offended repeatedly and failed to repent.²⁶

It is almost certainly amidst this atmosphere of intolerance towards unitarian views that the ‘Paradoxical Questions’ was composed, although much of the historical and doctrinal material for it could already be found in Newton’s earlier papers. Like other orthodox and unorthodox writers of the time, Newton turned to the events of the fourth century.²⁷ Contemporary authors thought that primitive Christianity could teach them important lessons in the late seventeenth-century political and religious situation. Even though one could reconstruct Newton’s heresy mostly on the basis of his intensive study of the Fathers, whose

²³ Wiles, *Archetypal Heresy*, 67.

²⁴ Schochet, ‘Samuel Parker’, 121-2.

²⁵ See Coffey, *Persecution and toleration*, 199 on the limitations of the ‘Toleration Act’. This is not even its official title and the word ‘toleration’ never appears in the text.

²⁶ Iliffe, ‘Prosecuting Athanasius’, 121; Westfall, *Never at rest*, 486. Ironically this happened while Newton was sitting on the Parliamentary committee in charge of considering the ‘Bill for Liberty and Indulgence to Protestant Dissenters’, which was none other than the 1689 Toleration Act. See Snobelen, ‘Isaac Newton, heretic’, 398 and his contribution to this volume.

²⁷ For comparisons between seventeenth-century England and the age of primitive Christianity, see, for example, William Cave, *A dissertation concerning the government of the ancient church, by bishops, metropolitans, and patriarchs* (London, 1683), ‘The Epistle Dedicatory’, and William Sherlock, *An apology for writing against Socinians in defence of the doctrines of the Holy Trinity and Incarnation* (London, 1693), 11.

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uncontaminated conclusions were for him in agreement with those at which he had arrived through the study of Scripture, he was obviously aware of the unorthodox literature of the time and some important volumes were part of his rather modest collection.²⁸ Thus, Newton owned Biddle's works in the compilation of Unitarian tracts entitled *The faith of One God*, the *Explicationes locorum Veteris et Novi Testamenti* by Georg Enyedi, and a copy of Sand's *Nucleus*, which displayed a few signs of dog-eating.²⁹ Nonetheless, fundamental connections or analogies between Newton's treatise and other anti-Trinitarian texts, particularly when it comes to considering the sources of Newton's heresy, require a note of caution. His work obviously shared certain characteristics with other nonconformist literature of the time, like his repudiation of religious persecution, his recourse to philology and his censure of Athanasius's role, but many of the techniques deployed by Newton, like his judicial style and his use of the *quaestio*, were not part of the anti-Trinitarian literature of the decade and constitute a typically Newtonian exercise of exploration of the limits of the different genres in which he argued.

Some of the latest exercises in the association of Newton's own heresy with a greater heresy are the work of Stephen Snobelen.³⁰ One of Snobelen's most recent arguments for the association of Newton's heresy with Socinianism uses as evidence a purported link between Newton and Sand (who was himself under the influence of Socinian histories of the Church, but never considered himself a Socinian).³¹ The Socinian strands

²⁸ Wiles, *Archetypal heresy*, 86.

²⁹ Christoph Sand, *Nucleus historiae ecclesiasticae: cui praefixus est tractatus de veteribus scriptoribus ecclesiasticis* (Amsterdam, 1669); John Harrison, *The library of Isaac Newton* (Cambridge, 1978), 232; Biddle, *The faith of One God, who is only the Father ... asserted and defended in several tracts* (London, 1691); and Enyedi, *Explicationes locorum Veteris et Novi Testamenti, ex quibus Trinitatis dogma stabiliri solet* (Groningen, 1670). For more on Newton's collection of anti-Trinitarian books, see the contribution by Snobelen in this volume.

³⁰ Snobelen, 'Isaac Newton, heretic', esp. 388-9; *idem*, 'Isaac Newton, Socinianism', esp. 270-2.

³¹ Lech Szczucki, 'Socinian historiography in the late 17th Century', in *Continuity and discontinuity in church history: essays presented to George Huntston Williams on the occasion of his 65th birthday*, ed. F Forrester Church and Timothy George (Leiden, 1979), 285-300 at 292; Wilbur, *A history of Unitarianism*, vol. 2, 572-3.

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of Newton's heresy are undeniable, as Snobelen shows so convincingly.³² However, as Snobelen himself warns, proving an analogy is clearly not the same as proving the flow of influence of one of the terms of the analogy on the other.³³ Thus, not only did the trend to employ textual criticism not start with the Socinians, but it was widely available in Walton's Polyglot Bible (1657) and in the Greek New Testament of 1675. As we shall see, other anti-Trinitarians like the Arian William Freke relied almost exclusively on this technique.³⁴ As Snobelen himself points out, the scholarship of the period, whether of orthodox or heterodox authors, was imbued with the philological culture of the Renaissance and many of the exegetical characteristics of Newton's work were to be found among other Protestants, who appropriated techniques whose origin was not the Polish Brethren, but humanism.³⁵ Some of the features of Newton's theology singled out for their Socinian echoes, such as the avowal of religious tolerance and separation of Church and State, were not exclusively Unitarian, but had permeated English religious thinking as a whole.³⁶ This is not to deny that Newton owned some Socinian volumes.³⁷ He also read from them and quoted one passage from Sand's *Interpretationes paradoxae quatuor Evangeliorum* (1670) twice, in his notes and in his 'Historical account of two notable corruptions of Scripture'. But there is insufficient evidence that allows us to place more

³² See Wilbur for the 'quiet' penetration of Socinianism in England. An additional note of caution is required. As Wilbur himself warns, despite the influence that Socinians writers would bear on English Unitarians afterwards, when the so-called 'father of the English Unitarians' John Biddle first formulated his view on the Trinity, he had not yet read a single Socinian writer (Wilbur, *A history of Unitarianism*, vol. 2, 167, 195).

³³ Snobelen, 'Isaac Newton, Socinianism', 256.

³⁴ Cf. Snobelen, 'Isaac Newton, Socinianism', esp. 270-2; William Freke, *A vindication of Unitarians, against a late revered author on the Trinity* (London, 1690).

³⁵ Snobelen concludes, however, that Newton's own use of principles of philological analysis was 'in several respects more characteristic of Socinians as opposed to orthodox interpreters or Renaissance humanists'. He adds that 'with both Newton and the Socinians these methods are given a hard edge in a deliberately antitrinitarian apologetic' (Snobelen, 'Isaac Newton, Socinianism', 273-4).

³⁶ Wilbur, *A history of Unitarianism*, vol. 2, 185; Iliffe, 'Prosecuting Athanasius', 117.

³⁷ Herbert McLachlan, *The religious opinions of Milton, Locke and Newton* (Manchester, 1941), 126; Harrison, *The library of Newton*, 66.

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weight on the reading of Sand than on other anti-Trinitarian readings that he must have made at the time.³⁸ In a similar vein, Scott Mandelbrote has recently qualified Newton's use of Biddle's *The faith of One God*. As Newton's marking of the volume which he used shows, Newton extracted from it passages from the Fathers that appear in one of his collection of notes, today Yahuda MS 14.³⁹

Rather than being under the direct influence of one heterodox writer of the time, Newton's narrative is most noteworthy for reversing the hagiographical lives of Athanasius and inverting the hero/antihero dialectic of the dominant pro-Athanasian biographies, as previously noted by Rob Iliffe in his recent study on the 'Paradoxical Questions'.⁴⁰ Several historical narratives that glossed the life and actions of Athanasius had appeared, most probably before Newton composed the 'Paradoxical Questions'. The epic *The life of Athanasius Bishop of Alexandria*, from William Cave's *Ecclesiastici* (1683) and the earlier *The history of the life and actions of St. Athanasius* (1664), by an anonymous author who signed N.B.P.C. Catholick, most probably Nathaniel Bacon, were among the kind of histories that Newton would in all probability have rejected as 'tales'.⁴¹ Despite the differences, both works shared a basic animosity against Arius, in spite of the lack of historical evidence regarding his life. Cave confidently described him as 'a man of a subtle and versatil Wit, of a turbulent and unquiet Head, but which he vail'd with a specious Mark of Sanctity'. Cave did not shy away from pointing out that Arius was the son of a Libyan, 'a Country fruitful in monstrous and unnatural Productions'. For the author of *The history of the life and actions of St.*

³⁸ The complete title is: *Interpretationes paradoxæ quatuor Evangeliorum quibus affixa est dissertatione de verbo, unà cum appendice*. Newton quotes *Interpretationes paradoxæ* in folio 19 of his *Theological notebook*, Keynes MS 2 (material from the front of the notebook) and in his 'An historical account of two notable corruptions of Scripture, in a Letter to a Friend', in *Newton to a Friend*, 14 November 1690, *The correspondence of Isaac Newton*, ed. H W Turnbull, et al. (7 vols., Cambridge, 1959-77), III, 89. The sentence he reproduces is the following: 'Codex Armeniacus ante 400 exaratus, quem vidi apud Episcopum Ecclesiæ Armeniacæ quæ Amstelodami colligitur locum illum non legit.'

³⁹ Scott Mandelbrote, "'That this nothing can be plainer'", 294.

⁴⁰ Iliffe, 'Prosecuting Athanasius', 150.

⁴¹ Iliffe, 'Prosecuting Athanasius', 128.

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Athanasius, Arius was no less than the fore-runner of the Antichrist. Even though the sources with which these authors engaged were not altogether different from Newton's (for example, Sozomen, Nazianzen, Theodoret) they obviously came to different conclusions about them and the credibility they granted the different testimonies and accounts departed clearly from Newton's own vision. For Cave, for instance, the charge of partiality fell upon Sand's shoulders, 'the historical Advocate for the *Arian Cause*'. For sources of the history of Athanasius, he made crystal clear that no account was more 'punctual and accurate' than that of Athanasius himself.⁴²

An important part of these works was devoted to dismantling what, according to the judgment of their authors, were misrepresentations of Athanasius's acts and personality orchestrated by the followers of Arius. Cave thought – as Newton himself did, but for different reasons – that important parallels existed between the centuries about which he was writing and seventeenth-century England. The era of the primitive Christian Church saw the first persecutions of those who subscribed to or maintained the doctrine of the Trinity. Arianism quickly overran the world, Cave argued, invoking Gregory Nazianzen's authority. Had it not been for an extraordinary breed of men like Athanasius, religion would have 'been stifled in a crowd of Heresie and Prophaness'.⁴³ Bacon felt comforted that, though the great Athanasius was at first the only great champion of the truth, upon being summoned to meet 'his Fathers, the Patriarchs, Prophets, Apostles, and Martyrs', he left 'many brave Stars' behind.⁴⁴ On the other hand, Bacon presented the faction of the Arians as internally divided and without scruples.

⁴² Cave, 'The Life of Athanasius Bishop of Alexandria', in *Ecclesiastici: or, The history of the lives, acts, death, & writings, of the most eminent Fathers of the Church* (London, 1683), 40-1 and 'The Preface to the Reader', *Ecclesiastici*, sig. c4v. However, not much is known about the historical figure of Arius, as pointed out by Wiles, *Archetypal heresy*, 4.

⁴³ Cave, *Ecclesiastici*, 'The Epistle Dedicatory', sig. b2r.

⁴⁴ N.B.P.C. Catholick, pseudo. [Nathaniel Bacon], *The history of the life and actions of S. Athanasius together with the rise, growth, and downfall of the Arian heresie Collected from primitive writers* (London, 1664), 220-1.

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Most publications of doctrinal pamphlets that defended the cause of the Unitarians and their rebuttals from the band of the orthodox Trinitarians took place in the last decade of the seventeenth century. In 1690, the second edition of *A vindication of the Unitarians*, a piece written in the form of a letter to an unnamed correspondent, appeared in London. Its author, William Freke, argued rather exclusively from the doctrinal or theological point of view. He attached, like Newton, enormous importance to textual criticism for his interpretation. Thus he claimed that without knowing anything about Arianism, Socinianism or Platonism, the profound enquiry into the New Testament, from which he 'collected every text relating to Father, Son, and Holy Ghost', had taught him such truths that he 'could not but fall into Arianism'. Freke's general strategy consisted in overthrowing the orthodox view by turning the Trinitarian weapons of the person to whom the work was addressed against him. The texts used by his correspondent against Socinians, Freke argued, 'confounded' his own hypothesis, so that not only the charges against Socinians vanished 'to Air', but when used by Arians, of which Freke considered himself one, they revealed the feebleness of the Trinitarians' own arguments. The positive charges of Freke against Trinitarians were the usual ones: they had twisted the meaning of Scriptures, used self-contradictory arguments, fallen into polytheism or idolatry and 'mazed' with metaphysics through the absurdities and contradictions of transubstantiation.⁴⁵

Appearing in the same year as Freke's *Vindication*, but far more influential, Stephen Nye's *Brief history of the Unitarians, called also Socinians* (1687) is normally considered the spark that reignited the Trinitarian controversy at the end of the century in the Church of England.⁴⁶ It consisted of four letters written to the anti-Trinitarian sympathizer and patron Thomas Firmin.⁴⁷ The first two letters contained

⁴⁵ Freke, *A Vindication of Unitarians*, 3, 7, 11, 12, 14 -16, 27-8.

⁴⁶ Trowell, 'Unitarian and/or Anglican', 78.

⁴⁷ Thomas Firmin was a famous philanthropist based in London, whose contacts with Biddle at an early age and later acquaintance with Nye himself inspired him to sponsor a campaign of support of the Unitarian cause (Wilbur, *A history of Unitarianism*, vol. 2, 219; Robert E Sullivan, *John Toland and the deist controversy: a study in adaptations* [Cambridge, MA, 1982], 82-108.)

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the history of Unitarianism and of how the Trinitarians had corrupted Christianity. The other longer letters discussed the Scriptural texts on which the Trinitarian cause relied. As in Freke's pamphlet, anti-Trinitarian readings were put forward that claimed to make more sense of these passages than the orthodox interpretations. This treatise, together with Nye's more provocative *Brief notes upon Athanasius's Creed* (1690), inspired the well-known replies of the Master of the Temple William Sherlock, a nonjuror, and of the mathematician John Wallis. In his *Brief notes*, Nye commented on the Athanasian Creed, line by line, and came to the conclusion that it was inconsistent with Scripture and that there was no doctrinal reason why it should be kept in any Christian Church.⁴⁸

Sherlock saw in the provocative publications of Nye a unique opportunity to champion the orthodox cause. As indicated by Wilbur, Sherlock's reasons might not have been, as it happens, exclusively pious. Having refused to take the oaths of allegiance to William III and Mary II, Sherlock could have seen this as an occasion to regain preferment within the church.⁴⁹ Whatever the case, Sherlock's *Vindication of the doctrine of the holy and ever blessed Trinity* provoked the reactions not only of Nye, at whom it was targeted, but the criticisms of others who, despite sharing Sherlock's animus against Nye, could not agree that the master of the Temple had actually given 'a very easie and intelligible Notion of a Trinity in Unity', in spite of Sherlock's own overconfident tone.⁵⁰ The anonymous author of the *Brief observations upon the Vindication* used the ideas of 'self-consciousness' and 'mutual-consciousness' to explain the relationship between the persons that integrate the Trinity and to convey their unity. He explained that the persons of the Trinity were three intelligent infinite beings, 'as really distinct as three Men, or as *Peter, James and John*'. Each of them had his own consciousness by which he saw himself as different from the others, but also, thanks to the mutual

⁴⁸ Wilbur, *ibid.* and Iliffe, 'Prosecuting Athanasius', 120-1.

⁴⁹ Wilbur, *A history of Unitarianism*, vol. 2, 227.

⁵⁰ Sherlock, *A vindication of the doctrine of the holy and ever blessed Trinity and the Incarnation of the son of God* (London, 1690), 'To the Reader', sig. A2v.

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consciousness, each of them had the wisdom, power and will of the other two. Most importantly, each of these beings was singly a God.⁵¹

Nye reacted quickly. He expanded his *Brief notes* into an unsigned tract entitled *The acts of great Athanasius*.⁵² Nye's attack constituted a powerful blow to the orthodox history of Athanasius – as it had been told by Cave and later used by Sherlock.⁵³ Nye allowed that Cave had given proofs of being an 'accurate and faithful Historian', but Sherlock had composed only a 'fair Tale'. Nye's vehemence was perhaps only equaled later by Newton's 'Paradoxical Questions'. After having called those who, like Sherlock, affirmed that there was more than one person who is God, 'Novellists', Nye further criticized him for having scorned Scriptures in favour of the tradition of the Church and not having the first as his 'Rule of Faith'. Athanasius had been restored at the same time as the Pope's supremacy, by the same western Fathers in the 'conventicle' of Sardica, whose authority Nye doubted for the same reasons as Newton. The Council of Sardica had acted under prejudice and not judicially.⁵⁴ Nye urged those inclined to think his own story a fiction, a 'Tale of Athanasius's or a 'wilful Forgery', to consider a number of reasons why his account should be held as true, without the need for further investigation. The last of those reasons was of a demolishing simplicity. Dr Sherlock could not deny the 'matter of Fact' that Athanasius had been condemned in different councils and a doctrine opposed to the Nicene

⁵¹ Anonymous, *Brief observations upon the vindication of the Trinity and Incarnation, By the learned Dr. W. Sherlock* (London?, 1690), 4 (in some catalogues misleadingly attributed to Sherlock).

⁵² [Nye], *The acts of great Athanasius with notes, by way of illustration on his Creed; and observations on the learned vindication of the Trinity and Incarnation* (London, 1690). This work was bound in *The faith of the One God*, which Newton owned (see note 30 above).

⁵³ According to McLachlan, *The religious opinions of Milton, Locke and Newton*, 125-26, the author of Nye's treatise was once thought to be Newton. McLachlan, unconvinced of this himself, says that even William Whiston suspected that one Unitarian tract was from Newton's pen, although one 'ludicrous paragraph' from Nye's work seemed to Whiston quite improper of Newton.

⁵⁴ [Nye], *The acts of great Athanasius*, 3, 6-7. On this issue, see also WACL MS, ff. 23r, 30r.

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one advanced. But then, either Athanasius was freely judged as guilty, as Nye had suggested, or Sherlock's 'good, honest, Catholick Bishops' were in fact 'a pack of the greatest Villains'. How could they have complied otherwise with Constantius's wishes and condemned both someone whom they believed to be innocent and a doctrine which they held fundamental to salvation?⁵⁵

The second half of the seventeenth century saw the appearance of a host of works engaged in the Unitarian debate. Cave and Bacon wrapped the theological question under the form of a historical narration that praised the numerous virtues of the martyr to the cause, Athanasius, and displayed a clear animosity against Arius. Successive defenders of Unitarian positions, like Freke or Nye, and attackers such as Sherlock and Wallis, concentrated rather on the philological and philosophical reasons that they thought could prove the absurdity of the opponents' opinions. Newton would develop a particular form of anti-Trinitarian treatise, which consisted in reversing the rhetoric of Trinitarians like Cave and Bacon. The topics in Newton's piece were the same as in the Unitarian treatises that I have described. He shared many of his arguments and concerns with authors like Freke and Nye, and in this respect Newton's 'Paradoxical Questions' deserves a place in this debate, a place which this essay wants to stress. However, and although further research is required, the reader who takes for granted that the only exegetical origin for Newton's piece is to be found within the anti-Trinitarian debates and who approaches the text with this mindset, will be disappointed by the complexity of Newton's style of argument. As we shall see in the next sections, the 'Paradoxical Questions' transcended the context from which it emerged by displaying a unique combination of historical narrative and dispute around the philosophical and philological issues common to all other participations in the debate, which was structured through the old-fashioned method of the *quaestio disputata*.

⁵⁵ [Nye], *The acts of great Athanasius*, 9-10.

*Newton's 'Paradoxical Questions'***The 'Paradoxical Questions': Athanasius's forgeries against matters of fact**

Newton decided to begin his 'Paradoxical Questions' with the question of whether the 'ignominious death of Arius in a bog-house was not a story put about by Athanasius above twenty years after his death', not because he thought himself that it was of 'great moment', but because it led 'to other things' of importance.⁵⁶ Since Newton's first question constitutes such a good example of the kind of manipulation that he wanted to condemn and of the kind of structure that he gave to most of his disputation, it deserves some detailed consideration.

The question started with a brief summary of the thesis: Arius died at Constantinople miserably 'by the effusion of his bowels' before having been absolved from excommunication. Newton's antithesis proposed that the story had been in fact broached by Athanasius at least twenty-four years after Arius's death. Athanasius's side was represented by two letters by him to the monks while in the wilderness of Egypt. Athanasius's basic argument was that, even though he was not at Constantinople when it happened, he had learnt from Macarius that Arius, being called to the presence of the emperor Constantine, swore that he had done none of the things for which he had been excommunicated. The emperor had dismissed him with the words: 'if thy faith be right, th{ou hast} well sworn, but if impious & yet thou hast swo{rn God} will condemn thee for thy oath'. And he had condemned him by letting him die miserably. However, Athanasius's role as *respondens* was quickly overshadowed by Newton's objections. It was then that Newton displayed the expertise of a researcher of forgeries and of a litigator and uncovered the paradoxes that would result from embracing Athanasius's narrative. Newton's careful critical analysis of the first letter by Athanasius allowed him to date this 'libel or narrative' to AD 359 or soon after. As a consequence, the story dated from the time of the council of Ariminum and its support

⁵⁶ WACL MS, f. 1r. Punctuation and spelling are left as in the original, as is superscript. Insertions appear between backslash and slash. Struckthrough text stands for deleted or cancelled text in the original. Braces represent material supplied from Keynes MS 10. The letter 'thorn' or 'þ', which by the seventeenth century had come to be used as an abbreviation of 'th' is transcribed as 'y', since Newton's own character is indistinguishable from 'y'.

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of Arianism. Not only that, but in the second text Athanasius relied, according to himself, on the testimony of Macarius, his presbyter. However, Macarius had, we are told, died long before Athanasius related the story. Athanasius's 'timorousness' also aroused Newton's suspicions. First Athanasius had asked the monks not to make copies of his letter and to return the writing quickly to him for, he said, 'it is not safe that those {our} writing should come to posterity w^{ch} we composed as {babblers} & unlearned'. However, some time after the story had been circulating, Athanasius wrote it again freely because, Newton thought, he had lost the fear of being uncovered as the forger that he was. Newton proposed a list of eight further objections that settled the question and allowed him to give his final *determinatio* on the matter.⁵⁷ Newton displayed an extraordinary sensitivity to inconsistency. Athanasius was betrayed by the contradictions of his own fiction. For instance, Athanasius's story had come from Egypt rather than from Constantinople, where the events were said to have taken place. Absence of evidence for the story in the letters written in favour of Athanasius underlined its spuriousness. Furthermore, Athanasius did not bring any outside evidence to support his report. Even if he had provided a proof, his testimony would bear no value, since a 'profest enemy ... may be an accuser but not a witness'. Moreover, 'accusations wthout pro{of are by the general rule of all courts} accounted calumnies'. The imaginary court that heard Newton's case against Athanasius was no exception to this.⁵⁸

Another of Newton's objections was based on the fact that the story only appeared in the records of the ecclesiastical historians ninety years after Arius's death. It appeared first in Athanasius's writings; there Athanasius pretended that it had originated in Constantinople, as it should have. But Athanasius's effort to give credibility to his story uncovered yet another contradiction: 'For how it could be so publicly known there at first & not spread thence into Egypt & other regions before Athanasius told it' was incomprehensible to Newton.⁵⁹ A last blow to the defenders of the story's authenticity focused on whether Arius had died 'without y^e

⁵⁷ WACL MS, ff. 1r-4r.

⁵⁸ WACL MS, ff. 3r-4v.

⁵⁹ WACL MS, f. 5r.

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pale of y^e Church'. In order for this story to be credible, Arius had to die before the Arians were received into communion by the Council of Tyre and Jerusalem. Accordingly, Athanasius feigned in his letters to Serapion and to the monks that Arius had died at Constantinople immediately after being recalled from banishment. The story was adopted by the ecclesiastical historians, who modified it to reconcile it with 'true history'. Newton criticized the historians' position, pointing out the irreconcilability of Athanasius's narrative with the belief that Arius was received into communion in Jerusalem. However, a letter from the council in which they recommended that Arius be readmitted in Alexandria – paradoxically mentioned by Athanasius himself in his book on the Councils of Ariminum and Seleucia – pointed in a different direction. Not only the written records, but also the oral tradition denied the consistency of Athanasius's narrative. To Newton, the 'memory and tradition' of Arius's reception in Tyre remained strong in Egypt and only died out due to the success of the campaign orchestrated by Athanasius.⁶⁰ The reasons laid down above formed the backbone of Newton's conclusion and ended the dispute regarding this question. Despite Athanasius's own insistence, his story was his very own invention.⁶¹

Newton's third question touched on such important issues as the Council of Tyre and started a series of questions on whether this council had judged Athanasius justly. It was in Newton's interest to prove that the Council that had sent Athanasius out of Alexandria was a legitimate forum, and not an Arian conventicle, as others claimed. The question, as phrased by Newton, was then 'whether the Council of Tyre & Jerusalem was not an bigger \orthodox authentic/ Council \bigger/ then that of Nice'. Hagiographical biographies of Athanasius, like the *The history of the life and actions of St. Athanasius* of 1664, had described the Council of Tyre as 'neither Theologically nor Politically innocent' and the Council at Jerusalem as 'the fag end of a Council under force'.⁶² Constantine had appointed Athanasius to appear in 335 before the Council of Tyre to

⁶⁰ WACL MS, ff. 5r-6r.

⁶¹ WACL MS, f. 6r.

⁶² [Bacon], *The history of the life and actions of S. Athanasius*, 56-7.

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confront charges that affected his election and other irregularities.⁶³ Once again, however, the odds were against the pretension of Athanasius and his friends. The council was to deal not only with Athanasius's rejection, but also with the reception of Arius and Euzoius. It was an ancient and necessary canon of the Church that one could not be received by a lesser number of bishops than had voted for one's deposition. The emperor's letter to all the eastern empire, trying to secure the presence of as many bishops as possible, was a written record that irrefutably supported Newton's argument. Newton's objections focused characteristically on that, which was absent but could reasonably have been expected, as much as on the present evidence. The eastern bishops objected that Athanasius could not be returned to his Bishopric because he had not been restored by the same number of bishops that had rejected him in the first place. Athanasius's followers, however, did not use the same strategy. They never complained that Arius had been unjustly received in Tyre *because* the number of bishops was lesser than the number of bishops that had rejected him. Obviously, given the strength of this argument and the parallels of both arguments, Newton conjectured that Athanasius would have presented this objection if Arius had been unjustly received, which alone proved the truth of that which was to be demonstrated.

Newton's careful distinction between acceptable evidence and pseudo-evidence played an important role in the rest of his discussion of this question.⁶⁴ In quoting what he considered uncontested evidence on the size of the council, Newton suggested that we 'hear how Eusebius \who/ was in both Councils \& so is a good witness,/ describes this'. Newton was very keen on letting the objectors speak for themselves. The custom of systematically citing the sources and making the evidence available to the reader was still a relatively young scholarly tradition. At a time when historians borrowed some rhetorical techniques from lawyers, and lawyers approached their cases as if they were undertaking historical

⁶³ [Nye], *The acts of great Athanasius*, 5.

⁶⁴ Many of the characteristics found in his discourse have been systematically analyzed as commonplace features of the language used by most historians in the period, historians whose works were, unlike Newton's, published in sixteenth- and seventeenth-century England. See, for example, Barbara Shapiro, *A culture of fact: England 1550-1720* (Ithaca, 2000).

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research, the law-like norm of impartiality was imposed with particular zeal when it came to providing the evidence and choosing the witnesses. Athanasius's testimonies were repeatedly rejected by Newton because they could not fail to be biased. Obviously, a good witness should not be directly involved in the disputation. A first-hand, written, consistent account, especially if it came from someone praised for his integrity or skill – like Eusebius in this case – was the best possible scenario. However, when Newton found himself disagreeing with a first-hand consistent account, he had little difficulty in proving that it came from a 'bad' witness after all. Oral testimonies could be acceptable (and hence called 'memory and tradition'), but they could also lead to *romances* or *novels* and hence be condemned as no more than 'rumour'. And this was indeed Newton's verdict on the Athanasians' accusation that the Council of Tyre had been Arian. The accusation seemed to Newton 'no more than popular fame'. Such five years standing fame, Newton continued, might make a strong impression, but since it had spread without the original evidence, it could be 'of no moment'.⁶⁵ The Athanasians held that the Council of Tyre was Arian because they had received Arius into communion and banished Athanasius.⁶⁶ However, this did not prove the council's unorthodoxy to Newton, who objected that in all the subsequent councils the bishops present at Tyre had declared against Arianism and anathematized Arius's unorthodox opinions. The Athanasian disputant would allege, Newton anticipated, that the bishops had dissembled at the Council of Tyre and that they were Arians at heart. But how could anyone attain knowledge of an individual's faith except by judging his profession and practice? And further – Newton objected – what could this kind of baseless accusation that claimed to look into people's hearts be called, but 'calumny' and 'malice'? Furthermore, the Athanasian objection did

⁶⁵ WACL MS, ff. 11r-12r. For the epistemological categories used by Newton and others at the time, see Shapiro, *A culture of fact*, 32-3, 36, 47. See also Shapiro, *Probability and certainty in seventeenth-century England* (Princeton, 1983), 119, 142, 146.

⁶⁶ This is also the only proof that Athanasius presented in his vindication to Constantine, according to Nye's account: 'and by then represents to the Emperor, that the Council of Tyre was wholly *Arian*; that they had believed all things against him, merely out of hatred to him for his Zeal to the Nicene Faith' ([Nye], *The acts of great Athanasius*, 5).

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not touch the authority of the council. What if many of the Tyrian bishops were Arians? The authority of a council, Newton argued, was not simply decided by its religious sincerity, but by its external acts, in the same way that the authority of a judge depended ‘upon his incorporation into y^e body politick & upon his Commission \to act/’. Adopting once more the pose of the empiricist, Newton wondered: how could we be sure that any council was authentic if we were to base our judgment on what we cannot see?⁶⁷

Newton also pointed out that the authenticity of the Council, that is, its authority, had indeed not even been doubted at the time of Athanasius. Such doubt was a later development. Newton’s *coup de grâce* was the unveiling of another inconsistency. Julius the Bishop of Rome had appointed the eastern bishops to appear before him to justify their integrity (again rather than the *authority* of the Council). Since they failed to appear, Julius absolved Athanasius, which meant that he was implicitly acknowledging the capacity of the purportedly Arian Council of Tyre to excommunicate him. Ironically, Athanasius’s arguments were ‘agreable to this’, that is, they ran against his ultimate point when spelled out.⁶⁸ It was Athanasius’s design, as seen before, to make Arius die outside the pale of the Church, that is, before he had had time to be received into communion again by the Council of Tyre and Jerusalem. Athanasius was therefore implicitly accepting that those received into communion by the Eusebians (for Eusebian is what the Council seemed to Athanasius) were in communion with the Catholic Church. The unpleasant consequence was that Athanasius was in practice not only recognizing the authenticity of the Council whose sincerity he doubted, but also granting that its acts were ‘valid & binding’.⁶⁹

The authenticity and authority of the Council of Tyre thus established, Newton moved on to assessing its performance. In doing so, he uncovered

⁶⁷ WACL Ms, ff. 12r-13r.

⁶⁸ WACL MS, f. 13r.

⁶⁹ WACL MS, ff. 11r-13v. Eusebius (260 AD-before 341 AD), Bishop of Caesarea in Palestine was an Arian sympathizer. He took sides with Arians and defended Arius after his excommunication in the year 320.

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Athanasius's strategies as a forger. After a slight hesitation as to the title of his next question, Newton set out to prove 'whether y^e story of the dead man's hand and the living Arsenius was not feigned by Athanasius about 25 years after y^e time of the Council of Tyre'. This question branched into others that could all be grouped as a series of objections to Athanasius's stories. There Newton displayed his extraordinary scholarship and his traditional approach to the textual analysis of ancient texts, while continuing to marshal his proofs in the same way that the advocate of the anti-Athanasian cause would have done in a court of justice. When humanists set norms to discriminate between truly ancient texts and forged antiquities, they contemplated their texts as the product of a wider cultural context, rather than as isolated items. Forgeries could be detected because they were not internally consistent, contained strange vocabulary, or because they showed awareness of events that could not have been known to the purported authors.⁷⁰ Newton discredited many of the Athanasian tales using these norms. The reverse of the last criterion was also true. He checked and rejected as evidence most of the letters exhibited by Athanasius, because their authors had failed to mention what they would have known had the letters been genuine, particularly since what they did not mention would have strengthened their cases.⁷¹

Corruption set on foot: the evolution of Newton's campaign against Athanasius

Newton arrived early at some of the conclusions that formed the raw material that he would turn into these questions in his later manuscripts. Almost certainly in the 1680s in his *Theological notebook* and under the heading 'De Antichristo', Newton attributed to Pope Julius II the statement that 'there was never any great slaughter in Christendom, nor any great calamity happen'd either of Church or State, whereof y^e Bishops of Rome were not the Authors'.⁷² Newton's early collection of notes bore

⁷⁰ Grafton, *Defenders of the text*, 29-30. It is interesting to note with Grafton that some of the rules of historical criticism formulated by early humanists had indeed been applied long before to decide ecclesiastical controversies.

⁷¹ For examples, see questions 5 to 9, WACL MS, ff. 15r-25r.

⁷² Keynes MS 2, ff. 18v, 19v.

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testimony to his concern with the Trinitarian passage 1 John 5:7, 8, and to his collation of some of the numerous editions of the New Testament to which he had access and that supported his idea that the passage was spurious and had been introduced by later, partisan scribes.⁷³ Other headings in the *Theological notebook* showed key notes from the sources for Newton's study of the history of the church in the fourth century, essential to understanding Newton's scripturally-based heresy and anti-Catholicism.⁷⁴ At the time, he had already started his investigation of the Council of Nicaea. Jottings about its composition appeared close to more exhaustive notes on Gregory Nazianzen's *Orationes de spiritu sancto* and the latter's censure of Arians.⁷⁵ Nazianzen's own description of how, at his arrival at Constantinople, he had been stoned as soon as he began to preach the deity of the Holy Ghost – that Newton had copied out in his notebook – would be later reproduced in his 'Paradoxical Questions' to prove the magnitude of the commotion suffered by the East as a consequence of the Emperor Gratian's edict to restore the 'consubstantialists'.⁷⁶ Newton's *Theological notebook* contained some 'Observations upon Athanasius's works' too. These observations

⁷³ Some of the editions that Newton quoted were Grotius's, Erasmus's and Luther's; but also the Syriac, Arabic and Ethiopian versions, the Latin versions in Jerome's time, the copies of the Eunomians, the copy of Basil, and those of Dydimus Alexandrinus, Epiphanius, Chrysostome, Theodoret, Damascene or 'any other ancient writer' for the matter, as well as the Armenian Codex according to Christopher Sandius's *Interpretationes paradoxae*; they all lacked the polemical verse (Keynes MS 2, ff. 19-21). For Newton's later account on the intrusion of the Trinitarian passage, see Newton to a Friend, 14 November 1690, *Correspondence of Newton*, III, 83-129. For the context and discursive tradition of 'A historical account of two notable corruptions of Scripture, in a Letter to a Friend', see Iliffe, 'The powers of demonstration: Simon, Newton, Locke and the Johanne comma', *Scripture and scholarship in early modern England*, ed. Ariel Hessayon and Nicholas Keene (Aldershot, 2006), 77-110.

⁷⁴ Such as 'Miscellania', 'De Trinitate', 'De Politia Ecclesiastica', 'De Athanasio', 'De his. Eccl. sub Constantino et Constantio', 'De eadem sub Valenti et Theodosio', 'De eadem post Theodosium', 'De Arrianis et Eunomianis \et Macedonianis/', 'De Hæresibus et Hæreticis' and 'De patribus, scriptoribus, Concilijs & auctoritate ecclesiastica', Keynes MS 2, verso of flyleaf.

⁷⁵ Keynes MS 2, ff. 30-3.

⁷⁶ Keynes MS 2, f. 34; WACL MS f. 68r.

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represented Newton's first impressions on his reading of the Bishop of Alexandria, or 'the inventor of forgery' as he would later call him.⁷⁷ The *Theological notebook* displayed abundant quotations from the Church Fathers. The selection of texts reflected Newton's concern with the nature of the Godhead and the origin of superstitions. However, he was very far from taking everything he read at face value and he must have thought that there was more than a grain of truth in the strong statements that he copied out of Lord George Digby's reply to the Viscount of Falkland, where the first denied the authority of the Fathers on the basis of their mutual contradiction and variance, among other reasons.

As most Newton scholars know well, 'Idolatry' had been one of Newton's early entries to his *Theological notebook*.⁷⁸ The topic of the origins of idolatry, which Newton would pursue further and more exclusively in other pieces, was a favourite of his. Some time in the late 1670s and 1680s he started a 'Chapter 3' on the advent of idolatry – 'the Devil' – on earth. There, Newton provided evidence that pointed to the culpability of the Church Fathers, and above all Athanasius, for their participation in the corruption of the Church. However, Athanasius was only occasionally mentioned at that time. The manuscript of that chapter, which bore the unusual title 'Quod Bestia bicornis locuta sit ut Draco' ('That the two-horned Beast spake as a Dragon'), was more a bundle of notes than the draft for a treatise.⁷⁹ This is of course part of the reason why no clear structure can be detected. Still, it is worthwhile noting that some of Newton's conclusions based on the evidence that he gathered there were later transformed into the arguments and conclusions found in the 'Paradoxical Questions'. Entire Latin passages extracted from

⁷⁷ Keynes MS 2, ff. 13-15.

⁷⁸ Keynes MS 2 (material from the back of the notebook), f. V.

⁷⁹ This is today Yahuda MS 2.2, a manuscript on Revelation, the history of the Church and Solomon's Temple. My concern for the purpose of this paper is not to carry out a systematic comparison between Yahuda MS 2.2 and the 'Paradoxical Questions'. Although Newton divided his work in different projects, there were very interesting connections between them and very fertile comparisons are waiting to be made. The evolution of Newton's textual material, across different manuscripts and projects, is a challenge which scholars can now start facing thanks to the aid of endeavours like the Newton Project.

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Hilary, Basil, Sozomen and others were carefully translated by Newton and turned into evidence pointing to Athanasius's culpability. The same evidence on which Newton had occasionally commented in 'Quod Bestia bicornis' was in questions 17, 18 and 19 from the 'Paradoxical Questions' taken to be a firm proof of Athanasius's direct involvement in the invocation of saints, the practice of false miracles and the propagation of superstition through monkery.

That in the year 400 or 420 the Church had become idolatrous was, Newton thought, a well-known fact. In two different places of 'Quod Bestia bicornis' he regretted that despite this, many were subject to the influence of those Fathers who, notwithstanding their great names, were often ultimately responsible for the corruption of the Church. In the 'Paradoxical Questions', Athanasius's responsibility, to which Newton had only hinted once or twice in 'Quod Bestia bicornis', was the conclusion of all of his investigations. The first question that Newton proposed to this effect bore the title 'Whether Athanasius did not set on foot the invocation of saints', the other two being 'Whether Athanasius did not for promoting his interest set on foot the practise of false miracles' and 'Whether Athanasius did not for promoting his interest set on foot the way of writing ~~laying~~ \fabulous/ Legends & propagate the superstition of Monkery.'⁸⁰ All the other questions up to this point had shared, to some extent or another, the structure of a *quaestio disputata*: the opposite of Newton's theses had been repeatedly considered, even if only through textual evidence whose authenticity Newton doubted or objected to. This structure was not applied to the three questions related to the emergence of idolatry, nor to the rest of the manuscript. Athanasians were hardly given any chance to contest Newton's evidence. Rather, Newton painstakingly reproduced texts that, when interpreted within his agenda, endorsed a thesis whose truth he never doubted any more, not even for the sake of a disputation exercise.⁸¹

⁸⁰ WACL MS ff. 54r, 61r, 80r.

⁸¹ It was of course not the first time when Newton seemed to forget or to ignore his preferred structure as his exploration of a subject led him to other, wide-ranging topics and consequently to rehearse different strategies of presentation. This is the case, for example, for some of his writings on prophecy (Delgado-Moreira, 'Newton's treatise on Revelation: the use of a mathematical discourse', *Historical Research*, 79 [2006], 224-46).

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Newton started by quoting biblical evidence that proved that the primitive Christians had placed the souls of the dead in Hades, the land of silence and darkness. It was only due to the corruption of the Egyptians, Platonists and other heathens, who had placed the statues of the better sort of dead above their sepulchres and in temples, that the vindication of saints had been introduced. Athanasius was accused of having 'laid the foundations' for his doctrine of daemons (and that popish one of purgatory) in his *Life of Antony*, by describing how Antony saw the soul of Ammon ascend up to heaven. That Athanasius was at the true origin of saint worship in the Greek Church was further proved by his own claim that the saints could understand men and could intercede with God on man's behalf.⁸²

Athanasius's corrupt teachings spread quickly from Egypt to Syria, according to Newton, and later even further East, according to Hilary. To support his point, Newton quoted evidence from Hilary's Psalms 124 and 129, the same passages that he had used some years before to illustrate the open and shameless preaching of the intercession of angels with God.⁸³ Once miracles were credited, the foundations were laid for the cult of the dead to emerge. Newton wanted to explain how this had happened after the death of Constantius. To this purpose, he introduced Basil's homilies 20 and 26. The reasoning and the evidence which we find in 'Quod Bestia bicornis' were closely paralleled in the 'Paradoxical Questions'. However, after the passages by Basil, Newton made a remark introducing further evidence from Ephraim. This remark changed slightly but significantly from 'Quod Bestia bicornis' to the 'Paradoxical Questions'. While 'Quod Bestia bicornis' related Basil's texts to what had happened in the Asiatic Churches, Newton – like any good litigator – decided to make the most of this evidence for the case that concerned him. Thus, after Basil's passages he wrote instead: 'here you have the general practise of y^e Athanasians in Asia'.⁸⁴ On the other hand, in both manuscripts Newton

⁸² WACL MS, ff. 55r-56r.

⁸³ WACL MS, f. 56r; Yahuda MS, 2.2, f. 24r.

⁸⁴ My emphasis. Compare: 'Here you have the general practise of y^e Athanasians in Asia during y^e reign of (Hæg) & Ephraim will acquaint you wth/their like practise in Syria' (WACL MS, f. 57r). 'Hæc in Ecclesijs Asiaticis. Quid in Syria factum sit ex scriptis Ephraen Syri patere potest.' 'This is in the Churches of Asia. What happened in Syria may be known through the writings of Ephraim' (Yahuda MS 2.2, insertion from f. 14v).

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pointed out that what had taken place in Asia and Syria had happened in Egypt to a greater extent, although again the wording differed. In ‘Quod Bestia bicornis’, Newton attributed the progress of idolatry in Egypt to the high concentration of superstitious monks.⁸⁵ In the ‘Paradoxical Questions’ Newton pointed again to the Athanasians who, being responsible for the spread of saint worship in the East, would have found Egypt fertile ground.⁸⁶

These were not the only occasions when Newton adapted some of his conclusions in ‘Quod Bestia bicornis’ to his purpose in the ‘Paradoxical Questions’, thus transforming pre-existing material into the *quaestio* structure of the more recent manuscript. For example, in folio 16v of ‘Quod Bestia bicornis’, Newton quoted Sozomen, who portrayed the emperor Theodosius invoking St John the Baptist as his protector against war. His conclusion to the passage from Sozomen was unspecific: ‘Talis erit hic Imperator, & tanto studio comitatus ejus cum clero et populo Constantinopolitano cultum defunctorum jam prosequi cœperant’.⁸⁷ On the other hand, folios 45v and 46r of the ‘Paradoxical Questions’ displayed the same passage from Sozomen, but Newton did not miss out on the opportunity to link Theodosius’s invocation to the saint with the Athanasians’ prominent role. Thus, Newton wrote: ‘This is that Theodosius ~~to whom the Athanasians~~ for who for setting up Athanasianism has ~~acquired~~ ^{been honoured with/} the name of Theodosius the great’.⁸⁸ In the same way, a passage by Chrysostom, which appeared in both manuscripts, where he urged people to check themselves and share their devotion for the saints with God, became in Newton’s hands further evidence against the Athanasians: ‘So then the Athanasians before the

⁸⁵ Yahuda MS 2.2, ff. 10r, 13r: ‘In Ægypto verò ubi major erat monachorum frequentia, non dubium est quin major fuit harum impietatum progressus.’ ‘In Egypt, where there was a higher number of monks, the progress of these superstitions was in fact doubtless greater.’

⁸⁶ WACL MS, f. 58r: ‘ffor if they did thus in Egypt Asia & Syria they did it much more in Egypt where they were more a [*sic*] liberty & from whence these superstitions ~~were propagated~~ had their rise’.

⁸⁷ ‘Of such kind will this Emperor be, and with so much enthusiasm had his guards and the people of Constantinople already set on foot the cult of the dead men.’

⁸⁸ WACL MS, f. 46r; Yahuda MS 2.2, f. 16v.

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end of the fourth Century had run almost all their devotion into saint-worship'.⁸⁹

Newton continued to expand on the 'great vehemence' of the superstition of the age and on Athanasius's leadership role for the space of three questions of his 'Paradoxical Questions'. Not only had the saints been invoked as intercessors, but also 'as Guardians Protectors, Rulers and Coadjutors'. They had been given the highest degree of worship, whose 'hard name' Newton would not disclose, but would rather leave 'the reader to consider'.⁹⁰ A remarkable part of the material employed in the two questions about saints and miracles – particularly paragraphs that Newton had copied out from other authors – appeared both in 'Quod Bestia bicornis' and in the 'Paradoxical Questions'. As we have seen, the conclusions in one and the other manuscripts differed however in slight but interesting ways, which adapted the material to the different purposes which Newton was pursuing in these two different pieces.

Conclusion

Newton's 'Paradoxical Questions' was composed in a period of Unitarian debate. We have proof that Newton was familiar with this debate and that many of his own arguments were common during this time. He must have been accounted with influential accounts of Athanasius's life, the effects of which he was probably trying to counterbalance with his own version of the same 'facts'. This essay has however introduced a caveat to the contextualization of the 'Paradoxical Questions' among the Unitarian literature of the 1680s and 90s. The evidence of Newton's *Theological notebook* and of earlier manuscript material shows that Newton's study of the Fathers was an equally important (or may be even the most important source) for Newton's anti-Trinitarian conclusions. His study of the early Fathers, which he presumably started around the time when he was expected to prepare for the priesthood, provided Newton with the confirmation that his unorthodox idea of the nature of the Godhead, to

⁸⁹ WACL MS, *ibid.* Cf. Yahuda MS 2.2, f. 17r.

⁹⁰ WACL MS, f. 45r.

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which his study of uncorrupted Scripture had taken him, was right. Through his reading of the Patristic scholar Petavius, Newton surveyed a good number of ante-Nicene Fathers and found that Justin Martyr's and Tertullian's views on the lesser status of the Son in respect of the Father agreed with his own interpretation of the sacred texts.⁹¹ The Fathers had also taught him that the triumph of the Athanasian creed had been facilitated through philological tricks.⁹²

The 'Paradoxical Questions' set out to reverse the order of things as it had been established by some fathers like Hilary and contemporaries like Cave and most probably Bacon.⁹³ Newton's text was much more an anti-Athanasian treatise than an apology of Arius. Thus, Newton targeted episodes of Athanasius's life that, as he repeatedly proved, had been invented by partisan enemies of the 'truth'. Although writing on the same topics as other enemies of the Trinity and often complaining about the same metaphysical and philological 'absurdities', Newton's anti-Trinitarian treatise displayed a unique structure which followed the conventions of the scholastic *disputatio*, designed to impose the truth on the rival by making the contradictions of his argument conspicuous. Disputations were an important pedagogical and research tool of the seventeenth-century Cambridge curriculum in which Newton was educated. Cambridge students were trained in the art of detecting the paradoxes of the opponent's argument and of writing convincingly and 'for the ear'.⁹⁴ The use of the *quaestio disputata* was however not indissolubly linked to the historical and theological debate for Newton, and his appropriation of it for the Unitarian cause (unique among the Unitarian authors) is an example of Newton's rehearsal of different techniques of argument for different projects in search of the most persuasive strategy for his imaginary reader. Furthermore and as previously pointed out by Manuel, Newton used in this manuscript 'techniques of reasoning-on-the-evidence developed in lawcourts and in

⁹¹ Keynes MS 4, 'Notes from Petau (Petavius) on the Nicene Council' (1670s), f. 2.

⁹² Yahuda MS 18, f. 4v, cited in Mandelbrote, "'Than this nothing can be plainer'", 291.

⁹³ Iliffe, 'Prosecuting Athanasius', 15; Mandelbrote, "'Than this nothing can be plainer'", 290.

⁹⁴ William T Costello, *The Scholastic curriculum at early seventeenth-century Cambridge* (Cambridge, Mass., 1958), 147.

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humanist scholarship'.⁹⁵ He deployed humanist techniques of historical criticism to discriminate between 'real proofs' and 'Athanasian forgeries', as other seventeenth-century Protestants did to detect Catholic frauds.⁹⁶

The 'Paradoxical Questions' also exemplifies particularly well one technique in which Newton was well versed: the adaptation or importation of evidence from one context into another. For his long disputation piece, Newton recycled material that he had used before at the end of the 1670s or beginning of the 1680s in a Latin bundle of notes ('Quod Bestia bicornis') on several theological topics, among them the corruption of the Church. There Newton had already quoted part of the textual evidence that he would invoke in trying to cancel out some of the paradoxes of his later anti-Trinitarian manuscript. While transplanting testimonies from one context to another, Newton guaranteed, through small but highly significant changes, that texts which had been used to illustrate the responsibility of the Fathers for the fall of the Church, or the propagation of corruption throughout Assyria and Egypt due to the action of superstitious monks, appeared in the 'Paradoxical Questions' as proofs that directly incriminated Athanasius. The import of evidence in this context also shows that Newton's Patristic study constituted one of the pillars on which his heretical thoughts rested.⁹⁷

This paper has analysed one of Newton's major anti-Trinitarian manuscripts against its temporal and intellectual milieu. Although the 'Paradoxical Questions' shared the subject matter and arguments with other anti-Trinitarian works of the time and reversed the arguments of other lives of Athanasius, there is not a single work or even a heretical movement with which it can be identified without straining the evidence. This is not to say that the works and disputes of the time had no influence whatsoever on Newton's composition of his own work, but as I have tried

⁹⁵ Manuel, *The religion of Newton*, 85.

⁹⁶ See also Michael Hunter, 'Essay review. Ancients, moderns, philologists, and scientists', 39 *Annals of Science*, esp. 190-2.

⁹⁷ Scott Mandelbrote has pointed out the extent to which Newton's Patristic scholarship was scholarship 'with a purpose' (Mandelbrote, "'That nothing can be plainer'", 282).

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to show, Newton's study of the Fathers (and surely of the Bible) played, at the very least, an equally important role. Newton's piece displayed a *quaestio disputata* structure, which was particularly suitable to the legal language of which Newton made abundant use. In the 'Paradoxical Questions', he took Athanasius to the bar and affected the neutrality proper of the judge. He expertly tested the authenticity of the Athanasians' proofs through strategies of reasoning on the evidence and its absence, aided by careful philological and textual analysis that allowed him to spot 'novels' or 'romances' and distinguish them from true matters of fact. Newton made a sustained effort to apply the disputational form to his work, but as it often happens in his archive, the structure lapsed at times.

The 'Paradoxical Questions' thus makes manifest Newton's import of structure and evidence from one context into another and his experimental or playful use of the genres within which he argued. Newton's adaptability makes an understanding of his work all the more exacting, for each reader who wishes to interpret Newton's works successfully, must pay close attention to the requirements and constraints – epistemological and rhetorical – facing Newton as he worked towards the production of his texts.

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**'NEWTONIAN' ELEMENTS IN LOCKE, HUME, AND REID, OR: HOW FAR
CAN ONE STRETCH A LABEL?***

Steffen Ducheyne

Introduction

This essay elaborates on how Newton's natural philosophy served as a source of inspiration in late seventeenth-century and eighteenth-century British philosophy. I shall focus on three fascinating but utterly different individuals: John Locke (1632-1704), David Hume (1711-1776), and Thomas Reid (1710-1796). Nowhere do I imply that these figures were of greater importance with respect to the issue at stake, 'Newtonianism' in British late seventeenth and eighteenth-century philosophy, than those philosophers I shall not mention in what follows. In a sense, my choice of addressing these authors is somewhat arbitrary, as I intend to chart but a tiny part of a larger whole. However, since the overarching goal of this essay is to document varying adaptations and appropriations of Newton's natural philosophy in later generations, Locke, Hume and Reid illustrate three different kinds of rapports – of a multitude of possible ones – with Newton's natural philosophy. Throughout this essay, I shall implicitly reflect on the historical usefulness of the label 'Newtonian' and on the criteria for its adequate attribution. Near the end of this essay, I shall more explicitly address this matter.

John Locke¹

As G A J Rogers has noted, most of the literature on Locke-Newton

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¹ A fuller treatment of my account of the Locke-Newton issue can be found in my 'The Flow of Influence: From Newton to Locke ... and Back', *Rivista di storia della filosofia*, 64 (2009), 265-88.

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assumes that the flow of influence goes from Newton to Locke.² Rogers himself has repeatedly claimed that Newton did not significantly influence Locke's *Essay concerning human understanding* and that Locke did not feel himself required to review his philosophical position in the light of Newton's work.³ Locke found in the *Principia* 'the exemplification of a method to which he himself already subscribed', that is, a combination of observation, generalization, induction and deduction.⁴

As Rogers states correctly, Locke (who died in 1704) only read the first edition of the *Principia* (1687) and was not affected by the philosophical and theological doctrines of the General Scholium in the second edition (1713). Even granting this, it does not imply that all has been said about the exchange of thought between Newton and Locke. The following questions deserve our consideration: (i) does Rogers' claim stand the test of Locke's *corpus*?, (ii) what about Newton's influence on the second and third editions of the *Essay* (Rogers grants an influence on the fourth, but tends to minimize it)?, and (iii) what about Locke's influence on Newton? In this section, it is shown that the flow of influence went in both directions: Newton's scholium on space and time influenced Locke significantly (*pace* Rogers' account)⁵ and Newton was inspired by Locke's empiricism and more specifically by his anti-innatism. There were thus mutual influences.

One caveat: nowhere in this section is it claimed that Locke was a Newtonian. Lisa Downing for instance has rightly stressed that Locke remained sceptical about the results of Newtonian natural philosophy, for, though he held it as an intelligible theory that accorded with the concept of body we distil from sense experience, he remained sceptical about the possibility of rendering natural philosophy as a *scientia*.⁶ By contrast,

² See: G A J Rogers, 'Locke's *Essay* and Newton's *Principia*', *Journal of the History of Ideas*, 39 (1978), 217-32, 217-20 (notes 1-7), for the references.

³ G A J Rogers, 'The System of Locke and Newton', in Zev Bechler ed., *Contemporary Newtonian Research* (Dordrecht/Boston/London, 1982), 215-38.

⁴ Rogers, 'Locke's *Essay* and Newton's *Principia*', 229; cf. Rogers, 'The System of Locke and Newton', 216.

⁵ Rogers, 'The System of Locke and Newton', 216.

⁶ Lisa Downing, 'Locke's Newtonianism and Lockean Newtonianism', *Perspectives on Science*, 5 (1997), 285-310, at 307.

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Newton thought that natural philosophy establishes truth, certainty and the causes of phenomena.⁷ Furthermore, the details of Locke's opinion on scientific methodology, induction and deduction from phenomena (which were crucial to Newton) are lacking. However, it will be shown that Locke's account of space and time can be rightfully labelled as 'Newtonian'.

In chapters IV to XXVIII of Book II, Locke expands on the origin of several of our ideas and the relations between them. We shall focus here on his treatment of the ideas of space, time,⁸ and God (and our ignorance of God's substance and substances⁹ in general). I claim that Locke's account of space and time, *from the second edition onwards*, was influenced by Newton.¹⁰ Locke and Newton became well acquainted from 1689 onwards and corresponded frequently from then on.¹¹ Newton sent a copy of his anti-Trinitarian 'Two notable corruptions' to Locke in 1690, a token of his trust in Locke.¹² According to his later statements after

⁷ Steffen Ducheyne, 'Newton's Training in the Aristotelian Textbook Tradition: From Effects to Causes and Back', *History of Science*, 43 (2005), 217-37; *idem*, 'Mathematical Models in Newton's *Principia*: A New View of the "Newtonian Style"', *International Studies in the Philosophy of Science*, 19 (2005), 1-19.

⁸ In Draft A (but not in Draft B) there is a brief discussion on the possibility of a void, but not about absolute space (Locke, *Drafts for the Essay concerning human understanding*, ed. Peter H Niddich and G A J Rogers [3 vols., Oxford, 1990], I, *Drafts A and B*, 45-6). In Draft B there is a small discussion about time. Locke wrote: '[t]ime therefor to duration is as place to extension which is noe thing but examining or assigneing the distance of any two points by some common knowne measure' (*ibid.*, 225, cf. 232). On time Locke observed that '[t]he Idea of Duration being taken from reflection on the succession of the Ideas in our owne mindes the measure of it from some observable equall periods' (*ibid.*, 249). Locke considered space and time to be infinite (*ibid.*).

⁹ See Michael Ayers, *Locke* (2 vols., London and New York, 1991), II, 39-64, 91-128. For the criticism of Locke's contemporaries on his notion of substance, see Edwin McCann, 'Locke's Theory of Substance under Attack!', *Philosophical Studies*, 106 (2001), 87-105.

¹⁰ I have checked against the original copies of the first and second edition of Locke's *Essay* (John Locke, *An essay concerning human understanding* (London, 1690) and John Locke, *An essay concerning human understanding* (London, 1694), 81-104.

¹¹ Rogers, 'Locke's Essay and Newton's *Principia*', 230-2.

¹² Newton, *The correspondence of Isaac Newton*, ed. H W Turnbull, et al. (7 vols., Cambridge, 1959-1977), III, 82; cf. Stephen D Snobelen, 'Isaac Newton, heretic: the strategies of a Nicodemite', *British Journal for the History of Science*, 32 (1999), 381-419, 401-2.

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Locke's death, during their meeting in 1689 Newton had suggested to Locke that 'one could in some fashion form an idea of the creation of matter by supposing that God could through his power prevent everything from entering a certain portion of pure space, space being by its very nature penetrable, eternal, necessary, infinite; for thereafter that portion of space would possess impenetrability, which is one of the essential qualities of matter'.¹³ This is important information, as it suggests that Newton and Locke discussed the status of space and time and God's relation to space and time. Rogers sees Locke as a defender of 'a relativist view of space and time'¹⁴ and claims that Locke never accepted Newton's absolutist position.¹⁵ This claim does not stand close scrutiny for there is textual evidence that he did.

It is true that in the *Essay* Locke noted that 'our *Idea* of Place, is nothing else, but such a relative Position of any thing'.¹⁶ Note, however, that this statement occurs at the very beginning of his discussion of space and time. Throughout his discussion Locke shows that our simple ideas of space and time can be extended *ad infinitum*¹⁷ and that space and time

¹³ Quoted from Roger Woolhouse, *Locke: a biography* (Cambridge, 2006), 279.

¹⁴ Rogers, 'The System of Locke and Newton', 236-7 (note 27).

¹⁵ Rogers, 'Locke's *Essay* and Newton's *Principia*', 221.

¹⁶ John Locke, *An essay concerning human understanding*, ed. with an intro. by Peter H Niddich (Oxford, 1975 [1689]), II.xiii, § 10, 171, cf. *ibid.*, § 9, 170.

¹⁷ John Jackson noted that Locke 'perhaps, has led this Author into his Notion of Necessary Existence being merely [sic] negative, (though he never says so), from his making the Ideas of Eternity and Infinity to be *negative*', is not entirely correct (Jackson, *The existence and unity of God; proved from his nature and attributes. Being a vindication of Dr. Clarke's demonstration of the being and attributes of God* [London, 1734], 17). In the latter work, Jackson defended Samuel Clarke's views on space and time (see also John Clarke's *A defence of Dr. Clarke's demonstration of the being and attributes of God: wherein is particularly consider'd the nature of space, duration, and necessary existence* [London, 1732]). According to John Clarke, space and time not only have actual and independent existence and are infinite (*ibid.*, 43ff.), but they are also 'Consequences of his [*i.e.*, God's] infinite and permanent Existence' (*ibid.*, 80, cf. 100-4; see e.g., Samuel Clarke's original statements in H G Alexander ed., *The Leibniz-Clarke correspondence* [New York, 1956], 31-2, 47). The latter point (as well as Jackson's and Clarke's claims that space and time are attributes and real entities) was forcefully rejected by Edmund Law (see his *An enquiry into the ideas of space, time, immensity, and eternity; as also the self-existence, necessary existence, and unity of the divine nature* [Cambridge, 1734], 92-3, 131). Law first raised his critique of the

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should have an intrinsic and absolute, though *unknowable*, metric. In other words, he shows that from a relative conception we can arrive at an absolute conception of space and time. Locke claimed that once we have formed the simple ideas of space and time we can extend these up to infinity.¹⁸ There cannot be an end to this process of extending space, otherwise we 'confine GOD within the limits of Matter'.¹⁹ Hence, the idea of relative space is but one of the 'Modifications of the Idea of Space'. In Chapter IV, entitled *Idea of Solidity*, which is more or less identical in all four editions, Locke states that our idea of solidity and our idea of (pure) space are distinct, for men can imagine 'two Bodies at a distance, so as they may approach one another, without touching or displacing any solid thing'²⁰ and natural philosophy shows that bodies mutually attract one another *in vacuo* 'which is unexplicable by us'.²¹ According to Locke, the idea of a vacuum is admissible, for if God were to annihilate everything in the universe a vacuum would remain.²² Moreover, the possibility of motion in itself proves a vacuum: Locke

Newton-Clarke doctrine of space and time in the explanatory notes to his translation of William King's *De origine mali* (William King, *An essay on the origin of evil. By Dr. William King, late Lord Archbishop of Dublin, translated from the Latin, with large notes; tending to explain and vindicate some of the author's principles against the objections of Boyle, Leibnitz, the author of A philosophical enquiry concerning human liberty; and others* [London 1731]). See furthermore: Samuel Colliber, *An impartial enquiry into the existence and nature of God, being a modest essay towards a more intelligible account of the divine perfections* (London, 1735), 252-76 and Isaac Watts, *Philosophical essays on various subjects, viz. space, substance, body ... With some Remarks on Mr. Locke's Essay on the human understanding* (London, 1733), 17-46.

¹⁸ Locke, *An essay concerning human understanding*, II.xiii, § 20, 176, cf. *ibid.*, II.xv, §§ 2-3, 196-97, cf. *ibid.*, II.xv, § 9, 202, II.xvii, §§ 4-22, 211-23.

¹⁹ *Ibid.*, II.xiv, § 2, 197. Cf.: 'GOD, every one easily allows, fills Eternity; and 'tis hard to find a Reason, why any one should doubt, that he likewise fills Immensity: His infinite Being is certainly boundless one way as another, and methinks it ascribes a little too much to Matter, to sat, where there is no Body, there is nothing' (*ibid.*, II.xiii, § 3, 197).

²⁰ Locke, *Essay*, II.iv, § 3, 124.

²¹ Locke, *The works of John Locke*, ed. H Woodfall, et al. (4 vols., London, 1768), IV, 581.

²² Locke, *Essay*, II.xiii, § 21, 176-7.

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notes that if ‘the least Particle of the Body divided is as big as a Mustard-seed, a void Space equal to the bulk of a Mustard-seed be requisite to make room for the free motion of the Parts of the divided Body within the bounds of its Superficies’.²³ On the Ideas of Solidity and Space Locke wrote:

Motion can neither be, nor be conceived without Space; and yet Motion is not Space, nor Space Motion: Space can exist without it, and they are very distinct *Ideas*; and so, I think, are those of Space and Solidity. Solidity is so inseparable an *Idea* from Body, that upon that depends its filling of Space, its Contact, Impulse, and Communication of Motion upon Impulse. And if it be a Reason to prove, that Spirit is different from Body, because Thinking includes not the *Idea* of Extension in it; the same Reason will be as valid, I suppose, to prove that *Space is not Body*, because it includes not the *Idea* of Solidity in it; *Space and Solidity being as distinct Ideas*, as Thinking and Extension, and as wholly separate in the Mind one from another.²⁴

Locke stated three additional arguments in favour of the distinctness of the idea of space and the idea of solidity. Body and extension are not the same, since:

- (i) ‘*Extension* [i.e., pure Space] includes no Solidity, nor resistance to the Motion of *Body*, as *Body* does.’²⁵ Pure Space does not offer resistance to the material objects contained in it.
- (ii) ‘The Parts of pure Space are inseparable one from the other; so that Continuity cannot be separated, neither really, nor mentally.’²⁶ While material objects can be separated, pure Space cannot be mentally or actually separated otherwise we would obtain ‘two Superficies, where before there was a Contiguity’.²⁷ In other words, pure Space is *homogeneous*.

²³ Ibid., II.xiii, § 22, 177. That Locke’s argument here presupposes the existence of a vacuum worried Jackson Jackson, *The existence and unity of God*, 89-91.

²⁴ Ibid., II.xiii, § 11, 172.

²⁵ Ibid., II.xiii, § 12, 172.

²⁶ Ibid., II.xiii, § 13, 172.

²⁷ Ibid.

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(iii) 'The parts of pure *Space*, are immovable, which follows from their inseparability; *Motion* [in the relative sense] being nothing but change of distance between any two things: But this cannot be between Parts that are inseparable; which therefore must needs be at perpetual rest one among another.'²⁸

In other words, the pure *Space* in which the motions of material bodies take place is fixed as the parts constituting it are immovable and thus in absolute rest.

Locke did not use the terms 'absolute space' or 'absolute time'. However, he did call space, conceived 'vulgarly', as 'nothing else but such a relative Position of any thing'²⁹ and he distinguished between 'space' and 'pure space' and between 'time' and 'pure time'. Locke wrote that relative time is 'Duration, as set out by certain Periods, and marked by certain Measures or *Epochs*'.³⁰ In addition, he wrote:

For Duration and Space being in themselves uniform and boundless, the Order and Position of things, without such known settled Points, would be lost in them; and all things would lie jumbled in an incurable Confusion.³¹

Locke also noted that 'We must therefore carefully distinguish betwixt Duration itself, and the measures we make use of to judge of its length. Duration, in itself, is to be considered as going on in one constant, equal, uniform Course: but none of the measures of it which we make use of can be *known* to do so'.³² Locke thus claimed that relative measures of duration of space should be distinguished from pure duration and pure space, respectively.³³ Relative measures (e.g., days, years, inches, yards, .) are 'determinate distinguishable Portions of those infinite Abysses of

²⁸ Ibid., II.xiii, § 14, 173.

²⁹ Ibid., II.xiii, § 10, 171.

³⁰ Ibid., II.xiv, § 17, 187.

³¹ Ibid., II.xv, § 5, 199.

³² Ibid., II.xiv, § 21, 190.

³³ Locke was quite sceptical about the possibility of measuring absolute motion. Newton, by contrast, suggested that the case was not utterly hopeless: 'For example, if two balls, at a given distance from each other with a cord connecting them, were revolving about a common centre of gravity, the endeavor of the balls to recede from the axis of motion could be known from the tension of the cord and thus the quantity of circular motion could be computed. Then, if any equal forces were simultaneously impressed upon the

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Space and Durations'.³⁴ In defence of his thesis on absolute time, Locke argues that we can imagine duration where nothing endures or exists.³⁵ Duration or succession is a 'common measure of *all* Existence whatsoever, wherein all things whilst they exist, *equally partake*'.³⁶ On the assumption of only relative time, no objective framework of time could be given (cf. Newton's concerns with Descartes' views) or as Locke formulated it '[w]ithout some such fixed Parts or Period, the Order of things would be lost'.³⁷ It is important to stress that Locke's contemporaries were aware of the Newtonian strands in his thinking on space and time. Joseph Raphson in his *De spatio reali*, in which he defended the idea that infinite space exists independently from motion and attempted to render intelligible the infinity involved hereby mathematically, cited from Newton's scholium on space and time (see *infra*). Immediately after this very citation, Raphson observed that Locke had similar views on the matter.³⁸

alternate faces of the balls to increase or decrease their circular motion, the increase or decrease of the motion could be known from the increased or decreased tension of the cord ... In this way both the quantity and the direction of circular motion could be found in any immense vacuum, where nothing external and sensible existed with which the balls could be compared' (Isaac Newton, *The principia: mathematical principles of natural philosophy*, trans. I Bernard Cohen, Anne Whitman and Julia Budenz [1726, 3rd edn., Berkeley, 1999], 414).

³⁴ Locke, *Essay*, II.xiv, § 21, 190; cf. *ibid.*, II.xv, §§ 6-7, 199-200.

³⁵ *Ibid.*, II.iv § 3, 124. In earlier work (in his notes, dated 27 March 1676) he denied that such 'imaginary' time is 'any thing reall, or positive' (R I Aaron and Jocelyn Gibb, *An early draft of Locke's essay together with excerpts from his journals* (Oxford, 1936), 77. His doctrine of space grew out of his dissatisfaction with Cartesianism (*ibid.*, 100). His main contention at this stage was that space is not identical to extension, but he did not consider the possibility of absolute space.

³⁶ Locke, *Essay*, II.xv, § 11, 203 (emphasis added).

³⁷ *Ibid.*, II.xv, § 7, 200.

³⁸ Raphson noted: 'Ad eundem ferè modum Vir Cl. J. Lock in Tentamine suo de Intellectu Humani, Ling.Ang.edito. Postquam in *cap*.13. fusè de ejus realitate & distinctione à materiâ egit, in *cap*.15. de Duratione & Spatio, seu, ut loquitur, Expansione, *Sect*.5. hæc è multis aliis Lectori propinamus' (Joseph Raphson, *De spatio reali seu ente infinito conamen mathematico-metaphysicum* [London, 1697], 25). Cf. Samuel Colliber, *An impartial enquiry into the existence and nature of God, being a modest essay towards a more intelligible account of the divine perfections* (London, 1735 [1718]), 258.

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Let us consider the essentials of Newton's scholium on space and time. In the scholium following the definitions (which includes the definitions of mass, quantity of motion, inherent force, impressed force, and centripetal force), Newton discusses absolute space and time.³⁹ There he wrote as follows:⁴⁰

Thus far it has seemed best to explain the senses in which less familiar words are to be taken in this treatise. Although time, space, place and motion are very familiar to everyone, it must be noted that these quantities are popularly conceived solely with reference to the objects of sense perception. And this is the source of certain preconceptions; to eliminate them it is useful to distinguish these quantities into absolute and relative, true and apparent, mathematical and common.

1. *Absolute, true, and mathematical time*, in and of itself and of its own nature, without reference to anything external, *flows uniformly and by another name is called duration. Relative time, apparent, and common time is any sensible and external measure of duration by means of motion; such a measure—for example a month an hour a day—is commonly used instead of true time.*

2. Absolute space, of its own nature without reference to anything external, always remains *homogeneous and immovable* [cf. (ii) and (iii)]. *Relative space is any movable measure or dimension of this absolute space; such a measure or dimension is determined by our senses from the situation of space with respect to bodies* and is popularly used for immovable space, as in the case of space under the earth or in the air or in the heavens, where the dimension is determined from the situation of the space with respect to the earth. Absolute and relative space are the same in species and in

³⁹ Newton, *Principia*, 408-15.

⁴⁰ We shall not dwell further on the differences between this scholium, on the one hand, and 'De gravitatione', 'Tempus et locus', the *Opticks* and the Leibniz-Clarke correspondence, on the other hand. See James E McGuire, *Tradition and innovation: Newton's metaphysics of nature* (Dordrecht, 1995).

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magnitude, but they do not always remain the same numerically. For example, if the earth moves, the space of our air, which in a relative sense and with respect to the earth always remains the same, will now be one part of the absolute space into which the air passes, now another part of it, and thus will be changing continually in an absolute space.⁴¹

Newton stated that local motions are referred to the parts of space, which does not impede bodies – which agrees with (i).⁴² This scholium is present from the first edition of the *Principia* and is clearly metaphysical in nature (cf. the statements ‘in and of itself and of its own nature, without reference to anything external’, ‘Absolute space ... always remains homogeneous and immovable’ or the idea that, when considering true space and time, we should abstract from the objects of sense perception),⁴³ *pace* G A J Rogers who writes that ‘[t]he full metaphysical and theological implications of Newton’s views on space and time were only clearly brought out in the General Scholium of the second edition of 1713’.⁴⁴ Locke had perfect access to Newton’s doctrine of absolute space and time when he wrote his review for *Bibliothèque universelle et historique*. In ‘Tempus et locus’ Newton wrote the following on the epistemological status of (absolute) time and space: ‘Time and Place in themselves do not fall under the senses, but are measured by means of sensible things, such as magnitudes of bodies, their positions, local motions, and any changes uniformly made’.⁴⁵ In similar vein, Newton noted:

Relative quantities, therefore are not the actual quantities whose names they bear but are those sensible measures of them (whether true or erroneous) that are commonly used instead of the quantities being measured. But if the meaning of words are

⁴¹ Newton, *Principia*, 408-9 (emphasis added).

⁴² Newton, *Isaac Newton: philosophical writings*, ed. Andrew Janiak (Cambridge, 2004), 26.

⁴³ Cf.: ‘Thus instead of absolute places and motions we use relative ones, which is not inappropriate in ordinary human affairs, although in philosophy abstraction from the senses is required’ (Newton, *Principia*, 413-14).

⁴⁴ Rogers, ‘Locke’s *Essay* and Newton’s *Principia*’, 217-32, at 222. On the theology, I agree.

⁴⁵ James E McGuire, ‘Newton on Place, Time and God: an unpublished source’, *British Journal for the History of Science*, 38 (1978), 114-29.

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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 the quantities being measured are understood here.⁴⁶

In the scholium on space and time, Newton further wrote that:

Just as the order of parts of time is unchangeable, so, too, is the order of the parts of space. Let the parts of space move from their places, and they will move (so to speak) from themselves. For times and spaces are, as it were the places of themselves and of all things. All things are placed in time with reference to order of succession and in space with reference to order of position. *It is of the essence of spaces to be places, and for primary places to move is absurd [cf. (iii)].* They are therefore absolute places, and it is only changes in positions from these places that are absolute motions.⁴⁷

It is significant in itself that Locke treats of God immediately after the sections on space and time (both infinite in quantity). God fills eternity and space. Locke notes that 'God's infinite Duration, being accompanied with infinite Knowledge and infinite Power, he sees all things, past and to come'.⁴⁸ Locke noted:

But if these Men are of the Mind, That they have clearer *Ideas* of infinite Duration, than of infinite Space, because it is past doubt, that GOD has existed from all Eternity, but there is no real Matter co-extended with infinite Space: Yet those Philosophers who are of the Opinion, That Infinite Space is possessed by GOD's infinite Omnipresence, as well as with infinite Duration by his eternal Existence, must be allowed to have as clear an *Idea* of infinite Space, as of infinite Duration; though neither of them, I think, has any positive *Idea* of Infinity in either case.⁴⁹

⁴⁶ Newton, *Principia*, 414.

⁴⁷ *Ibid.*, 410 (emphasis added).

⁴⁸ Locke, *Essay*, II.xv, § 12, 204.

⁴⁹ *Ibid.*, II.xviii, § 20, 222.

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In the *Principia*, Newton also adhered to the view that God is omnipresent and eternally present:

He is eternal and infinite, omnipotent and omniscient, that is he endures from eternity to eternity, and he is present from infinity to infinity ... He is not eternity or infinity but eternal and infinite; he is not duration and space, but he endures and is present. He endures always and is present everywhere, and by existing always and everywhere he constitutes duration and space ... God is one and the same God always and everywhere. He is omnipresent not only virtually but also substantially; for action requires substance.⁵⁰

Motion cannot be attributed to Him, not because he is immaterial, but because he is an *infinite* spirit.⁵¹ In the General Scholium Newton later pointed out that 'God experiences nothing from the motions of bodies; the bodies feel no resistance from God's *omnipresence*'.⁵² Here Newton notes that God's being present at all times does not influence material bodies. In other words, God's being infinite in extension is not a (direct) cause of change in the physical world. That God is immaterial is irrelevant here: for Newton (and Locke) granted that immaterial active principles acted in *rerum natura*. In line with his empiricist epistemology,⁵³ Locke adds that God's essence is unknown:

For though his own Essence (which we certainly do not know, not knowing the real Essence of a Pebble, or a Fly, or of our own selves,) God be simple and uncompounded; yet I think I may say we have no other *Idea* of him, but a complex one of Existence, Knowledge, Power, Happiness, *etc.* infinite and eternal: which are all distinct *Ideas*, and some of them, being relative, are again compounded of other ... [T]here is no *Idea* we attribute to God, bating Infinity, which is not also a part of our complex *Idea* of other Spirits.⁵⁴

⁵⁰ Newton, *Principia*, 941.

⁵¹ Locke, *Essay*, II.xxiii, § 21, 307.

⁵² Newton, *Principia*, 941-2 (emphasis added).

⁵³ Paul Schuurman, 'Continuity and change in the empiricism of John Locke and Gerardus de Vries (1648-1705)', *History of European Ideas*, 33 (2007), 292-304.

⁵⁴ Locke, *Essay*, II.xxii, §§ 35-6, 315.

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Newton also rejected absolute characterisations of 'God'. We cannot, as Trinitarian orthodoxy would want it, define God's substance or essence,⁵⁵ as Descartes attempted, by using predicates such as 'eternal', 'infinite', 'omnipotent' or 'omniscient' to characterize His essence.⁵⁶ We can only know God's attributes, not His substance. This opinion resonates with Newton's views on the matter:

As a blind man has no idea of colors, so we have no idea of the ways in which the most wise God senses and understands all things. He totally lacks any body or corporeal shape, and so he cannot be seen or heard or touched, nor ought he to be worshiped in the form of something corporeal. We have ideas of his attributes, but we certainly do not know what is the substance of any thing. We see only the shapes and colors of bodies, we hear only their sounds, we touch only their external surfaces, we smell only their odors, and we taste their flavors. But there is no direct sense and there are no indirect reflected actions [intimas substantias nullo senso, nulla actione reflexa cognoscimus] by which we know innermost substances; much less do we have an idea of the substance of God. We know him only by his properties and attributes and by the wisest and best construction of things and their final causes, and we admire him because of his perfections; but we venerate and worship him because of his dominion.⁵⁷

⁵⁵ Newton, *Principia*, 942. Snobelen discusses several examples of compatible manuscript material and compares Newton's nescience about God's substance to Locke on substance, providing references to the *Essay* (see Stephen D Snobelen, "'God of Gods, and Lord of Lords": the Theology of Isaac Newton's General Scholium to the *Principia*', *Osiris* 16 [2001], 169-208, at 180-6). For Descartes' idea of God, see Jean-Marie Beyssade, 'The Idea of God and the Proofs of His Existence', in *The Cambridge companion to Descartes*, ed. John Cottingham (Cambridge, 1992), 174-99.

⁵⁶ On their anti-Trinitarianism, see Stephen D Snobelen, 'Isaac Newton, Socinianism and "the one supreme God"', in *Socinianism and cultural exchange: the European dimension of Antitrinitarian and Arminian Networks, 1650-1720*, ed. Martin Mulso and Jan Rohls (Leiden, 2005), 241-93. Besides heretical views which were illegal at the time Locke and Newton also exchanged alchemical recipes (see letters 389-91 in Newton, *Correspondence of Newton*, III, 215-19).

⁵⁷ Newton, *Principia*, 942.

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The most important overlapping themes are the following: Newton notes that we have no idea of the innermost substance of finite bodies; we only know the external surfaces of them and by extrapolation even less about the idea of an infinite God and that of God we only know his properties and attributes, but not his essence (an application of Locke's doctrine of essences to the nature of God). Whether it is appropriate to consider the theological view referred to as a case of influence (in either direction) is contingent on an exact dating of when Newton and Locke came to endorse it – two circumstances which I could not determine with certainty.

There is, however, material that testifies to Locke's influence on Newton. In manuscript material composed roughly around the same time (1713-1715) as the General Scholium,⁵⁸ Newton added several other points of criticism on Leibniz's Cartesianism (and Cartesian philosophy in general) in addition to those which are commonly documented.⁵⁹ Bear in mind that Newton's objections in this manuscript material against Leibniz and Cartesianism were not only physical or formulated from the point of view of 'experimental philosophy', as is clear from published material.⁶⁰ Firstly, Newton rejected Descartes's innatism. Newton stressed that all our knowledge, including ideas, derives from phenomena. In the following passage we see Newton adopting an empiricist approach on sensory perception:

What is taught in metaphysics, and if it is deduced from divine revelation, is religion;⁶¹ if it is deduced from phenomena by means of the five senses it pertains to physics; if it [is derived]

⁵⁸ CUL Ms. Add. 9597.2.11, ff. 2r, 3r.

⁵⁹ See Newton's *An account of the book entitled Commercium epistolicum* (1715) (reproduced in Janiak, *Isaac Newton: philosophical writings*, 123-7), his unpublished letter to the editor of *Mémoires de Trévoux* (May 1712) (reproduced in *ibid.*, 114-17; cf. Alan E Shapiro, 'Newton's "Experimental Philosophy"', *Early Science and Medicine*, 9 (2004), 168-217, 201 [for the reconciliation of this date and his interpretation]), his letter to Cotes on 28 March 1713 (reproduced in Janiak, *Isaac Newton: philosophical writings*, 118-22) and, of course, the General Scholium.

⁶⁰ The famous first line of the General Scholium is 'The hypothesis of vortices is beset with many problems' (Newton, *Principia*, 939).

⁶¹ In Keynes MS 6 (Seven statements on religion, post-1710), f. 1r, Newton stated that religion and philosophy are to be 'preserved distinct': 'We are not to introduce divine revelations into Philosophy, nor philosophical opinions into religion'.

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from the knowledge of the internal actions of our mind by the faculty of reflection, it is philosophy concerning only the human mind and its ideas (as if internal phenomena) likewise pertains to physics. To dispute about the objects of ideas, unless insofar as they are phenomena, is a dream. In all philosophy we have to start from the phenomena, and not admit any principles, causes or explanations of things, unless they are established by phenomena.⁶²

Here Newton argued that since ideas can be considered as internal phenomena⁶³ they are part of physics, that is, the study of phenomena. Note that Newton wrote 'there is no direct sense [which agrees with what Locke called 'extrinsical knowledge'] and there are no indirect reflected actions [which agrees with what Locke called 'intrinsical knowledge'] by which we know innermost substances'.⁶⁴ Newton owned thirteen⁶⁵ works by Locke in his private library (including the *Essay*⁶⁶ and *De intellectu humano*⁶⁷). We also know that Newton read parts of the *Essay*

⁶² Author's translation of: 'Quod in Metaphysica docetur & si a revelatione [missing word: 'divina'] deducitur religio esse, si a Phaenomenis per sensus quinque externos, ~~deducitur~~ a Physica pertinet, ~~si a revelatione divina, religio~~ <est>; si a cognitione actionum internarum mentis nostrae per sensum reflexionis, philosophia est de sola mente humana & ejus ideis <tanquam Phaenomenes internas> & ad Physicam <item> pertinet. De Idearum objectis disputare nisi quatenus sunt phaenomena ~~sonniamus~~ <sonnium est>. ~~Ideoq; a Phaenomenis in omni Philosophia incipiendum est.~~ In omni Philosophia incipere debemus a Phaenomenis, & nulla admittere <rerum> principia nullas causas nullas explicationes nisi quae per phaenomena stabiliuntur. Et quamvis tota philosophia non statim pateat, tamen satius est aliquid Indies addiscere quam hypotheseon praepudicijis mentes hominum praepoccupare' (CUL Ms. Add. 9597.2.11, f. 2r). In transcriptions from Newton's manuscripts, deletions are struck through and insertions placed within angle brackets.

⁶³ Newton interpreted the notion 'phenomena' broadly as to include not only what can be known by the five senses but also 'things internal which we contemplate in our minds by thinking' (McGuire, *Tradition and innovation*, 132. Cf. CUL Ms. Add. 3970, f. 621v, quoted from Shapiro, 'Newton's "Experimental Philosophy"', 198.

⁶⁴ Newton, *Principia*, 942.

⁶⁵ John Harrison, *The library of Isaac Newton* (Cambridge, 1978), 180-1 (items 966-78).

⁶⁶ He owned the 1690 edition of the *Essay* (London).

⁶⁷ He owned the fourth edition of this work (London).

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by May 1693.⁶⁸ In one manuscript, Newton synthesized his objections against Cartesian natural philosophy and metaphysics in a very strong way. Again Newton expressed his dissatisfaction with Leibniz' (and Descartes') doctrine of innate ideas:

the author [Leibniz] hopes that the philosophy of Newton ([which] is founded on mathematical demonstrations from phenomena) is rejected and all at last unite in a philosophy which they will found on adapted hypotheses [to arrive] at geometrical [and] healthy metaphysical notions.⁶⁹ [This] metaphysics is based on innate ideas; the philosophy of Newton on phenomena through mathematical demonstrations. Innate ideas are hypotheses and does our author wish to found natural philosophy on phenomena and demonstrations [drawn] from metaphysical hypotheses.⁷⁰

Here Newton's rejection of Cartesianism was based on an empiricist epistemological criterion. As proper natural philosophy is based on experience alone, no room is left for the hypothesis of innate ideas. Given Newton's phrasing of his criticism of the doctrine of innate ideas, it is highly likely that his terminology derives from Locke.

⁶⁸ See Newton's famous letter to Locke, where Newton apologizes for accusing Locke of embroiling Newton 'wth woemen' during his depressive breakdown. Newton notes: 'For I am now satisfied that what you have done is just and I beg your pardon for my having hard thoughts of you for it & for representing that you struck at y^e root of morality in a principle you laid down in your book of Ideas & designed to pursue in another book & that I took you for a Hobbist' (Newton, *Correspondence of Newton*, III, 280).

⁶⁹ It was precisely the lack of proper (mathematical) demonstrations that led to the downfall of proper natural philosophy, as Newton discusses in another place: 'Defectu demonstrationibus haec philosophia intermissa fuit eandemque non inveni sed vi demonstrationum in lucem tantum revocare conatus sunt' (CUL Ms. Add. 3965.9, f. 109r).

⁷⁰ Author's translation of: 'sperat Author ut Philosophia Newtoni in Phaenomenis per Demonstrationes Mathematicas fundata rejiciatur & omnes tandem convenient in Philosophia quam Geometrae in Hypothesibus ad notiones Metaphysicae sanae aptatis fundabunt. Metaphysica Idaeis innatis ~~In Hypothesibus Idearum~~ in Idaeis innatis, Philo<so>phia Newtoni in Phaenomenis <per mathematicis Demonstrationibus> fundatur. Idaeae innatae sunt hypotheses & vult author noster Philosophiam ~~naturalem~~ ~~in hypothesis metaphysicis~~ fundari. Et phaenomenis ac demonstrationibus per hypotheses metaphysicas fundari' (CUL Ms. Add. 9597.2.14, f. 4r).

*'Newtonian' elements in Locke, Hume, and Reid***David Hume**

Hume's acquaintance with Newton's natural philosophy is traditionally seen as a mystery wrapped in riddle: not only do we know little about Hume's scientific education,⁷¹ we are also puzzled by the fact that, when Hume refers to Newton, his statements do not engage in a discussion of the specifics and technicalities of the *Principia* or the *Opticks*.⁷² Although a copy of the second edition of the *Principia* was available to Hume at the Physiological Library at Edinburgh,⁷³ we currently have no evidence showing conclusively that Hume studied Newton's scientific works directly. We do know for sure that he had access to accounts of Newton's natural philosophy from secondary sources.⁷⁴ It should be noted from the outset that in Hume's *milieu* there was 'a selective pedagogical assimilation of Newton into an existing heterogeneous body of natural knowledge'.⁷⁵ Although Newton was certainly part of the tradition on which Hume drew, he was but a part of that tradition. Eric Schliesser correctly notes that there is a significant gap between Newton's complex physico-mathematical mode of experimenting and Hume's rather 'systematic observations'.⁷⁶ Nowhere did Hume explicitly refer to technical procedures of Newtonian knowledge production: he did not

⁷¹ Michael Barfoot, 'Hume and the Culture of Science in the Early Eighteenth Century', in *Studies in the Philosophy of the Scottish Enlightenment*, ed. M A Stewart (Oxford, 1990), 151-90 is still the most informative study on this matter. Barfoot provides a detailed account of the resources accessible to Hume whilst he was member of the University of Edinburgh's Physiological Library. See furthermore, M A Stewart, 'Hume's Intellectual Development, 1711-1752', in *Impressions of Hume*, ed. M Frasca-Spada and P J E Kail (Oxford, 2005), 11-58.

⁷² James E Force has compiled Hume's explicit references to Newton (James E Force, 'Hume's interest in Newton and Science', *Hume Studies*, 13 (1987), 166-216.

⁷³ Barfoot, 'Hume and the Culture of Science in the Early Eighteenth Century', 158.

⁷⁴ For instance, Hume was exposed to George Campbell's presentation of Newton's method of ultimate ratios (*ibid.*, 190, note 76; Stewart, 'Hume's Intellectual Development', 21). Even if Hume studied Section 1 of Book I of the *Principia*, this tells us nothing about his command of the *Principia in toto*. Cf. Eric Schliesser, 'Hume's Newtonianism and Anti-Newtonianism', *The Stanford encyclopedia of philosophy*, ed. Edward N. Zalta, 2007, URL: <<http://plato.stanford.edu/entries/hume-newton>>, section 2 (accessed 3 February 2009).

⁷⁵ Barfoot, 'Hume and the Culture of Science in the Early Eighteenth Century', 153.

⁷⁶ Schliesser, 'Hume's Newtonianism and Anti-Newtonianism', section 4.1.

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mention Newton's deductions from phenomena, he did not contrast Newton's more demanding way of arguing in natural philosophy with hypothetico-deductive methodology, nor did he discuss Newton's complex methodology of inferring centripetal forces from *quam proxime* observations or the significance of the definitions and laws of motion. Although some scholars claim that Hume's philosophy was inspired by Newton,⁷⁷ few have scrutinized the details and clarified to what extent Hume's views derived from Newton's.⁷⁸ Robert H Hurlbutt has claimed that Hume was a better Newtonian than Newton himself: 'he applied Newtonian principles, consistently, where Newton did not'.⁷⁹ Galen Strawson claims that Hume derived the philosophical lessons on causation from Newton: '[f]ollowing Newton, he repeatedly insists on the epistemological claim that we know nothing of the ultimate nature of Causation'.⁸⁰

In his *Treatise of human nature* (1739-1740; it is relevant to note its subtitle: *Being an attempt to introduce the experimental method of reasoning into moral subjects*),⁸¹ David Hume stressed that proper metaphysics should be based on experimental knowledge. He jeered at those who sought to pursue metaphysical doctrines disconnected from specific branches of science:

By metaphysical reasonings, they do not understand those on any particular branch of science, but every kind of argument,

⁷⁷ E.g., Alexander Rosenberg, 'Hume and the Philosophy of Science', in *The Cambridge companion to Hume*, ed. David Fate Norton (Cambridge, 1993), 64-89, 64; Terence Penelhum, 'Hume's Moral Psychology', in *ibid.*, 117-47, 120-1, 140-1; Paul Stanistreet, *Hume's scepticism and the science of human nature* (Aldershot, 2002), 16-17, 20-1.

⁷⁸ Schliesser's 'Hume's Newtonianism and Anti-Newtonianism' is a notable exception.

⁷⁹ Robert H Hurlbutt III, *Hume, Newton, and the design argument* (Lincoln, 1965), 144.

⁸⁰ Galen Strawson, 'David Hume and Power', in *The new Hume debate*, ed. Rupert Read and Kenneth A Richman (second and revised edition, London, 2007), 31-51, 45. Cf. Simon Blackburn, 'Hume and Thick Connexions', in *ibid.*, 100-12, 105.

⁸¹ In part 2 of the second book, Hume listed several 'experiments' which proved that the passions of love and hatred are produced by ideas to the object of passion and the sensation of passion itself (David Hume, *A treatise of human nature*, ed. David Fate Norton and Mary J Norton (Oxford, 2000), 2.2.2, ¶¶ 5-28, 216-25). Henceforth, I shall refer to this edition and provide the section and paragraph to which a piece of text pertains and add the page number in the Norton and Norton edition at the end.

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which is any way abstruse, and requires some attention to be comprehended.⁸²

Hume noted that all sciences are dependent on human nature. Mathematics, natural philosophy, natural religion and the other sciences are founded on 'the science of man' 'since they lie under the cognizance of men, and are judg'd by their powers and faculties'.⁸³ A fundamental epistemological issue for Hume to resolve was then to elaborate on 'the science of man' so as to highlight 'the cognizance of men' and their 'powers and faculties'.⁸⁴ The 'science of man' was thus the foundation of the sciences, according to Hume:

And as the science of man is the only solid foundation for the other sciences, so the only solid foundation we can give to this science itself must be laid on experience and observation. 'Tis no astonishing reflection to consider, that the application of natural philosophy to moral subjects shou'd come after that to natural at the distance of above a whole century; since we find in fact, that there was about the same interval betwixt the origins of these sciences; and that reckoning from THALES to SOCRATES, the space of time is nearly equal to that betwixt LORD BACON and some late philosophers in *England*, who have begun to put the science of man on a new footing, and have engag'd the attention, and excited the curiosity of the public.⁸⁵

Schliesser notes that the sub-title of the *Treatise* shows Hume's 'self-conscious debt to Newton'.⁸⁶ Philosophical method and experimental method, which consisted in 'deducing general maxims from a comparison of particular instances',⁸⁷ were one and the same thing for Hume. However, Hume's reference to experimental method hardly constitutes

⁸² Hume, *A treatise of human nature*, Introduction, ¶ 3, 3.

⁸³ *Ibid.*, ¶ 4, 4.

⁸⁴ Thus Hume claimed: 'Be a philosopher; but amidst all your philosophy, be still a man' (David Hume, *Enquiries concerning human understanding and concerning the principles of morals*, ed. L A Selby-Bigge, with text revised and notes by R H Nidditch [Oxford, 1975], 1, ¶ 4, 9).

⁸⁵ Hume, *A treatise of human nature*, Introduction, ¶ 7, 4-5.

⁸⁶ 'Schliesser, 'Hume's Newtonianism and Anti-Newtonianism'', section 4.1.

⁸⁷ Hume, *Enquiries concerning human understanding*, 1, ¶ 138, 174.

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evidence that the *Treatise* is in some sense ‘Newtonian’. There is nothing specifically ‘Newtonian’ about his adoption of the experimental method. Rather, it signals that Hume aligned himself to a method of philosophizing that goes back to Bacon and Boyle⁸⁸ and that was taken up by Locke, Shaftesbury, Mandeville, Hutcheson and Butler. Moreover, the attention Hume draws to the ‘science of man’ can be seen as an implicit criticism of Newton’s natural philosophy because of its lack of utility and relevance for morality.⁸⁹ Science, Hume noted, should have direct reference to ‘action and society’.⁹⁰ Hume’s ‘science of man’ proposed ‘a compleat [*sic*] system of the sciences, built on a foundation almost entirely new, and the only one upon which they can stand with any security’.⁹¹ Schliesser furthermore suggests that there is ‘strong resemblance’ between Hume’s rules of reasoning⁹² and Newton’s rules of philosophizing.⁹³ Hume frequently referred to what might appear to be Newton’s rules of philosophizing. In line with Newton’s first and second *regulae philosophandi*,⁹⁴ Hume noted that ‘[t]he same cause always produces the same effect, and the same effect never arises but from experience’.⁹⁵ This principle is the source of most of our philosophical reasoning, ‘[f]or when by any clear experiment we have discover’d the causes or effects of any phænomenon, we immediately extend our observation to every phænomenon of the same kind’.⁹⁶ He also noted that ‘[t]o multiply causes, without necessity is indeed contrary to true philosophy’.⁹⁷ Hume’s statements might be seen as references to Newton’s rules of philosophizing. However, it should be noted that the

⁸⁸ Barfoot emphasizes Hume’s familiarity with Boyle and his rôle in the experimental hydrostatics tradition (Barfoot, ‘Hume and the Culture of Science in the Early Eighteenth Century’, 165, 167).

⁸⁹ Schliesser, ‘Hume’s Newtonianism and Anti-Newtonianism’, section 1.

⁹⁰ Hume, *Enquiries concerning human understanding*, 1, ¶ 4, 9.

⁹¹ Hume, *A treatise of human nature*, Introduction, ¶ 6, 4.

⁹² *Ibid.*, 1.3.15, ¶ 1-12, 116-18.

⁹³ Schliesser, ‘Hume’s Newtonianism and Anti-Newtonianism’, section 4.5.

⁹⁴ Force has raised the importance of these *regulae* for Hume’s criticism of the design argument (Force, ‘Hume’s interest in Newton and Science’, 178-87).

⁹⁵ Hume, *A treatise of human nature*, 1.1.4, ¶ 4, 13.

⁹⁶ *Ibid.*, 1.3.15, ¶ 6, 116-17. Cf. Hume, *Dialogues*, 58, 101, 114, 234-5.

⁹⁷ Hume, *Dialogues*, 108.

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rules of philosophizing were standard maxims in eighteenth-century natural philosophy.⁹⁸ Hume never contextualised the meaning of Newton's *regulae philosophandi* on the basis of a careful reading of the original text. As we shall see in the following section, Reid carefully did so. In commenting on gravity as a cause he noted:

We may establish it as a certain maxim, that in all moral as well as natural phænomena, wherever any cause consists of a number of parts, and the effect encreases [*sic*] or diminishes, according to the variation of that number, the effect, properly speaking, is a compounded one, and arises from the union of the several effects, that proceed from each part of the cause.⁹⁹

Note that, although there is some superficial resemblance between the latter quotation and Newton's third *regula philosophandi*, Hume was addressing compound causes to which Newton did not refer in his third rule.¹⁰⁰

According to Hume, all perceptions subsume under two categories: *impressions* (*i.e.*, all sensations, passions, and emotions, as they first enter the mind) and *ideas or thoughts* (the faint images of impressions occurring during thinking and reasoning) – in doing so, he explicitly distanced himself from the Lockean account of ideas, in which ideas stood

⁹⁸ Barfoot, 'Hume and the Culture of Science in the Early Eighteenth Century', 161. The same can be said for the rules Edmund Burke enounced in his *A philosophical enquiry into the origin of our ideas of the sublime and beautiful*. Although, Burke echoed Newton's first rule when he stated that, 'To multiply principles for every different appearance, is useless, and unphilosophical too in a high degree' (Edmund Burke, *A philosophical enquiry into the origin of our ideas of the sublime and beautiful with an introductory discourse on taste, and several other additions*, in: *The collected works of Edmund Burke* (12 vols., London, 1886 [1757]), II, 62-250, 88), his own rules of use in his *A philosophical enquiry into the origin of our ideas of the sublime and beautiful* were not exactly Newton's original *regulae philosophandi* (cf. '1. If two bodies produce the same or a similar effect on the mind, and on examination they are found to agree in some of their properties, and to differ in others; the common effect is to be attributed to the properties in which they agree, and in those in which they differ. 2. Not to account for the effect of a natural object from the effect of an artificial object. 3. Not to account for the effect of any natural object from a conclusion of our reason concerning its uses, if a natural cause might be assigned' (*ibid.*, 158-9).

⁹⁹ Hume, *A treatise of human nature*, 1.3.12, ¶ 16, 93.

¹⁰⁰ Newton, *Principia*, 796.

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for all our perceptions.¹⁰¹ Hume's epistemology is neatly summarized in his famous anti-innatist credo: *simple ideas are always preceded by their corresponding simple impressions*.¹⁰² As a possible exception to his credo, Hume provided the famous 'missing shade of blue' thought experiment: he pondered on whether an individual with full capacities of colour perception, except one shade of blue, would be able to form the idea of this missing shade of blue with his own imagination.¹⁰³ According to Hume, essences and substances are fictional entities for they are 'collection[s] of simple ideas, that are united by the imagination and have a particular name assign'd to them, by which we are able to recall, either to ourselves or other, that collection'.¹⁰⁴ These simple ideas are attributed to an 'unknown *something*, in which they are suppos'd to inhere'.¹⁰⁵ We can have no ideas of the essence of substances whatsoever.¹⁰⁶ The same applies to the concepts of 'Power' and 'Force'.¹⁰⁷ On bodies, Hume noted:

For to me it seems evident that the essence of the mind being equally unknown¹⁰⁸ to us with that of external bodies, it must be equally impossible to form any notion of its powers and qualities otherwise than from careful and exact experiments, and the observation of those particular effects, which result from its different circumstances and situations. And tho' we must endeavour to render all our principles as universal as possible, *by tracing up our experiments to the utmost, and explaining all effects from the simplest¹⁰⁹ and fewest causes, 'tis still certain we cannot go beyond experience; and any hypothesis, that pretends to discover the ultimate original*

¹⁰¹ Hume, *A treatise of human nature*, 1.1.1, ¶ 1, 7.

¹⁰² *Ibid.*, 1.1.1, ¶ 8, 9.

¹⁰³ *Ibid.*, 1.1.1, ¶ 10, 10.

¹⁰⁴ *Ibid.*, 1.1.6, ¶ 2, 16.

¹⁰⁵ *Ibid.*

¹⁰⁶ *Ibid.*, Appendix, ¶ 11, 399.

¹⁰⁷ Cf. Philo's statement: 'These words, *generation, reason*, mark only certain powers and energies in nature, whose effects are known, but whose essence is incomprehensible' (David Hume, *Dialogues concerning natural religion* (3rd edn., London, 1779), 135.

¹⁰⁸ Cf. Hume, *A treatise of human nature*, 1.1.2, ¶ 1, 11, cf. 1.1.5, ¶ 6, 14.

¹⁰⁹ Cf. Hume, *Dialogues*, 228-9.

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*qualities [or ultimate principles] of human nature, ought at first to be rejected as presumptuous and chimerical.*¹¹⁰

Again this assertion is rather general which makes it difficult to ascertain a specific Newtonian component in it. Since the advent of the experimental method, Hume noted, men were 'cured of their passion for hypotheses and systems in natural philosophy, and will hearken to no arguments but those deriv'd from experience'.¹¹¹ He stressed that the basic constituents of nature are unknowable:

The real nature of this position of bodies is unknown. We are only acquainted with its effects on the senses, and its power of receiving body. Nothing is more suitable to that philosophy, than a modest scepticism to a certain degree, and a fair confession of ignorance in subjects, that exceed all human capacity.¹¹²

Similarly, he wrote that 'the observation of human ignorance and weakness is the result of all philosophy, and meets us, at every turn, in spite of our endeavours to conquer, or avoid it'.¹¹³ Hume took Newton's desire to remain silent on the cause of gravity as being consistent with his own scepticism about the essences of things. Likewise, in his *History of England* he noted explicitly that '[w]hile Newton seemed to throw off the veil from some of the mysteries of nature, he shewed at the same time the imperfections of the mechanical philosophy; and thereby restored her ultimate secrets to that obscurity in which they ever did and ever will remain'.¹¹⁴ On the progress in astronomy he noted:

Astronomers had long contented themselves with proving, from the Phænomena, the true Motions, Order, and Magnitude of the heavenly Bodies: Till a Philosopher, at last, arose, who seems, from the happiest Reasoning, to have also determin'd the Laws

¹¹⁰ Hume, *A treatise of human nature*, Introduction, ¶ 8, 5 (emphasis added), cf. *ibid.*, 1.1.5, ¶ 6, 14. Cf. Stanistreet, *Hume's scepticism and the science of human nature*, 26-40.

¹¹¹ Hume, *Enquiries concerning human understanding*, 1, ¶ 138, 174-5.

¹¹² Hume, *A treatise of human nature*, 1.2.5, ¶ 2, 47, note 12.

¹¹³ Hume, *Enquiries concerning human understanding*, IV, ¶ 26, 31.

¹¹⁴ David Hume, *The history of England, from the invasion of Julius Caesar to the Revolution in 1688* (8 vols., London, 1756), VIII, 332-4.

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[which are only known from experience] and Forces, by which their Revolutions are govern'd and directed.¹¹⁵

Likewise, he commented:

'Tis confess'd, that the utmost Effort of human Reason is, to reduce the Principles, productive of natural Phænomena, to a greater Simplicity, and to resolve the many particular Effects into a few general Causes, by Means of Reasonings from Analogy, Experience, and Observation. But as to the Causes of these general Causes, we should in vain attempt their Discovery; nor shall we ever be able to satisfy ourselves, by any particular Explication of them. These ultimate Springs and Principles are totally shut from human Curiosity and Enquiry. *Elasticity, Gravity, Cohesion of Parts, Communication of Motion by Impulse; these are probably the ultimate Causes and Principles we shall ever discover in Nature;* and we may esteem ourselves sufficiently happy, if, by accurate Enquiry and Reasoning, we can trace up the particular Phenomena to, or near to, these general Principles. The most perfect Philosophy of the natural Kind only staves off our Ignorance a little longer: As perhaps the most perfect Philosophy of the moral or metaphysical Kind serves only to discover larger Portions of our Ignorance.¹¹⁶

A compatible statement is found in the *Dialogues concerning natural religion*: 'nor is it ever within the reach of human capacity to explain ultimate causes, or show the last connections of any objects. It is sufficient, if the steps, so far as we go, are supported by experience and observation'.¹¹⁷ Note that Newton did not in principle object to establishing the essential qualities of things. In manuscript material Newton recorded: 'Hypoth 5. The essential properties of bodies are not yet fully known to us. Explain this by y^e cause of gravity, & by y^e √ metaphysical √ power of bodies to cause sensation, imagination & memory & mutually to be moved by o^e thoughts'.¹¹⁸

¹¹⁵ Hume, *Enquiries concerning human understanding*, 1, ¶ 9, 14.

¹¹⁶ *Ibid.*, 4.1, ¶ 26, 30.

¹¹⁷ Hume, *Dialogues*, 139.

¹¹⁸ CUL Ms. Add. 3970, f. 338v.

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In general, Hume's interpretive comments on Newton's natural philosophy often diverged radically from Newton's original statements and Hume ascribed views to Newton that were not his own. For instance, in his philosophical reinterpretation of a vacuum, Hume noted that Newtonian philosophy properly understood asserts the following: '[a] vacuum¹¹⁹ is asserted: That is, bodies are said to be plac'd after such a manner, *as to receive bodies betwixt them*, without impulsion or penetration'.¹²⁰ Although for Hume matter and extension were the same, he maintained the possibility of speaking of a void. At the end of his discussion of the ideas of space and time, he clarified this statement:

I shall conclude this subject of extension with a paradox, which will easily be explain'd from the following reasoning. This paradox is, that if you are pleas'd to give to the invisible and intangible distance, or in other words, to the capacity of becoming a visible and tangible distance, the name of vacuum, extension and matter are the same, and yet there is a vacuum. If you do not give it that name, motion is possible in a plenum, without any impulse in infinitum, without returning to a circle, and without penetration. But however we may express ourselves, we must always confess, that we may have no idea of any real extension without filling it with sensible objects, and conceiving its parts as visible or tangible.¹²¹

Instead of seeing the solar system filled with *vortices*, Newton saw it as a Boylean vacuum in which the celestial bodies could move freely.¹²² During his preparations for the third edition of the *Principia*, Newton considered introducing an explicit definition of a vacuum: 'Vacuum voco locum omnem in quo corpore sine resistentia move<n>tur'.¹²³

Also, Hume's account of causation was at odds with universal gravitation. Hume conceived objects as causes when the cause and effect

¹¹⁹ For excellent contextualisation of Hume's views on matter and void, see Barfoot, 'Hume and the Culture of Science in the Early Eighteenth Century', 172-81.

¹²⁰ Hume, *A treatise of human nature*, 1.2.5, ¶ 27, 47.

¹²¹ *Ibid.*, 1.2.5, ¶ 2, 47, note 12.

¹²² Newton, *Principia*, 937; cf. CUL Ms. Add. 4003, f. 30r.

¹²³ 'I call vacuum all place in which body is moved without resistance' (CUL Ms. Add. 3965, f. 422r).

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are contiguous in space and time, when the cause is prior to its effects, and when there is constant conjunction between cause and effect (the latter being a consequence of the uniformity of nature¹²⁴).¹²⁵ Hume then could not account for simultaneous causation (e.g., in the case of gravity) as he stressed temporal priority of causes over their effects. The requirement of spatiotemporal contiguity is puzzling since it implies that non-mechanical causes, such as gravity, are left out of Humean causation. Hume noted that distant bodies are ‘link’d by a chain of causes, *which are contiguous among themselves*, and to *distant objects*; and when in any particular instance we cannot discover this connexion, we still presume it to exist’.¹²⁶ By contrast, when Hume commented on Newton’s views of the cause of gravitation, he wrote:

It was never the Meaning of Sir *Isaac Newton* to rob Matter of all Force or Energy; tho’ some Philosophers have endeavour’d to establish that Theory upon his Authority. On the contrary that great Philosopher had recourse to an ethereal active Matter to explain his universal Attraction; tho’ he was so cautious and modest as to allow, that it was a mere Hypothesis, not to be insisted on, without more Experiments.¹²⁷

It should be noted that Hume’s quote derives from A M Ramsay.¹²⁸ Since Ramsay’s text offers significant insight into Hume’s statement on the matter, we shall quote from it:

Some disciples of the great Newton, such as Doctor Clarke, Baxter, Cheyne, and many others both French and English, contrary it seems to the last judgement of their master, have adopted the doctrine of the absolute inactivity of matter, and pretend that the great law of attraction is an immediate effect of the divine action, which pushes all bodies to one another in a certain proportion to their masses and distances without an

¹²⁴ Hume, *A treatise of human nature*, 1.3.6, ¶ 4, 62.

¹²⁵ *Ibid.*, 1.3.15, ¶¶ 2-5, 116.

¹²⁶ *Ibid.*, 1.3.2, ¶ 6, 54 (emphasis added).

¹²⁷ Hume, *Enquiries concerning human understanding*, 7.1, ¶ 57, 73, note 1; cf. Hume, *Dialogues*, 147.

¹²⁸ Barfoot, ‘Hume and the Culture of Science in the Early Eighteenth Century’, 161, note 28.

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interveneing [*sic*], physical, or mechanical medium. It is not our business to show here that the great Sir Isaac does not establish this doctrine, nor despoils all material agents of active force; this idea is entirely subversive to all natural philosophy.¹²⁹

In 1745 Hume noted that Newton rejected occasionalism in his mechanics, which he substituted by 'an Aethereal Fluid, not the immediate Volition of the Deity, as the Cause of Attraction'.¹³⁰ Hume was criticised by John Stewart for claiming that the ether Newton pondered on is material and that matter is active by itself.¹³¹

In manuscript material related to the composition of the *Queries* in the *Opticks*, Newton pondered:

What is it by means of w^{ch} bodies act on one another at a distance. And To what Agent did the Ancients attribute the gravity of their atoms. Or what did they mean ... by calling God an harmony & comparing him & matter ... to y^e God Pan & his Pipe. Can any space be wthout something <in it> & what is that something in space void of matter [& what are its properties & operations ~~on matter~~]¹³²

Newton rejected action at a distance at *gravitational level*, that is, the view that material bodies directly and gravitationally act on each other *in vacuo* without the mediation of a *tertium quid*. This is precisely the point Newton made in a letter to Richard Bentley (on 25 February 1692/3):

It is inconceivable, that inanimate brute Matter, should, *without the Mediation of something not material*,¹³³ operate upon, and

¹²⁹ Andrew Michael Ramsay, *The philosophical principles of natural and revealed religion* (2 vols., Glasgow, 1748-1749), I, 269.

¹³⁰ Hume *A Letter from a gentleman to his friend in Edinburgh*, ed. Ernest C Mossner and John V Price (Edinburgh, 1967 [1745]), 29.

¹³¹ John P Wright, 'Hume's Causal Realism: Recovering a Traditional Interpretation', in *The new Hume debate*, 88-100, at 96. Cf. David Hume, *An enquiry concerning human understanding: a critical edition*, ed. Tom L Beauchamp (Oxford, 2000), lxxviii-lxxix.

¹³² CUL Ms. Add. 3970, f. 291r (emphasis added).

¹³³ Cf. CUL Ms. Add. 3965, f. 269r, where Newton wrote: 'Nam Planetæ ... non ... <petent se mutuo> vi <aliqua> gravitates neque ullo modo agent in se invicem nisi mediante principio aliquo activo quod utrumque intercedat, et per quod vis ab utroque in alterum propagetur'.

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affect other matter without mutual Contact, as it must be, if Gravitation in the Sense of *Epicurus*, be essential and inherent in it. And this is the Reason why I desired you not to ascribe innate Gravity to me. That Gravity should be innate, inherent and essential to Matter, so that one body may act upon another at a distance thro' a Vacuum, without the Mediation of any thing else, by and through which their Action and Force may be conveyed from one to another, is to me such an Absurdity, that I believe no Man who has in philosophical Matters a competent Faculty of thinking can ever fall into it.¹³⁴

With 'Mediation', Newton was referring to God's interaction. Otherwise Newton's clarification, which immediately follows, that 'whether this Agent be material or immaterial, I have left to the Consideration of my Readers'¹³⁵ would be blatantly inconsistent.¹³⁶ Note that Newton is rejecting Epicurean atomism, which states that brute matter can without the mediation of a *tertium quid* affect one another.¹³⁷ On the Epicurean account, gravity is an essential and inherent property of particles. In another letter to Richard Bentley, Newton stated clearly:

You sometimes speak of Gravity as essential and inherent to Matter. Pray do not ascribe that Notion to me; for the Cause of Gravity is what I pretend not to know, and therefore would take more Time to consider of it.¹³⁸

Such an Epicurean view would be untenable for Newton to accept since it would imply that matter itself was self-propelling or self-activating. On

¹³⁴ Newton, *Opticks*, pp. 302-3 (emphasis added).

¹³⁵ Newton, *Isaac Newton's papers and letters on natural philosophy and related documents*, ed. I Bernard Cohen (Cambridge, Mass., 1978), 303.

¹³⁶ John Henry, 'Isaac Newton y el Problema de la Acción a Distancia', *Estudios de filosofía*, 35 (2007), 189-226, 215.

¹³⁷ John Henry is surely to be given the credit for emphasizing the Epicurean position against which Newton is reacting. See John Henry, "'Pray do not Ascribe that Notion to Me": God and Newton's Gravity', in James E Force and Richard H 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, 1994), 123-47, and more recently: Henry, 'Isaac Newton y el Problema de la Acción a Distancia'.

¹³⁸ Newton, *Isaac Newton's papers and letters on natural philosophy*, 298.

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the contrary, Newton emphasized that matter itself is utterly passive and that it requires the activity of certain non-mechanical 'Active Principles'. Bodies are passive and are moved by active principles, that is, immaterial agents: '[f]or we meet very little Motion in the World, besides what is owing to these active Principles'.¹³⁹ He stated this explicitly: 'all these regular motions [*i.e.*, celestial motions] do not have their origin in mechanical causes, since comets go freely in very eccentric orbits and into all parts of the heavens'.¹⁴⁰ However, Newton endorsed the view that non-material agents mediated the gravitational attraction of material bodies *in vacuo*.¹⁴¹ John Henry adequately notes that the ethers Newton introduced to account to explain gravitation were not mechanical since they 'consisted of particles held apart from one another, and from particles to other matter, by repulsive forces operating between them'¹⁴² and that 'the aether theories were not intended to be a way of avoiding actions at a distance'.¹⁴³ These points are well taken.¹⁴⁴ The subtle answer to the conundrum of action at a distance is then the following: Newton denied that matter could act at a distance according to its own nature (because this would imply that matter would be innately self-acting, an

¹³⁹ Newton, *Opticks*, 399.

¹⁴⁰ Newton, *Principia*, 940.

¹⁴¹ As he did in Newton, *Opticks*, 339, 370-1; for corresponding manuscript material, see CUL Ms. Add. 3970, ff. 252r-254r, 257r, 273r, 291r.

¹⁴² Henry, 'God and Newton's Gravity', 123. Newton's account of gravitation as being produced by 'the elastick force' of mutually repellent small particles occurs in Query 21 (Newton, *Opticks*, 350-2).

¹⁴³ Henry, 'God and Newton's Gravity', 135. This observation is correct, for if Newton thought otherwise we would be led to accept the conclusion that Newton tried to explain action at a distance at a macro-level by reintroducing it at a micro-level.

¹⁴⁴ In his 'Newton and the Reality of Force', where it is claimed that Newton rejected action at a distance, Janiak did not refer to Henry's work (also see Andrew Janiak, *Newton as philosopher* [Cambridge, 2008], 54, 172). He does so in *Newton as philosopher*, 53, note 53. There Henry's views are quickly dismissed on the basis of an excerpt wherein Henry (incorrectly) wrote that gravity is 'a superadded *inherent* property' (Henry, 'God and Newton's Gravity', 141). In any case, Henry's slip should not detract us from the important point he made: that the ether theories did not originate in Newton's dissatisfaction with action at a distance *per se*, and that Newton accepted action at a distance in his optical work and in his work on the cause of gravity. In his subsequent discussion (*Newton as philosopher*, 53-65), Janiak does not consider these two vital points.

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option unacceptable for Newton); however, Newton endorsed action at a distance for the secondary mechanism producing gravity, because he postulated the ‘elastick ether’ consisted of repellent particles acting *at a distance*. In a nutshell: Newton rejected action at a distance at a macro-level but accepted it at a micro-level. Thus Newton had no *a priori* objections against *actio in distans*.¹⁴⁵

Prima facie, Hume’s scepticism might be considered as being incompatible with Newton’s causal view of science. However, as John Biro has noted: ‘his scepticism is better understood as one about pretended supra-scientific metaphysical knowledge, rather than about scientific knowledge itself’.¹⁴⁶ Graciela de Pierris’ study nicely fits with this interpretation, for she claims that ‘the judicious use of causal inferences in everyday life and science can be, and in fact is, insulated from the radical skeptical results’.¹⁴⁷ Hume rejected only ‘*abstruse metaphysics*’ which did not take into account the results of science. He noted that ‘nothing but the most determin’d scepticism, along with a degree of indolence, can justify this aversion of metaphysics’.¹⁴⁸ Moreover, some recent Hume scholars have come to view Hume as a ‘sceptical realist’: he was a ‘realist about an entity’s existence, but agnostic about the nature or character of that thing because it is epistemically inaccessible to us’.¹⁴⁹ Hume is sceptical about the nature of the ‘secret connexion’ between cause and effect not about the fact that the secret connexion exists and acts as a cause. Although this realist evaluation of Hume is not uncontroversial, it seems compatible with several of Hume’s statements. For instance, Hume noted that ‘[t]he *existence* ... of any being can only be proved by arguments from its cause or its effect; and these arguments are founded entirely on experience’ and that ‘[i]t is only experience, which teaches us the nature and bounds of

¹⁴⁵ Cf. Ernan V McMullin, *Newton on matter and activity* (Notre Dame, 1978), 144, note 13 and 151, note 210.

¹⁴⁶ John Biro, ‘Hume’s New Science of the Mind’, in *The Cambridge companion to Hume*, 33-63, at 38.

¹⁴⁷ Graciela de Pierris, ‘Hume’s Pyrrhonian Skepticism and the Belief in Causal Laws’, *Journal of the History of Philosophy*, 39 (2001), 351-83, at 354, cf. 368, 373, 382.

¹⁴⁸ Hume, *A treatise of human nature*, Introduction, ¶ 3, 3.

¹⁴⁹ Kenneth A Richman, ‘Debating the New Hume’, in *The new Hume debate*, 1-15, at 1.

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cause and effect, and *enables us to infer the existence of one object from that of another*'.¹⁵⁰ He noted that 'we van give no reason for our most general and most refin'd principles, beside *our experience of their reality*'.¹⁵¹ In the *Treatise*, he formulated 'some general rules' for ascertaining whether two objects stand in a causal relationship.¹⁵² When commenting on the relation of causation, he noted: '[t]wo objects may be consider'd as plac'd in this relation, as well when one is *the cause of any of the actions of motion of the other, as when the former is the cause of the existence of the latter*'.¹⁵³ Note that I do not commit myself to the view that Hume was a sceptical realist. My point is rather that, if this interpretation in future Hume scholarship proves to be adequate, Hume's causal stance on science would be compatible with Newton's. If it turns out to be untenable, then Hume and Newton differed once more.

Was Hume then a Newtonian philosopher? It is undeniable that Hume, who sought to provide the foundation of a 'science of man' for all the sciences, was familiar with Newton's scientific works as treated in secondary sources. There currently is no evidence suggesting that Hume had mastered the *Principia* or the *Opticks* directly. Although Hume made statements resembling Newton's ideas, closer scrutiny of his statements does not show any substantial correspondence with specific or possibly technical elements directly derived from Newton's texts; it is notable in itself that Hume rarely quotes from Newton. Moreover, Hume's philosophical claims were not, in a significant way, based on the specific methods Newton had developed for knowledge production. Nowhere did Hume engage with Newton's original texts. Although Newtonian science (as a part of science) was relevant for Hume's belief that a 'science of man' should provide the foundation for human knowledge, his philosophical doctrines were not significantly derived from Newton's methods or theories.

¹⁵⁰ Hume, *Enquiries concerning human understanding*, 2.7.3, ¶ 132, 164 (emphasis added). Cf. *ibid.*, 1.3.6, ¶ 7, 63.

¹⁵¹ Hume, *A Treatise of human nature*, Introduction, 5 (emphasis added).

¹⁵² *Ibid.*, 1.3.15, ¶ 2, 116.

¹⁵³ *Ibid.*, 1.1.4, ¶ 4, 13 (emphasis added), cf. *ibid.*, 1.3.12, ¶ 16, 93.

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Thomas Reid¹⁵⁴

Reid studied Newton's *Principia* in detail¹⁵⁵ and was immersed in different foundational issues in mathematics such as the grounding of Newton's method of fluxions and Euclidean geometry.¹⁵⁶ Reid's uncle was the famous David Gregory who knew Newton personally. Reid recognized the importance of Newton's natural philosophy and its importance for philosophical inquiry – he started his career as a lecturer of Newton's *Principia*. However, much detail is lacking on how Reid interpreted and adapted Newton's natural philosophy (primarily embodied in the *Opticks* (1704) and the *Principia* (1687)) to his own philosophical needs.

We shall see that Reid radicalized some of the core methodological tenets of Newton. According to Reid, the moral of the Newtonian Revolution was that philosophers should reject the search for efficient causes and concentrate only on the discovery of the laws of nature, that is, the necessary causes of motion – Newton himself endorsed that the main business of natural philosophy consists in inferring proximate and efficient causes from effects.¹⁵⁷ Reid argued against Hume's presumed doubt concerning 'the existence of causal connections'¹⁵⁸ and stressed that cause-and-effects attributions can be safely made:

¹⁵⁴ In this part I draw on my 'Reid's Adaptation and Radicalization of Newton's Natural Philosophy', *History of European Ideas*, 32 (2006), 173-89. Needless to say, the present treatment includes some improvements.

¹⁵⁵ In contrast to Hume, he was well informed about Newton's views on specific matters. For instance, he correctly represented Newton's views on the solidity of matter (Reid, *Thomas Reid on the animate creation: papers relating to the life sciences*, ed. Paul Wood [Edinburgh, 1995], 169-70), absolute versus relative motion (ibid., 172), Definition III (170), inertia (ibid., 172), gravity as a non-essential property of motion (ibid., 165), and the relation between Book I and III of the *Principia* (ibid., 183-4).

¹⁵⁶ Reid, *The correspondence of Thomas Reid*, ed. Paul Wood (Edinburgh, 2002), 55ff.; compare with Nicholas Wolterstorff, *Thomas Reid and the story of epistemology* (Cambridge, 2004), 41, 61, 65.

¹⁵⁷ CUL Ms. Add. 3965, f. 422r.

¹⁵⁸ Benjamin W. Redekop, 'Thomas Reid and the Problem of Induction: from Common Experience to Common Sense', *Studies in History and Philosophy of Science*, 33 (2002), 35-58, at 47.

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When we have by frequent experience observed a certain Effect closely conjoined to any thing, we conclude the former to be the Cause, & the latter the Effect, by which according to him, we mean nothing more, that our Minds (as observed before) are determined to pass from the former to the latter, or vice versa

For previous to all experience, we find that our minds are very uneasy upon any new Accident, till we find out some Cause on which it depends. & if We don't see any indication of the Effect produced by such a cause, 'tis not at all an improper Question, how such an effect comes to be produced by such a Cause.¹⁵⁹

For what is called the association of ideas is a law of nature in our constitution; which produces its effects without any operation of reason on our part, and in a manner of which we are entirely ignorant.¹⁶⁰

Attributions of cause-and-effects relations are the fundamental principles on which all knowledge is based and, according to Reid, consequently, do not require any further justification.¹⁶¹ Peter Baumann refers to this as Reid's 'principle argument'.¹⁶² In the last quotation, Reid uses what could be called a 'constitution argument':¹⁶³ cause and effect attributions are inherent features of our human constitution; they are not derived from experience – in this respect he agreed with Kant. Here, I shall focus on Reid's main philosophical works *An inquiry into the human mind* (1764), *Essays on the intellectual powers of man* (1785), and *Essays on the active powers of man* (1788) – especially the last two works are relevant for my present purposes. I will try to elucidate how Reid interpreted and utilized

¹⁵⁹ Quoted from M A Stewart, 'Rational Religion and Common Sense', in *Thomas Reid, context, influence, significance*, ed. Joseph Houston (Edinburgh, 2004), 123-60, at 154-5.

¹⁶⁰ Thomas Reid, *Essays on the active powers of man* (Edinburgh, 1788), 262.

¹⁶¹ Cf. '*Felix qui potuit rerum cognoscere causas*, is the voice of nature in all men' (ibid., 172).

¹⁶² Peter Baumann, 'The Scottish Pragmatist? The Dilemma of Common Sense and the Pragmatist Way Out', *Reid Studies*, 2 (1999), 47-58.

¹⁶³ Reid agreed that only synthetic principles *a priori* are the proper foundations of human knowledge. See James McCosh, *The Scottish philosophy, biographical, expository, critical, from Hutcheson to Hamilton* (New York, 1875), 475.

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Newton's *modus investigandi* in his philosophical project. For one thing is certain, according to Reid: Newton's methodology was a source of inspiration for philosophy in general. It is important to note that, in contrast to Hume, Newton's natural philosophy was at the centre of Reid's philosophical agenda. When Reid referred to science, he referred to Newton's natural philosophy *tout court*. Although Reid surely cannot be considered as a full-fledged positivist, his thinking definitely anticipated some strands of the nineteenth-century positivism movement later inaugurated by Auguste Comte (1798-1857).¹⁶⁴

According to Reid, Newton has formulated the key principles of philosophical reasoning in his *regulae philosophandi* (spelled out at the beginning of Book III of the *Principia*). These principles give (natural) philosophy its secure foundation. In the *Essays on the intellectual powers of man*, Reid writes:

Sir Isaac Newton, the greatest of natural philosophers, has given an example well worthy of imitation, by laying down the common principles or axioms, on which the reasonings in natural philosophy are built. Before this was done, the reasonings of philosophers, in that science, were as vague and uncertain as they are in most others ... It may, however, be observed that the first principles of natural philosophy are of a quite different nature from mathematical axioms. They are such as these: that similar effects proceeds from the same or similar causes: that we ought to admit of no more causes of natural effects, but such as are true, sufficient to account for the effects. These are principles, which, though they have not the same kind of evidence that mathematical axioms have, yet have such evidence, that every man of common understanding readily assents to them, and finds it absolutely necessary to conduct his actions and opinions by them, in the ordinary affairs of life.¹⁶⁵

¹⁶⁴ Benjamin W Redekop, 'Reid's Influence in Britain, Germany, France, and America', in *The Cambridge companion to Thomas Reid*, ed. Terence Cuneo and René Van Woudenberg (Cambridge, 2004), 313-39, at 326-7.

¹⁶⁵ Thomas Reid, *Essays on the intellectual powers of man* (Cambridge, Mass. and London, 1969[1785]), 32-3.

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Reid pointed out that philosophers are in need of discovering 'the proper and scientific way of proceeding in philosophical disquisitions'.¹⁶⁶ This way will dispense with the often hypothetical nature of philosophical inquiry.¹⁶⁷ Reid wanted an absolute ban on the introduction of unwarranted hypothetical elements in philosophy.¹⁶⁸ Reid offered several different arguments against the hypothetical method (seven *in toto*, including logical, psychological and historical ones).¹⁶⁹ Reid especially referred to Descartes' situation of the mind in the pineal gland in philosophy of mind and his vortex theory of gravitation in natural philosophy.¹⁷⁰

Crucial to proper philosophical inquiry is the application of Newton's *regulae philosophandi*. These rules should guide philosophers in their work. '[N]o cause of natural phaenomena ought to be admitted which they exclude, nor any rejected, which they authorise', Reid commented.¹⁷¹ In stark contrast to Hume, Reid carefully based his interpretation of Newton's *regulae* on the original text. Reid noted that in order to 'adhere uniformly and rigorously to Sir Isaac Newton's Rules, it is necessary to understand them perfectly', since '[t]he plainest rules may be misapplied, and misinterpreted, if due attention be not given to their design, and to the words by which they are expressed'.¹⁷² On Newton's first *regula philosophandi*,¹⁷³ according to which 'no more causes of natural things should be admitted than are both true and sufficient to explain their phenomena',¹⁷⁴ Reid notes:

¹⁶⁶ Ibid., 41.

¹⁶⁷ Ibid., 45-6.

¹⁶⁸ Ernan V McMullin, 'The Impact of Newton's *Principia* on the Philosophy of Science', *Philosophy of Science*, 68 (2001), 279-310, at 303-6.

¹⁶⁹ See Larry Laudan, *Science and hypothesis, historical essays on scientific methodology* (Dordrecht, 1981), 90-4 on this matter.

¹⁷⁰ Reid, *Essays on the intellectual powers of man*, 62, 144.

¹⁷¹ Reid, *Thomas Reid on the animate creation*, 185.

¹⁷² Reid, *Essays on the intellectual powers of man*, 182.

¹⁷³ The second rule is based on the first. Rule II goes: 'Therefore, the causes assigned to the natural effects of the same kind must be, so far as possible, the same' (Newton, *Principia*, 795).

¹⁷⁴ Newton, *Principia*, 794.

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This is a golden rule; it is the true and proper test, by which what is sound and solid in philosophy may be distinguished from what is hollow and vain.¹⁷⁵

In manuscript material (c.1788) containing Reid's criticism of Joseph Priestley,¹⁷⁶ Reid insisted that Newton wrote '*et verae sint et earum phaenomenis explicandis sufficient*' and was thus invoking a conjunction, not a disjunction, that is, the proper causes introduced should be explanatory as well as true.¹⁷⁷ 'It is evident therefore', Reid commented: 'that he [Newton] did not conceive the explaining appearances to be the only condition required in a cause of natural things that ought to be admitted, and that he considered the proof of its truth as an essential condition'.¹⁷⁸ Otherwise Newton's first rule would not rule out arbitrary hypotheses.¹⁷⁹ According to Reid this *regula* is a principle of common sense 'practised every day in common life'.¹⁸⁰ This rule provides guidance to arrive at a correct inductive argument – Reid also uses the expression 'the inductive principle'.¹⁸¹

[Newton] saw, that all the length men can go in accounting for phenomena, is to discover the laws of nature, and therefore, that the true method of philosophizing is this, from real facts ascertained by observation and experiment, to collect by just induction the law of nature, and to apply the laws so discovered, to account for the phenomena of nature.¹⁸²

When commenting on Priestley's interpretation of Newton's second rule, Reid commented as follows:

Sir Isaac Newton does not direct us to apply this Rule *as far as possible* as if the danger were of not applying it when it ought

¹⁷⁵ Thomas Reid, *An inquiry into the human mind on the principles of common sense* (Edinburgh, 1997 [1764]), 47, cf. 145.

¹⁷⁶ More specifically, Reid's target was Priestley's *Disquisitions relating to matter and spirit* (London, 1777) and *A free discussion of the doctrines of materialism, and philosophical necessity* (London, 1778).

¹⁷⁷ Reid, *Thomas Reid on the animate creation*, 186-7.

¹⁷⁸ *Ibid.*, 188; cf. Reid, *Essays on the active powers of man*, 24, 43, 70.

¹⁷⁹ Reid, *Thomas Reid on the animate creation*, 168.

¹⁸⁰ Reid, *An inquiry into the human mind on the principles of common sense*, 12.

¹⁸¹ *Ibid.*, 198.

¹⁸² Reid, *Essays on the intellectual powers of man*, 145.

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to be applied this would not have been agreeable to the Spirit of his Philosophy. When Natural Effects are evidently of the same kind, the conviction which all Men have of the Uniformity of Nature is a sufficient inducement to impute them to the same Cause, & they need not to be required to do this as far as possible. The danger lies on the other side, lest our proneness to assign similar Effects to the same Cause should lead us to take Effects to be of the same kind & therefore to have the same Cause because they have some resemblance. To obviate this danger Sir Isaac Newton illustrates the Rule onely by examples of those Effects to be of the same kind such as the Respiration in Men & Brutes, & the descent of heavy Bodies in Europe and in America. Had he thought fit to enlarge upon the application of his Rule, there is Reason to think, that he would rather have warned Men that it is to be applied with great Caution and Prudence than directed to apply it as far as possible because most of the False Theories in Philosophy have been owing to the misapplication of it.¹⁸³

Newton proceeded from phenomena and *regulae* to gravitational theory; both constitute 'the first principles which he assumes in his reasoning'.¹⁸⁴ Reid also mentioned Newton's third *regula philosophandi*.¹⁸⁵

Newton has laid down as a first principle in natural philosophy, that a property which has been found in all bodies upon which we have had access to make experiments, and which has always been found in its quantity to be in exact proportion to the quantity of matter in every body, is to be held as an universal property of matter. This principle, as far as I know, has never been called into question. The evidence we have, that all matter is divisible, moveable, solid, and inert, is resolved into this principle: and if it be not true, we cannot have any rational

¹⁸³ Reid, *Thomas Reid on the animate creation*, 169.

¹⁸⁴ Reid, *An inquiry into the human mind on the principles of common sense*, 687.

¹⁸⁵ The third *regula philosophandi* states: 'Those qualities of bodies that cannot be intended or remitted and that belong to all bodies on which experiments can be made should be taken as qualities of all bodies universally' (*ibid.*, 795).

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conviction that all matter has those properties. From the same principle that great man has shown, that we have reason to conclude, that all bodies gravitate toward each other.¹⁸⁶

Surprisingly, Reid did not refer to Newton's fourth rule in his *An Inquiry into the human mind on the principles of common sense* (1785). In his *Essays on the active powers of man*, however, Reid finally did refer to Newton's fourth rule of philosophizing according to which 'conclusions established by induction should not exclude exceptions' and he criticized Hume for not referring to Rule IV.¹⁸⁷ The Latin text Reid provides when railing against Priestley (where Rule IV is not mentioned) is based on the second edition of the *Principia*. Rule II goes as follows, according to edition Reid quoted from: '*Ideoque effectuum naturalium ejusdem generis eadem sunt causæ*'.¹⁸⁸ However, the third edition of the *Principia* reads: '*Ideoque effectuum naturalium ejusdem generis eadem assignandæ sunt causæ, quatenus fieri potest*'.¹⁸⁹ As Reid previously had not relied on the third edition, he noted that the clause 'as far as possible' ('*quatenus fieri potest*') 'is purely an addition of the translator [Priestley]'.¹⁹⁰ This may suggest that Reid only relatively late became aware of Rule IV – however, this contention awaits further scrutiny.

Just as Newton did not feign arbitrary hypotheses in the *Principia*, Reid wanted to proceed in the same way in philosophy of mind and perception.¹⁹¹ Proper philosophical inquiry should establish *real* and *sufficient* causes (cf. the first rule of philosophizing):

If a philosopher, therefore, pretend to shew us the cause of any natural effect, whether relating to matter or to the mind; let us first consider whether there be sufficient evidence that the cause he assigns does really exist. If there be not, reject it with disdain

¹⁸⁶ Reid, *Essays on the intellectual powers of man*, 597-8; cf. Reid, *Thomas Reid on the animate creation*, 191.

¹⁸⁷ Reid, *Essays on the active powers of man*, 94.

¹⁸⁸ Reid, *Thomas Reid on the animate creation*, 189.

¹⁸⁹ Newton, *Isaac Newton's 'Philosophiæ Naturalis Principia Mathematica': the third edition (1726) with variant readings*, ed. Alexandre Koyré, I Bernard Cohen and Anne Whitman (Cambridge, 1972), II, 550-1.

¹⁹⁰ Reid, *Thomas Reid on the animate creation*, 189.

¹⁹¹ Reid, *Essays on the intellectual powers of man*, 62, 87; cf. Laudan, *Science and hypothesis*, 89.

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as a fiction which ought to have no place in genuine philosophy. If the cause assigned really exists, consider in the next place, whether the effect it is brought to explain necessarily follows from it.¹⁹²

This constitutes the core of what to Reid counts as Newtonian explanation (and hence, as proper philosophical explanation in general). Two points are important in such an explanation: (1) the attributed cause should be sufficient to explain the phenomena and (2) it should postulate entities and mechanisms whose existence can be directly ascertained (this means that unobservable entities, since they have no direct evidence of their existence, have no place in causal explanations).¹⁹³ Reid's criticism of hypothetical scientific explanation is especially pronounced in his attack on David Hartley's (1705-57) theory of mind, according to which perception is caused by mechanical vibrations in the medullary substance of the nerves and (finally) the brain (see *Essay II*, chapter III, entitled 'Hypotheses Concerning the Nerves and Brain'). Reid starts by pointing out that a proper explanation of the mind ought to satisfy the two Newtonian criteria mentioned above.¹⁹⁴ According to Reid, Hartley's argument goes as follows:

1st, It is observed, that the sensation of seeing and hearing, and some sensations of touch, have some short duration or continuance. 2dly, Though there be no direct evidence that the sensations of taste and smell, and the greater parts of these of touch, have the like continuance; yet, says the author, analogy¹⁹⁵ would incline one to believe that they must resemble the sensations of sight and hearing in this particular. 3dly, The continuance of all our sensations being thus established, it follows, that external objects impress vibratory motions in the medullary substance of the nerves and brain; because no

¹⁹² Reid, *Essays on the intellectual powers of man*, 47.

¹⁹³ *Ibid.*, 93.

¹⁹⁴ *Ibid.*, 88.

¹⁹⁵ For Reid's concerns with analogical reasoning, see Richard Olson, *Scottish philosophy and British physics 1750-1880: a study of the foundations of the Victorian scientific style* (Princeton, N.J., 1975), 48-52.

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motion, besides a vibratory one, can reside in any part for a moment of time.¹⁹⁶

Reid rejects this hypothesis, since there is no proof that the vibrations really exist and there is no demonstration of how such vibrations might produce sensations.¹⁹⁷ Hartley's explanation is therefore simply an idle speculation: it fails with respect to the two Newtonian criteria. Reid concludes:

While this is the case, is it not better to confess our ignorance of the nature of those impressions made upon the nerves and brain in perception, than to flatter our pride with the conceit of knowledge which we have not, and to adulterate philosophy with the spurious brood of hypotheses?¹⁹⁸

In close agreement to Newton's apparent causal agnosticism, Reid argues that it is better to leave aside the assignment of efficient causes in natural philosophy and to stop the concocting of arbitrary hypotheses. Instead, we should limit ourselves to stay as close as possible to the given objects of our perceptual experience. Reid's stance on hypothesis is quite similar to that of Newton. Newton preached extreme caution when engaging in causal explanations and the strict separation between heuristic hypotheses and established theory. In Section XV of *An inquiry into the human mind on the principles of common sense* entitled 'Squinting considered hypothetically', Reid offered some hypothetical conditions that could potentially explain the optical phenomena of squinting. It is important to stress that Reid did not consider them as true explanations; but saw them as Newton saw his *Queries to the Opticks*, that is, as contentions heuristically useful for future research or 'hints to be examined & improved'.¹⁹⁹

Let us, secondly, look at Reid's reinterpretation of causal knowledge in Newton's natural philosophy. Reid pointed out that when philosophers attribute active powers (e.g., gravity) to an inert substance such as matter,

¹⁹⁶ Reid, *Essays on the intellectual powers of man*, 62, 87; cf. Laudan, *Science and hypothesis*, 88.

¹⁹⁷ *Ibid.*, 88-98.

¹⁹⁸ *Ibid.*, 89.

¹⁹⁹ CUL Ms. Add. 3970, f. 242r; Reid, *An inquiry into the human mind on the principles of common sense*, 357.

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which 'they expressly teach us to consider as merely passive and acted upon by some unknown cause',²⁰⁰ they are talking in a vulgar way and should be interpreted only metaphorically. A proper philosopher knows that such ascriptions ought not to be taken literally. To illustrate his point, Reid refers to Definition VIII of the *Principia*, where Newton declares:

Moreover, I use interchangeably and indiscriminately words signifying attraction, impulse, or any sort of propensity towards a center, considering these forces not from a physical but only from a mathematical point of view. Therefore, let the reader beware of thinking that by words of this kind I am anywhere defining a species or mode of action or a physical cause or reason, or that I am attributing forces in a true and physical sense to centers (which are mathematical points) if I happen to say that centers attract or that centers have forces.²⁰¹

According to Reid, when we do ascribe physical causes or modes of action to natural substances, we unwarrantedly make hypotheses²⁰² – Reid refers to Descartes' explanation of magnetic *effluvia* in this context.²⁰³ Rather, we ought to confess our ignorance of the real cause of celestial motion and subscribe to the idea that the sole business of philosophy is to discover by experiment the laws of nature by which it is regulated in all cases.²⁰⁴ We are simply left in darkness concerning the inner causes of things:

With regard to the operations of nature, it is sufficient for us to know, that, whatever the agents may be, whatever the manner of their operation, or the extent of their power, they depend upon the first cause, and are under his control; and this is all that we know; beyond that we are left in darkness.²⁰⁵

Natural philosophy does not discover the efficient causes of natural phenomena, only the rules regulating motion, that is, the necessary causes.

²⁰⁰ Reid, *Essays on the active powers of man*, 196.

²⁰¹ Newton, *Principia*, 408.

²⁰² Cf. 'Divinare hoc est, non philosophari', quoted from Walter R Humphreys, ed., *The philosophical orations of Thomas Reid* (Aberdeen, 1937), 34.

²⁰³ Reid, *Essays on the active powers of man*, 199.

²⁰⁴ *Ibid.*, 199-200, 205.

²⁰⁵ *Ibid.*, 191, cf. 197

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According to Reid, attributions of causal relations are the result of our innate constitution. Reid directly distinguished between two senses of causation: the first, the metaphysical one, refers to ‘a being or mind that has the power and will to produce the effect’; the second, the physical one, to ‘something which, by the laws of nature, the effect always follows’.²⁰⁶ The first type is an agent-causal concept; the second a regularity-law concept. According to Reid, humans are in darkness with respect to the first type (except for matters concerning our own acts of will), and we can only know the second type. It is clear by now that Reid took it that Newtonian science restricted itself – and philosophical inquiry should do so as well – to provide a nomological-necessitarian explanation of phenomena, without ever establishing an efficient (or agent) cause.²⁰⁷

According to Reid the notion of a(n) ‘(active) power’ is ‘a common word in our language, used every day in discourse, even by the vulgar’.²⁰⁸ Only active powers, that is minds, count as proper (efficient) causes. In the case of agent-causation, the relation between cause and effect is non-necessary: it depends on the willingness of the relevant agent to decide whether or not to exert his will. Only substances with wills, that is active powers, can be proper causes. This leads him to a radically non-necessitarian account of causation. When we attribute active powers to passive objects, we do so metaphorically. Humans have a tendency of incorrectly projecting ‘wills’ into inert objects. Philosophers, however, know that only active agents are proper causes. When we ascribe power to animate things, we mean nothing more than a constant (and hence necessary) conjunction by the laws of nature. This is what Reid says on Newton’s law of universal gravitation:

The Cause of a body’s falling to the ground is its gravity. But gravity is not an efficient Cause, but a general Law that obtains in Nature ... In natural Philosophy therefore we seek onely the general Laws according to which Nature works, and these we call Causes of what is done according to them. But such Laws

²⁰⁶ William L Rowe, ‘Reid’s Theory of Freedom and Responsibility’, in *The Cambridge companion to Thomas Reid*, 53-4.

²⁰⁷ Olson, *Scottish philosophy and British physics 1750-1880*, 43.

²⁰⁸ Reid, *Essays on the active powers of man*, 161.

'Newtonian' elements in Locke, Hume, and Reid

cannot be the Efficient Cause of anything. They are only the Rule according to which the Efficient Cause operates.²⁰⁹

According to Newton, when physics shall be carried to the utmost perfection, there would not be found in the whole science such a conception as that of a cause; nothing but laws of nature, which are general facts grounded on experience, and phenomena which are particular facts, included in the more general, and consequent upon them. Some indeed call the laws of nature, 'causes'. But surely no man that thinks can believe that laws of nature can produce any phenomenon unless there be some agent that puts the law in execution.²¹⁰

Laws of nature are not causes in Reid's proper philosophical sense. According to Reid, Newton was perfectly aware that he 'discovered no real cause, but only a law or rule, according to which the unknown cause operates'.²¹¹ Newton, however, considered centripetal forces as efficient causes of orbital motion.²¹²

Clearly, Reid's ideas did not always converge with Newton's original views. However, it should be noted that Reid's philosophical reinterpretation of Newton's natural philosophy was based on a careful examination of Newton's original texts and his methodological approach. Reid engaged in Newton's thought in a way that Hume never did. In this respect, Reid reasonably was the Newtonian philosopher he intended to be.

²⁰⁹ Reid, *The correspondence of Thomas Reid*, 124, Reid to Lord Kames, 7 Nov. 1780.

²¹⁰ John Haldane, 'An Essay by Thomas Reid on the Conception of Power', *The Philosophical Quarterly*, 51 (2001), 1-12, at 7. The quotation is Reid as edited by Haldane.

²¹¹ Reid, *Essays on the active powers of man*, 527.

²¹² For the details I refer to my 'The Argument(s) for Universal Gravitation', *Foundations of Science*, 11 (2006), 419-47 and my 'Mathematical Models in Newton's *Principia*: A New View of the "Newtonian Style"'.

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Conclusion

In the eighteenth century the term ‘Newtonian(ism)’ was a slippery one,²¹³ as a broad myriad of self-acclaimed interpreters of the *Principia* and the *Opticks* used Newtonian natural philosophy or the icon of the Lucasian Professor-genius at Cambridge for their own programmatic and philosophical agendas. This essay has pleaded for careful ascription of the label ‘Newtonian’. We should restrict its use to cases where (philosophical) positions are shown to be significantly derived from the specifics of Newton’s natural philosophy – which is obviously not in itself an easy exercise. Otherwise, we run the risk of promoting and perpetuating a predicate that is no longer adequate, explanatory nor meaningful. The benchmark for the label ‘Newtonian’ should reflect a significant degree of proximity to Newton’s corpus.

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²¹³ See Simon Schaffer, ‘Newtonianism’, in R C Olby, et al. eds., *Companion to the history of modern science* (London, 1990), 610-26. For an informative account of the different forms of ‘Newtonianism’ in the Dutch Republic, see Eric Jorink, ‘Honouring Sir Isaac, or, Exorcising the Ghost of Spinoza’, in *Future perspectives on Newton scholarship and the Newtonian legacy in Eighteenth-Century science and philosophy*, ed. Steffen Ducheyne (Brussels, 2009), 20-32.

**HOLY GRAIL, (ALMOST) WHOLLY NEWTON:
REVISITING THE NEWTONIAN ELEMENTS IN ALEXANDER POPE'S *ESSAY
ON MAN***

James E Force

Brown's new fiction

The question of the Newtonian elements in the thought of Alexander Pope arises anew in the context of the hugely successful novel *The Da Vinci code* by Dan Brown. In Brown's intricate plot, in both the book and the subsequent film, Newton and Pope are linked as part of a string of clues which the fictional protagonist, a professor of 'religious symbology' named Langdon, follows as he unravels a centuries-long, Church-led conspiracy to conceal a supposed union between Jesus and Mary Magdalene and their lineal descendants. In the novel, Jesus' bloodline is his true legacy. The esoteric meaning of the Holy Grail – a secret preserved by the mysterious Priory of Sion once led by, among others, Sir Isaac Newton – refers to the fertile womb of Jesus' beloved, Mary Magdalene. In Brown's novel, to learn the location both of Mary Magdalene's tomb and of the last blood descendant of her union with Jesus, Langdon must unravel the meaning of the following verse:

In London lies a knight a Pope interred.
His labor's fruit a Holy wrath incurred.
You seek the orb that ought be on his tomb.
It speaks of Rosy flesh and seeded womb.¹

When Langdon's computer search reveals a book about Isaac Newton entitled *The gravity of genius: biography of a modern knight*, Langdon realizes that the knight referred to in the above riddle must in fact be Newton whose labors, Langdon asserts, 'produced new sciences that incurred the wrath of the church'.² After identifying the knight as Newton, Langdon next realizes that the 'Pope' in the above passage refers not to the Catholic pontiff but to Alexander Pope. Clicking on the hyperlinks

¹ Dan Brown, *The Da Vinci code* (New York, 2003), 337.

² Brown, *The Da Vinci code*, 392.

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for the *The gravity of genius*, a fictitious book, the fictitious Langdon's fictitious computer generates the following fictitious quotation: 'Sir Isaac Newton's burial, attended by kings and nobles, was presided over by Alexander Pope, friend and colleague, who gave a stirring eulogy before sprinkling dirt on the tomb.' Finally, Langdon intuits that the last two lines of the puzzle refer to the famous apple which supposedly fell in Newton's garden and stimulated him to think of his universal theory of gravitational attraction.³ Apples are orbs; apples are members of the rose family; apples have a rosy skin; apples have seeds at their cores; and, despite the widespread currency of the story of the falling apple as the cause of Newton's idea of gravity, a rosy, seedy orb does *not* appear on Newton's tomb. Dialing the letters a-p-p-l-e into a cryptex – a portable, code-operated vault purportedly designed by Leonardo Da Vinci (a past Master of the Priory of Sion, like Newton) – Langdon retrieves the last clue to the final resting place of Mary Magdalene in Rosslyn Chapel near Edinburgh. In Scotland, Brown concludes his story with a final plot twist when the esoteric meaning of the Holy Grail – in the person of Sophie Neveu, a policewoman who has shared Langdon's adventures and who is the lineal descendant of Jesus and Mary Magdalene – is at last revealed.

It is an easy, if inane, exercise to list the historical falsehoods in this popular fictional account of the relationship between Newton and Pope: Pope's only role in Newton's funeral arrangements was confined to his famous epitaph which was only proposed by Pope and never used on the tomb;⁴ Pope was neither a friend nor a colleague of Newton; and, while Newton's well known anti-Catholicism⁵ doubtlessly did not endear Newton to the Church of Rome (or, possibly, to the Catholic poet,

³ Brown, *The Da Vinci code*, 392.

⁴ The historically-accurate version of Pope's involvement with Newton's funeral arrangements is summarized by Derek Gjertsen, *The Newton handbook* (London, 1987), 439 and 514-15.

⁵ See Rob Iliffe, 'Those "Whose business it is to cavill": Newton's anti-Catholicism', in *Newton and religion: context, nature, and influence*, ed. J E Force and R H Popkin (Dordrecht, 1999), 97-119.

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Alexander Pope),⁶ Newton's science never incurred the wrath of any church and his scientific work was celebrated throughout Catholic Europe as well as Protestant England.

The narrative of Pope's connection with Newton in *The Da Vinci code*, so excitingly depicted and so historically inaccurate, is faintly disturbing because of the novel's enormous impact and prompts a re-examination of the real Newtonian echoes in Pope's poetry. While Pope doubtlessly draws on many traditions and sources for his poetic imagery besides Newton, Newtonian ideas, especially as mediated by the Newtonian, William Whiston, are very important resources for Pope.⁷ The best single essay on this topic has been F E L Priestley's classic 'Pope and the Great

⁶ Opinions differ about the nature of Pope's Catholicism. See Patrick Cruttwell, 'Pope and his church', *Hudson Review*, 13 (1960), 392-405; Nancy K Lawlor, 'Pope's *Essay on man*: oblique light for a false mirror', *Modern Language Quarterly*, 28 (1967), 305-16; and Chester Chapin, 'Alexander Pope: Erasmian Catholic', *Eighteenth-Century Studies*, 6 (1973), 411-30. I agree with Cruttwell's observation (401) that what Pope 'was trying to do—though he did it imperfectly because it was not really his province, spasmodically because he was not profoundly interested, and elusively because he was afraid of giving offence—was to produce a version of his faith which would harmonise with the spirit of the age and his own acceptance of that spirit'.

⁷ Extremely valuable scholarly accounts of the relationship between Newton and Pope do exist. Marjorie Hope Nicolson's wonderful book, *Newton demands the muse: Newton's Opticks and the eighteenth century poets* (Princeton, 1946), contains much material about the use which Pope makes of Newton's imagery regarding light. Gerd Buchdahl's *The image of Newton and Locke in the Age of Reason* (London, 1961) also contains material about Newton and Pope and is especially good on the omnipresence of Newton in eighteenth-century intellectual life. The single best and most sustained analysis of Newton and Newtonian influence on Pope is the classic book by Marjorie Hope Nicolson and G S Rousseau, *'This Long Disease, My Life': Alexander Pope and the sciences* (Princeton, 1968). G S Rousseau's essay, "'To Thee, whose Temple is all Space": varieties of space in *The Dunciad*', *Modern Language Studies*, 9 (1979), 37-47, is an interesting analysis of the influence of Newton's conception of space on Pope's imagination. Finally, Patricia Fara and David Money make an important contribution in 'Isaac Newton and Augustan Anglo-Latin poetry', *Studies in History and Philosophy of Science*, 35 (2004), 549-71.

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Chain of Being'.⁸ In this paper, I intend to describe, and to build upon, Priestley's ground-breaking work by utilizing advances in Newtonian research over the past twenty years to re-emphasize the Newtonian elements in some of the religious and epistemological imagery in Pope's *Essay on man*.

The intellectual synchronicity (and divergence) between Pope and Newton is not immediately obvious, however, especially in light of Arthur O Lovejoy's highly influential interpretation of Pope's *Essay on man*. Therefore, I begin by describing Lovejoy's idea of the Great Chain of Being, the ancient, decidedly non-Newtonian, *a priori*, metaphysical theory which Lovejoy finds on prominent display in Epistle I of Pope's poem. Then, I deploy the results of recent Newtonian research to re-analyze the *Essay on man* in order to extend and elaborate Priestley's ground-breaking Newtonian, voluntaristic, *a posteriori*, interpretation; following this is my grail quest for a more complete understanding of the Newtonian elements on display in Pope's great poem. Finally, I summarize the results of my quest. Pope's *Essay on man*, even in its most obviously Newtonian passages, is not wholly Newtonian; Pope crucially diverges from Newton's own conclusion regarding the limits of the design inference when reasoning from a part to the whole. Even this singular difference, however, reveals a surprising underlying similarity: while Pope disagrees with Newton's (or anyone's) dogmatically-certain assertion of the design inference, Pope does so in a manner reminiscent of the spirit of Newton's own cautious empirical methodology.

Lovejoy's classic view

Whatever Pope's source for the idea of the Great Chain of Being,⁹ the version of the idea of the Great Chain of Being which Lovejoy famously attributes

⁸ F E L Priestley, 'Pope and the Great Chain of Being', in *Essays in English Literature from the Renaissance to the Victorian Age presented to A S P Woodhouse*, ed. Millar MacLure and F W Watt (Toronto, 1964). The importance of Priestley's ground-breaking essay cannot be overestimated. Priestley is the first scholar to focus upon the decidedly Newtonian echoes in Epistle I of *An Essay on man* and to overturn completely the interpretation put forward by Arthur O Lovejoy in *The Great Chain of Being: a study of the history of an idea* (Cambridge, 1964; orig. publ. 1936).

⁹ The possible sources of influence on Pope's use of the idea of the Great Chain of Being – Leibniz, Shaftesbury, Bolingbroke, and King – are discussed in detail by Maynard Mack in his 'Introduction to *An essay on man*'. See Mack, '*Collected in himself*': *essays critical, biographical, and bibliographical on Pope and some of his contemporaries* (Newark, 1963), 205ff.

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to Pope¹⁰ is a strictly *a priori* intellectual metaphysical system derived ultimately from Plato in which the one perfect Being, because of its self-transcending fecundity, necessarily creates the Many as a continuum of beings stretching from the lowest to the highest because it is simply in the nature of this Being to pass on his own perfections to the fullest possible extent. This creator cannot, in fact, do otherwise.

It is necessary to quote Lovejoy at some length to be clear about how he reads this deterministic, *a priori* idea of the Great Chain of Being – with its concomitant unit ideas, the principles of plenitude and continuity – into the first Epistle of Pope’s *Essay on man*. Lovejoy writes that:

Pope, ... in a passage which, I trust, every schoolboy knows, enunciates the chief premise of his — which is to say, the usual — argument for optimism, by summing up the principles of plenitude and continuity in two neat couplets:

Of systems possible, if ’tis confest
That wisdom infinite must form the best,

Then

... all must full or not coherent be,
And all that rises, rise in due degree.

From the resultant picture of the whole of things Pope deduces a moral — much cherished by the eighteenth-century mind — to which we shall have occasion to return.

¹⁰ William F Bynum, in ‘The Great Chain of Being after forty years: an appraisal’, *History of Science*, 13 (1975), 1-28, makes a useful critique of the limitations inherent in Lovejoy’s intellectualist methodology and emphasizes the need for historians of science to balance such intellectualism with a focus upon the societal context of historical individuals. The debate about Lovejoy and the intellectualist history of ideas has not gone away. Recently, Peter Harrison has championed the intellectualist methodological approach to reading the history of science and cautioned against seeing any connection between voluntarism of the sort espoused by Newton and Pope and the development of science. See Harrison, ‘Voluntarism and early modern science’, *History of Science*, 40 (2002), 63-89. Harrison, in turn, has been vigorously challenged by John Henry who strongly defends the thesis that voluntarist theology is an important component in the thought of many early modern thinkers. See Henry, ‘Voluntarist theology at the origins of modern science: a response to Peter Harrison’, *History of Science*, 47 (2009), 79-113. In the light of this recent re-opening of the debate, it is all the more important to show how progress in our understanding of Newton buttresses Priestley’s interpretation of Pope’s *Essay on man*.

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Vast Chain of Being! which from God began,
 Natures aethereal, human, angel, man,
 Beast, bird, fish, insect, what no eye can see,
 No glass can reach; from Infinite to thee,
 From thee to nothing. — On superior pow'rs
 Were we to press, inferior might on ours;
 Or in the full creation leave a void,
 Where, one step broken, the great scale's destroyed;
 From Nature's chain whatever link you strike,
 Tenth, or ten thousandth, breaks the chain alike.¹¹

Lovejoy's interpretation of Epistle I has great plausibility. Certainly, in the above passage, Pope does seem to present Lovejoy's idea of a Great Chain of Being which must extend from the lowest part of creation to the creator with humanity 'Placed in this isthmus of a middle state' between the pure reason of angelic spirits and the pure instinct of lower animals. Because the best system is the fullest possible, mankind must exist and, also, every gradation of humanity, from the most sublime thinker to the 'fool and the evil-doer', must, of necessity, exist.¹² While plausible, Lovejoy's interpretation of Pope's poem is contrary to the even more plausible possible influence of Newtonian ideas upon the poet.

'And showed a NEWTON as we show an Ape' (Essay, II, 34)

Pope's direct mention of Newton in connection with an ape may seem, at first, to confirm Lovejoy's interpretation that the *a priori* Great Chain of Being is the idea to which Pope refers in the passages cited by Lovejoy above. On Lovejoy's reading, God's intellectual conception of the universe compels him to create the world according to the Principles of Plenitude and Continuity. God is necessitated to create a range of men, from the highest to the lowest, as well as both a range of creatures below humanity and a range of creatures above humanity for whom even the genius Newton is but an ape:

¹¹ Lovejoy, *The Great Chain of Being*, 60. I have quoted Pope's lines exactly as Lovejoy cites them.

¹² Lovejoy, *The Great Chain of Being*, 223.

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Superior beings, when of late they saw
 A mortal Man unfold all Nature's law,
 Admired such wisdom in an earthly shape,
 And showed a NEWTON as we show an Ape.

(*Essay*, II, 31-4)

But the superior creatures to whom Newton and his discoveries regarding Nature's laws may seem ape-like need not be a necessary effect dictated to God by any inherent metaphysical necessity in the unit ideas of the Great Chain of Being. Such beings might only illustrate the related, yet metaphysically dissimilar, idea of a ladder-like scale of creatures from highest to lowest created by God in an act of creative, free, transcendent, divine choice. Certainly, this voluntaristic version of the Chain of Being as a divinely-ordained effect is as common in Pope's day as Lovejoy's deterministic version of the.¹³

However, if a freely-ordained and graduated chain of *beings* – not Lovejoy's grandly-deterministic idea of the Great Chain of Being – is what Pope has in mind in Epistle I, then Pope's use of the term 'chain of being' reflects little more than an amplification of the design argument, an argument which appeals to Pope as well as to many of his contemporaries including deists, latitudinarian Anglicans, Newtonian physico-theologians, and orthodox divines. Indeed, the elucidation of the idea of the freely-ordained, divine design of creation, in a scale of creatures, seems to be precisely what Pope means in those sections where he sounds like any enthusiastic design theorist cataloging the wondrous craftsmanship evident in nature. Thus, Pope writes that:

Far as Creation's ample range extends,
 The scale of sensual, mental pow'rs ascends:
 Mark how it mounts, to Man's imperial race,
 From the green myriads in the peopled grass:
 What modes of sight betwixt each wide extreme,

¹³ Donald F Bond, 'The *Essay on man*, epistle II, lines 31-34', *Modern Language Notes*, 43 (1928), 326, cites a passage from Addison's *Spectator* – no. 621 (17 November 1714) – which illustrates the 'wide currency' of the idea of 'a gradual Rise in Beings, from the meanest to the most High'. Again, Priestley is the first scholar to trace this line of interpretation in Pope; see Priestley, 'Pope and the Great Chain of Being', 217. Mack agrees; see Mack, *Alexander Pope: a life* (New York, 1985), 526-8.

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The mole's dim curtain and the lynx's beam ...

(*Essay*, I, 207-12)

Or, again:

See, through this air, this ocean, and this earth,
All matter quick, and bursting into birth.
Above, how high progressive life may go!
Around, how wide! how deep extend below!
Vast chain of being, which from God began,
Natures ethereal, human, angel, man ...

(*Essay*, I, 233-8)

For Pope, an interconnected, created natural continuum of creatures, graded from highest to lowest, is simply what natural philosophers empirically observe in that small part of nature open to their observation and subsequently often employ in the design argument to exult the power and wisdom of a divine architect and, in Pope's case, to criticize 'human presumption in evaluating God's Creation'.¹⁴ As Priestley points out, on this view of the chain of beings, as distinct from Lovejoy's deterministic and intellectualist idea of the Great Chain of Being, God has freely chosen to design a range of creatures including some as superior to Newton as Newton is superior to apes.

The 'high Priori Road' (*Dunciad*, IV, 471)

In claiming that Pope shares the metaphysical determinism inherent in Lovejoy's idea of the Great Chain of Being, Lovejoy places great emphasis on the following passage:

Of Systems possible, if 'tis confessed
That Wisdom infinite must form the best,
Where all must fall or not coherent be,
And all that rises, rise in due degree ...

(*Essay*, I, 43-6)

But Pope does not in fact say that this idea is a demonstrated *a priori* conclusion. It is, for Pope, only a hypothetical premise. 'IF' the Great Chain of Being, as it is described by Lovejoy, is 'confessed', then the metaphysical consequences which Lovejoy describes follow: God 'must

¹⁴ Peter Dendle, 'Hume's *Dialogues* and *Paradise lost*', *Journal of the History of Ideas*, 60 (1999), 261.

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form the best', that is, the fullest creation 'where all must fall or not coherent be' and where 'there must be, somewhere, such a rank as Man'.¹⁵ Pope, again, may be interpreted as endorsing only the natural order which the all-powerful God freely ordained and which is cataloged by design theorists.

Moreover, like any design theorist, Pope derives his descriptions of the ordained, scaled order of the chain of 'natures' entirely by empirical, *a posteriori* observations.¹⁶ Lovejoy's grand hypothesis of the Great Chain of Being is, by contrast, as much an *a priori*, logical category as it is a necessary metaphysical system. Lovejoy's Great Chain of Being precedes, and is independent of, both human experience and divine will. The unit ideas of plenitude and continuity in God's mind prior to the act of creation are what determine God to create the world with its necessary fullness. But, for Pope, it is folly for human beings to attempt to follow the 'high Priori' road to a perfect – that is, an *a priori* – intellectual understanding of ideas as they are known to God. In discoursing of God's attributes (in so far as we are able to do so), Pope writes that empirical data – not imaginary or feigned, *a priori* hypotheses quite beyond human experience – is all that humanity may aspire to know:

Through worlds unnumbered, though the God be known,
'Tis ours to trace him only in our own.

(*Essay*, I, 21-2)

¹⁵ Mack connects Pope's mockery of rationalistic theologians in the fourth part of the *Dunciad* with *An essay on man*, in *Alexander Pope*, 527-8. Priestley argues that Pope does not accept the 'conditional premise' and thus is not committed to Lovejoy's hard, deterministic version of the idea of the Great Chain of Being in which God is so limited that he 'must' create 'such a rank as man'. See Priestley, 'Pope and the Great Chain of Being', 218.

¹⁶ Lovejoy points out that, in the early eighteenth century, a proponent of the deterministic version of the idea of the Great Chain of Being such as Bolingbroke thought that a scale of beings 'almost from nonentity up to man' was established 'by observation'. Bolingbroke also acknowledges that, beyond the rank of man on the scale of creatures, empirical evidence is NOT obtainable but that, even so, 'we have the most probable reasons to persuade us' that the Great Chain of Being 'continues up to natures infinitely below the divine, but vastly superior to the human'. See Lovejoy, *The Great Chain of Being*, 191-2.

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Pope asserts that it is human pride which causes human beings to envy the intuitive reason of angels and to rebel against accepting the empirical mode of reasoning which God has freely ordained as most appropriate for human natures.¹⁷ Pope emphatically advises mankind not to wish, foolishly, to ‘soar with Plato to th’ empyreal sphere’ (II, 23). Only ‘gloomy clerks’, who are ‘prompt to impose’ and ‘fond to dogmatize’, criticize the empirical method of natural philosophy. Their arrogance and vanity lead these dogmatists to mock the commonsensical, *a posteriori* method of science:

Let others creep by timid steps, and slow,
On plain experience lay foundations low,
By common sense to common knowledge bred,
And last, to Nature’s Cause through Nature led.
All-seeing in thy mists, we want no guide,
Mother of Arrogance, and Source of Pride!
We [*i.e.*, the ‘gloomy clerks’] nobly take the high Priori Road,
And reason downward, till we doubt of God ...

(*Dunciad*, IV, 465-72)¹⁸

The empirical reasoner will put aside such *a priori* aspirations to rise to what is, in fact, impossible, a divine understanding of every aspect of the order in the universe:

Know thy own point: This kind, this due degree
Of blindness, weakness, Heav’n bestows on thee.

(*Essay I*, 283-4)

¹⁷ Pope, *Essay on man*, Epistle I, argument, ‘OF THE NATURE AND STATE OF MAN, WITH RESPECT TO THE UNIVERSE’, 5.

¹⁸ B W Young has argued that Pope’s criticism of religious rationalism in the *Dunciad* is aimed at the followers of Newton especially Samuel Clarke who does, in fact, employ the *a priori* method more than any other Newtonian. The criticism in this passage of the *Dunciad*, however, seems to me to be aimed at least as much at Clarke’s opponent, Leibniz, and at other contemporary exponents of Lovejoy’s classically-derived idea of the Great Chain of Being. See Young, “‘See Mystery to Mathematics fly!’: Pope’s *Dunciad* and the critique of religious rationalism”, *Eighteenth-Century Studies*, 26 (1993), 435-48.

*Holy Grail, (Almost) Wholly Newton***‘The great directing MIND of ALL ordains’ (Essay, I, 266)**

If human beings will but confine themselves to sound, empirical reasoning, they will understand well enough the order which God has chosen to impose on the universe by a direct act of his unfettered will. The world is good because God has chosen it. It is not good because it measures up to any rational understanding that the best possible world is the fullest possible one. Pope’s clear confession of faith in a more voluntaristic and Newtonian Lord God of supreme freedom and power cancels and supersedes Lovejoy’s view that the strongly deterministic idea of the Great Chain of Being with its necessary limits on God’s freedom applies to Pope. Pope thus writes of the order willed into effect by ‘the great directing MIND’ of God:

What if the foot, ordained the dust to tread,
Or hand to toil, aspired to be the head?
What if the head, the eye, or ear repined
To serve mere engines to the ruling Mind?
Just as absurd for any part to claim
To be another, in this gen’ral frame:
Just as absurd to mourn the tasks or pains
The great directing MIND of ALL ordains ...

(*Essay, I, 258-66*)

‘... the rapid comet bind’ (Essay, II, 35)

Newton’s single greatest scientific breakthrough, it is frequently claimed, is his insight that the ordinary differential equations which describe the cannon ball’s fall or the moon’s orbit or the radically elliptical trajectories of comets are governed by the uniform and universal law of gravitation.¹⁹ Pope sees it as the glory of Newton to have succeeded in utilizing properly regulated human empirical reason to describe the natural laws which ‘bind’ even comets to God’s freely ordained and orderly plan of creation. ‘Newton’s laws’ – which Pope repeatedly refers to as ‘Nature’s laws’²⁰ –

¹⁹ David Orrell, *The future of everything: the science of prediction* (New York, 2007), 83.

²⁰ The published version of Pope’s proposed epitaph for Newton’s tomb reads:
Nature and Nature’s Laws lay hid in Night:
God said, Let Newton be! and All was Light.
See Gjertsen, *The Newton handbook*, 514-5.

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are immediately understood by all contemporary proponents of the design argument to provide one of the best pieces of empirical evidence of providential order and design in nature because they are descriptions of God's ordained laws of motion.

In the General Scholium, which dates from the second (1713) edition of his *Mathematical principles of natural philosophy* (around the time that Pope was attending Whiston's subscription lectures on the new astronomy), Newton famously describes the beautiful orderliness of the solar system and emphasizes that Nature's laws do, in fact, bind even the wandering comets:

The six primary planets revolve about the sun in circles concentric with the sun, with the same direction of motion, and very nearly in the same plane. Ten moons revolve about the earth, Jupiter, and Saturn, in concentric circles with the same direction of motion, very nearly in the planes of the orbits of the planets.

From this detailed description of the orderly structure which he has observed in the solar system, Newton, in this statement of the design argument, infers the existence of a divine architect sufficiently powerful and intelligent to cause this observed effect:

This most elegant system of the sun, planets, and comets could not have arisen without the design and dominion of an intelligent and powerful being....

He rules all things, not as the world soul but as the lord of all. And because of his dominion he is called the Lord God *Pantokrator*. For "god" is a relative word and has reference to servants, and godhood is the lordship of God, not over his own body as is supposed by those for whom God is the world soul, but over servants. The supreme God is an eternal, infinite, and absolutely perfect being; but a being, however perfect, without dominion is not the Lord God.²¹

²¹ Newton, *The principia: mathematical principles of natural philosophy*, trans. I Bernard Cohen, Anne Whitman and Julia Budenz (1726, 3rd ed., Berkeley, 1999), 940-1. On the anti-Trinitarian dynamics of Newton's General Scholium, see Stephen D Snobelen, "'God of God, and Lord of Lords': the theology of Isaac Newton's General Scholium to the *Principia*", *Osiris*, 16 (2001), 169-208.

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The evidence which links Pope's enthusiasm for the new astronomical elements of the design argument to Newton's discoveries is a famous letter, which Pope writes to John Caryll, dated 14 August 1713. In this letter, Pope describes the effect upon his imagination of attending the coffee house lectures on astronomy given by Whiston in the summer of 1713:

You can't wonder my thoughts are scarce consistent, when I tell you how they are distracted! Every hour of my life, my mind is strangely divided. This minute, perhaps, I am above the stars, with a thousand systems round about me, looking forward into the vast abyss of eternity, and losing my whole comprehension in the boundless system of the extended Creation, in dialogues with W[histon] and the astronomers; the next moment I am below all trifles, even grovelling with T[idcombe] in the very center of nonsense.²²

One month after writing the letter to Caryll, Pope published an anonymous letter²³ in *Guardian* No. 169 (24 September 1713) in which he elaborates on the theological implications of the new scene of thought opened to his poetic imagination by Whiston's lectures:

How many Foxhunters and Rural Squires are to be found in *Great Britain*, who are ignorant that they have all this while lived on a Planet, that the Sun is several thousand times bigger than the Earth; and that there are other Worlds without our View, greater and more glorious than our own. ... When I consider things in this Light, methinks it is sort of Impiety to have no Attention to the Course of Nature, and the Revolutions

²² Pope to Caryll, 14 August 1713, in Pope, *The correspondence of Alexander Pope*, ed. George Sherburn (5 vols., Oxford, 1956), vol. 1, 185. Marjorie Hope Nicolson and G S Rousseau give this letter its proper emphasis in 'This Long Disease, My Life', 137-8. Mack also cites Pope's famous letter in Mack, *Alexander Pope*, 232, as does George Sherburn in 'Pope and "The Great Shew of Nature"', in *The seventeenth century: studies in the history of English thought and literature from Bacon to Pope*, by Richard Foster Jones and others writing in his honor (Stanford, 1951).

²³ Nicolson and Rousseau join Norman Ault in attributing the anonymous letter published in the *Guardian* on 24 September 1713, to Pope. See Nicolson and Rousseau, 'This Long Disease, My Life', 149.

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of the Heavenly Bodies. To be regardless of those *Phaenomena* that are placed within our View, on purpose to entertain our Faculties, and display Wisdom and Power of their Creator, is an Affront to Providence of the same kind (I hope it is not Impious to make such a Simile) as it wou'd be to a good Poet, to sit out his Play without minding the Plot or Beauties of it.²⁴

In these two letters, Pope clearly states the effect that hearing Whiston's lectures has upon his poetic imagination. The letter to Caryll becomes especially important as a directly documented source of evidence regarding Pope's understanding of the Newtonian design argument. Much light has recently been shed on both the venue of Whiston's subscription lectures in the summer of 1713 (and the spring of 1715) and their contents by Stephen D Snobelen who has thoroughly tracked these lectures through Whiston's advertisements for them in the *Daily Courant*.

In the *Daily Courant* on 17 March 1713, there is an advertisement for Whiston's 'mathematical' lectures. Beginning on 18 March, Whiston gave one lecture at the 'Marine Coffee-house in Birch-in-lane' at 6:00 p.m. and a second lecture at 'Douglas's Coffee-house in St. Martin's-lane' at 8:00 p.m. On 1 April, Whiston advertised in the *Daily Courant* that his lectures would continue at the Marine Coffee-house on Mondays and at Douglas's Coffee-house on Tuesday and that both would commence at 6:00 p.m. Finally, on 24 August, Whiston advertised that while his Monday lectures at the Marine Coffee-house would continue, the site of his Tuesday lectures would shift from Douglas's Coffee-house to Button's Coffee-house in Covent Garden. Snobelen concludes that Pope probably attended Whiston's lectures at Douglas's Coffee-house before writing his letter of 14 August 1713 to Caryll.²⁵

²⁴ Cited by Nicolson and Rousseau, *This Long Disease, My Life*, 149-50.

²⁵ Stephen D Snobelen, 'William Whiston: natural philosopher, prophet, primitive Christian', (Ph.D. diss., University of Cambridge, 2000), 68-70. Snobelen notes that the first scholar to question whether Pope is referring to Button's Coffee-house as the venue where he hears Whiston speak of astronomy – in Pope's letter to Caryll, dated 14 August 1713 – is Larry Stewart, *The rise of public science: rhetoric, technology, and natural philosophy in Newtonian Britain, 1660-1750* (Cambridge, 1992), 96, n. 109.

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Most importantly, Snobelen has clarified the physico-theological content of Whiston's early lectures attended by Pope. Snobelen analyses the advertisement in the 17 March 1713, *Daily Courant* and concludes that, when Whiston promises to explain 'his New Scheme of Astronomy', he is referring to his own copper-engraved broadsheet published in 1712 as Whiston's *Scheme of the solar system*.²⁶ Whiston's *Scheme of the solar system* is a square broadsheet illustrated with the planets orbiting the central sun. Within the square boundaries of the sheet's outer edges, the orbit of Saturn marks the outer circular boundary of the planets. Between this circle and the square boundaries of the sheet's edges is printed Whiston's commentary – which was later reprinted in Whiston's *Astronomical principles of religion, natural and reveal'd* (1717). Snobelen emphasizes the religious purpose of this vital visual aid deployed by Whiston to illustrate his lectures which contains:

an appeal to the design argument and a quotation from Psalm 104:24. The wonder encapsulated in the cited Psalm undoubtedly derives in large part from the contemporary realization that God in His providential care had so ordered this complicated system that none of these periodic cometary visits to the inner reaches of the solar system had resulted in a cataclysmic collision with the earth. Amongst this intricate system, quotations from Newton's *Opticks* arrayed in spherical form orbit freely with the other celestial bodies almost as if they were taken to be sacred text.²⁷

With his customary precision, Pope compresses what he most probably learns of comets from Whiston with what he regards as the limits of even the great Newton's reason:

Could he, whose rules the rapid Comet bind,
Describe or fix one movement of his Mind?

(*Essay II*, 35-6)

²⁶ Snobelen, 'William Whiston', 69.

²⁷ Snobelen, 'William Whiston', 170.

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‘... can a part contain the whole?’ (Essay, I, 32)

Pope uses the design argument to infer a designer who has freely ordained a great natural scale of creatures. But perhaps the most crucial, if much less noted, Newtonian element which runs through Pope’s poem is Newton’s criticism of the misuse of induction in which careless human epistemologists forget or disregard the necessarily-provisional nature of empirical human knowledge – especially when they infer particular attributes of the maker of the whole of creation with absolute confidence. Pope repeatedly emphasizes the difficulty in reasoning from a part of created nature, known through limited *a posteriori* experience, to the cause of the whole. Pope writes that human natural philosophers are not God – only God:

... through vast immensity can pierce,
See worlds on worlds compose one universe,
Observe how system into system runs,
What other planets circle other suns,
What varied Being peoples every star,
May tell why Heav’n has made us as we are.

In marked contrast, human beings are woefully limited:
But of this frame the bearings, and the ties,
The strong connections, nice dependencies,
Gradations just, has thy pervading soul
Looked through? Or can a part contain the whole?

(*Essay*, I, 23-32)

Or, again:

So Man, who here seems principal alone,
Perhaps acts second to some sphere unknown,
Touches some wheel, or verges to some goal;
’Tis but a part we see, and not a whole.
(*Essay*, I, 57-60)

Or, again:

Of Man what see we, but his station here,
From which to reason, or to which refer?
Through worlds unnumbered, though the God be known,
’Tis ours to trace him only in our own.

(*Essay*, I, 19-22)

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Pope's conception of the absolute power of God and Pope's *a posteriori* method for arriving at cautiously modest conclusions concerning the nature of the Creator based upon empirical experience from this remote corner of the universe strongly resemble Newton's clearly stated natural philosophical methodology.

The most important implication of Newton's voluntaristic conception of the Lord God *Pantokrator* for human knowledge is hidden in plain sight – so to speak²⁸ – in Newton's theological conception of the Lord God built into his 'Rules for the Study of Natural Philosophy' in the second edition of the *Principia*. In the first edition of 1687, Newton publishes only two of what become, in the second edition, a total of four 'Rules for the Study of Natural Philosophy'.

What becomes Rule I in the second edition is the so-called 'Rule' of simplicity: '*No more causes of natural things should be admitted than are both true and sufficient to explain their phenomena.* As the philosophers say: Nature does nothing in vain, and more causes are in vain when fewer suffice. For nature is simple and does not indulge in the luxury of superfluous causes.'²⁹ Newton is extremely fond of the saying that 'Nature does nothing in vain'. In Query 28 of the *Opticks*, he gives this principle as an example of the sort of question that it is the 'main Business of natural Philosophy' to answer by arguing 'from Phaenomena'.³⁰

According to Rule II, '*Therefore, the causes assigned to natural effects of the same kind must be, in so far as possible, the same.*'³¹

²⁸ In this approach, I agree entirely with Snobelen's viewpoint that Newton embeds in plain sight his views about the alliance between his theological conception of the Lord God of creation and the law-regulated natural world. See Snobelen, "'The true frame of Nature": Isaac Newton, heresy, and the reformation of natural philosophy', in *Heterodoxy in early modern science and religion*, ed. John H Brooke and Ian Maclean (Oxford, 2005), 223-62.

²⁹ Newton, *Principia*, 794.

³⁰ Isaac Newton, *Opticks or a treatise of the reflections, refractions, inflections & colours of light* (New York, 1952), Query 28, 369. Cf. William Whiston, *Sir Isaac Newton's corollaries from his own philosophy and chronology; in his own words* (London, 1729).

³¹ Newton, *Principia*, 795.

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In the second edition of the *Principia* (1713), Newton retains these two ‘hypotheses’ but re-labels them as the first two ‘Rules for the Study of Natural Philosophy’. In the second edition, Newton adds the third rule which Westfall regards as ‘perhaps’ Newton’s ‘most important statement of his epistemology’.³² In Rule III in the second edition, Newton sounds remarkably like Descartes when the latter asserts that extension is the rationally-necessary essence of matter. Newton writes that: ‘*Those qualities of bodies that cannot be intended and remitted [i.e., qualities that cannot be increased and diminished] and that belong to all bodies on which experiments can be made should be taken as qualities of all bodies universally.*’³³ This rule sanctions, ‘on the analogy of nature, the inference from observed qualities known to attach to all bodies within our experience, to “all bodies whatsoever”’.³⁴

It is these three rules, and especially Rule III, which underlie the claim of those interpreters for whom Newton’s greatest breakthrough and ultimate legacy is his realization that the same natural laws which govern and describe the fall of a cannon ball also ‘bind’ – now, forever, and everywhere, it is often interpreted – the orbits of the moon, comets, and all other celestial bodies. The laws of nature are not only simple, but also uniform. It is a strong claim indeed to say that qualities of bodies which fall under our observation in our local region of space ‘*should be taken as qualities of all bodies universally*’, that is, at all times and in all regions of space.

In the third edition of the *Principia* in 1726, however, Newton also adds his all-important fourth rule:

In experimental philosophy, propositions gathered from phenomena by induction should be considered either exactly or very nearly true notwithstanding any contrary hypotheses,

³² Westfall, *Never at rest: a biography of Isaac Newton* (Cambridge, 1980), 731.

³³ Newton, *Principia*, 795.

³⁴ Gerd Buchdahl, *Metaphysics and the philosophy of science. The classical origins: Descartes to Kant* (Boston, 1969), observes, 337, that this inference in Rule III is ‘intended to cover both the step “in depth” from the realm of the observable to that of the unobservable (insensible particles: a kind of “analogical inference”), and the step “in breadth” from local regions of space to all regions’.

Newton, *Principia*, 795.

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until yet other phenomena make such propositions either more exact or liable to exceptions.

This rule should be followed so that arguments based on induction may not be nullified by hypotheses.³⁵

Most interpreters follow Burtt³⁶ and Westfall³⁷ in arguing that the fourth rule is only a re-statement of Newton's cautious, experimental empiricism. As such, Rule IV is viewed as an arrow aimed only at the shaky, speculative, *a priori* conjectures both about the internal essence of matter and about the mechanical, cosmic vortices so intrinsic to the thought of Descartes. As an experimental empiricist, Newton regards such conjectures as metaphysical wizardry.

Rule IV, however, describes both a process intrinsic to scientific method and also a spontaneous logical function. The phrase, '*propositions gathered from phenomena by induction*' refers both to the process through which we empirically arrive at a causal account which explains any particular event and the provisional manner in which, logically, throughout this process, we 'hold' the empirically derived law or hypothesis *as if* it is universally applicable. The key fact to note about this provisionality clause is that, as a process, it can never be terminated in time.³⁸

By the time of the third edition of the *Principia* in 1726, Newton apparently realizes that his first two rules, along with the newly-added third rule added to the second edition in 1713 (and the laws of motion themselves), if not qualified, would be open to an interpretation that they themselves are speculative, *a priori* conjectures and that Newton is, on the

³⁵ E A Burtt, *The metaphysical foundations of modern science* (Garden City, 1954; orig. publ. 1925), 219. Burtt, does argue that Rule IV imposes 'definite limits' on the first three rules even while he simultaneously maintains that Rule IV is one of Newton's 'strictly scientific paragraphs' and, thereby, disconnects Newton's science from its theological foundation, the Lord God *Pantokrator*.

³⁶ Westfall, *Never at rest*, 800-1.

³⁷ This distinction between 'process' and logical 'inference', as well as this entire interpretation of Rule IV, is found in Buchdahl, *Metaphysics and the philosophy of science*, 337-8.

³⁸ Robert Boyle, *Reconcilableness of reason and religion*, in *The works of the honourable Robert Boyle*, ed. Thomas Birch (6 vols., London, 1772), IV, 161.

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basis of these three rules alone, open to the charge of being a kind of Cartesian speculative wizard. In short, the first three rules, by themselves, may be interpreted not as provisional, open-ended, *a posteriori* methodological approaches to understanding nature, but as *a priori* and purely speculative descriptions of nature which set definite limits upon what is possible (and knowable) about the structure of the natural universe. Possibly to make the first three rules of his natural philosophical method consistent with his theological conception about the voluntaristic power of the Lord God and certainly to clarify the metaphysical status of the first three rules, Newton apparently adds Rule IV to allow for their modification in the light of possible future experience. The main theological and metaphysical import of Newton's fourth rule of reasoning is that, however experimentally confirmed any locally derived natural law or regulative, hypothetical rule (such as, for example, the principle of uniformity), we must be open to the possibility that, in the future, such natural laws and rules, which we have hitherto experienced always to hold, may possibly be altered by divine fiat either locally or in distant parts of creation. Newton's scientific procedure, regulated, methodized, and corrected by the addition of the fourth rule, reflects his openness to the possibility that God may contravene his own rules and laws in the future and, in so doing, may surprise us utterly. In the future, anything is possible in nature given the ubiquitous and total power and dominion of the Lord God of creation. Newton's view about the ultimate contingency of human knowledge, in the light of God's absolute power and dominion over every aspect of this creation, parallels that of Robert Boyle who writes that:

... if God be the author of the universe, and the free establisher of the laws of motion, whose general concurrence is necessary to the conservation and efficacy of every particular physical agent, God can certainly invalidate all experimentalism by withholding His concurrence, or changing those laws of motion, which depend perfectly upon His will, and could thus vitiate the value of most, if not all the axioms and theorems of natural philosophy. Therefore reason operating in the mechanical world is constantly limited by the possibility that there is not final regularity in that world, and

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that existential regularity may readily be destroyed at any moment by the God upon whom it depends.³⁹

For Newton, as for Boyle, the voluntaristic power of the Lord God underlies nature. Because God is so powerful that he can alter the course of created nature at will, human knowledge must necessarily be based upon repeated empirical observations because there is no guarantee that nature's laws will continue to function in the future, either in our part of the whole of creation or in the whole itself, as they have in the past.⁴⁰ Our empirically-based knowledge of causal scientific laws – laws created once long ago by God's creative act of general providence and observed to operate only in our remote corner of creation – can only be probable because of God's utter dominion over the whole of creation. God may change his generally-provident laws at any time and in any place by a particular interposition of his sovereign will. The natural philosopher must keep performing experiments and generally extending the reach of his observations (possibly by boldly going where no man has gone before) because of the possibility of a divinely-ordained, specially-provident suspension in nature's heretofore continuous operation.⁴¹

Pope clearly understands that, in contrast to Newton's confident design inference about the nature of the Lord God in the General Scholium, our limited experience must also render us extremely cautious in what we infer about God's nature on the basis of that part of the ordained natural

³⁹ James E Force, 'Providence and Newton's *Pantokrator*: natural law, miracles, and Newtonian science', in *Newton and Newtonianism: new studies*, ed. James E Force and Sarah Hutton (Dordrecht, 2004), 65-92.

⁴⁰ James E Force, 'Hume and the relation of science to religion among certain members of the Royal Society', *Journal of the History of Ideas*, 45 (1984), 517-36.

⁴¹ The scholars who wish to read Pope as a kind of classically-influenced sceptic often fail to denote Pope's voluntarism and the impact which voluntarism has upon the ability of human beings to obtain certain knowledge of nature. See, for example Harry M Solomon, *The rape of the text: reading and misreading Pope's essay on man* (Tuscaloosa, 1993); and Fred Parker, *Scepticism and literature: an essay on Pope, Hume, Sterne, and Johnson* (Oxford, 2003). I contend, however, that the doubts about the limits of human understanding entertained by writers in the voluntaristic tradition such as Pope (and Newton when he is writing about the methodology of natural philosophy and not the design argument where he is much less cautious) are encased within the metaphysics of a transcendentally free deity rather than any naturalistic frame of thought. See Note 45.

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order which falls under our observation. Pope, ironically, seemingly understands the limits which Newton's own fourth rule apply to the design inference better than Newton himself. While we may aspire to approach an adequate knowledge of the operations of God's ordained nature in our immediate vicinity, it is for God alone to love 'from Whole to Parts' (IV, 361).⁴²

There is no mention in Pope's letter to Caryll from 14 August 1713, or from the letter published in the 24 September 1713 edition of the *Guardian*, of the source of Pope's admonition against trying to go beyond the human limits of empiricism by attempting to assert with certainty the nature of the cause of the whole based on limited human experience of our little part of creation. But this feature of Newtonian methodology is implied in the General Scholium of the second (1713) edition of the *Principia* and it is plausible that Whiston mentioned this crucial aspect of Newtonian methodology in his astronomical lectures in the summer of 1713 when Pope was already engaged upon the themes of the *Essay on man*. The *Essay on man* was published anonymously in parts over several months in 1733, but well before 1730 there are several other possible Newtonian sources available to Pope to supplement what he may have learned from Whiston in 1713.⁴³

⁴² William Whiston, *A collection of authentick records belonging to the Old and New Testament* (2 vols., London, 1728), II, 1073-4.

⁴³ David Hume criticizes the Newtonian design argument in a manner somewhat, but not precisely, akin to Pope when he asks: 'But can a conclusion, with any propriety, be transferred from parts to the whole?' See Hume, *Dialogues concerning natural religion*, ed. N K Smith (Indianapolis, 1947), 147. Hume elaborates, 149: 'A very small part of this great system, during a very short time, is very imperfectly discovered to us: And do we thence pronounce decisively concerning the origin of the whole?' Hume's *Dialogues* were not published until 1779 and so would not have been known to Pope; however Pope certainly knew of Hume's *Treatise concerning human understanding* because Hume sent him an inscribed copy when it was first published. See E C Mossner, *The life of Hume* (2nd edn., Oxford, 1980), 627-8. Despite the fact that both Hume and Pope emphasize the weakness of the design inference based on reasoning from limited empirical knowledge of nature's laws in a part of the cosmos to the cause of the whole, Hume's doubts about the limits of reason are grounded in a completely naturalistic metaphysical framework. For Pope and Newton, the future need not resemble the past simply because of the ubiquity and power of the free divine will. See James E Force,

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Why Pope is so cautiously alert to the limitations of the design inference based upon reasoning from a part to a whole when Newton – the originator of the fourth rule of reasoning with its implicitly-cautious stipulation about the limits of such a causal design inference – is not so alert is open to question.⁴⁴ The answer seems to me to lie in the Newtonians' inability to treat the universe as, in fact, infinite and so, in principle, forever beyond the reach of *a posteriori* human experience. One possible explanation for their fascination with comets is that both Newton and Whiston think that the laws governing the motion of comets, as we observe them when their orbits converge with earth, can be extended to the farthest boundaries of creation. As Newton says in the General Scholium, '... comets go freely in very eccentric orbits and into all parts of the heavens'.⁴⁵ For the Newtonians, comets bridge the gap between the solar region and the abyssal deeps of far distant space.

Even so, while these cometary wanderers illustrate spatial boundaries practically indistinguishable from infinity, they are not infinite. As Whiston writes:

But then, as to the Vastness of the Extent of this Presence of God, through this grand System of the Fixed Stars also, it is to us hitherto unlimited and undetermin'd; tho', in all probability, in it self not really Infinite. However, so far we are certainly upon Fact to suppose the Divine Omnipresence to reach, and to be present, as we discover the Effects of the same; I mean so far as the visible Universe extends; which we know, on the lowest Computation, must be nearly that of a Cube of

'The virgin, the dynamo, and Newton's prophetic history', in *The millenarian turn: millenarian contexts of science, politics, and everyday Anglo-American life in the seventeenth and eighteenth centuries*, ed. James E Force and Richard H Popkin (Dordrecht, 2001). Despite the dissimilarity of their metaphysical foundations, Pope and Hume's specific use of the part-whole argument to undercut confidence in the design inference makes it tempting to speculate that perhaps Pope's *Essay on man* played a shaping role for Hume in his *Dialogues*.

⁴⁴ Newton, *Principia*, 940.

⁴⁵ Whiston, *Astronomical principles of religion, natural and reveal'd* (London, 1717), 121.

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1,400,000,000,000 Miles Diameter. ... An amazing Space this,
and as to any Power of Imagination, scarcely to be distinguish'd
from Infinite Space it self!⁴⁶

Pope's more vivid poetic ability to imagine the infinity of space may serve him better than Whiston's calculations. Pope sarcastically inquires whether finite mankind's mental capacities are sufficient to penetrate the inner springs and principles of the 'vast immensity' – which he calls 'boundless' in his letter to Caryl of 14 August 1713 – of God's creation:

He, who thro' vast immensity can pierce,
See worlds on worlds compose one universe,
Observe how system into system runs,
What other planets circle other suns,
What varied Being peoples every star,
May tell why Heav'n has made us as we are.
But of this frame the bearings, and the ties,
The strong connections, nice dependencies,
Gradations just, has thy pervading soul
Looked through? or can a part contain the whole?

(Essay, I, 23-32)

'WHATEVER IS, IS RIGHT' (*Essay, I, 294*)

Because of Pope's emphatic conclusion to Epistle I – that is, that 'WHATEVER IS, IS RIGHT' – critics have protested the cheerlessness of Pope's philosophical 'optimism'. Mack singles out Voltaire's poem on the Lisbon earthquake as a typical attack on the 'real bleakness' of Pope's statement that 'WHATEVER IS, IS RIGHT' and quotes the following lines from Voltaire's *Poem on the Lisbon disaster; or an examination of the axiom, 'all is well'*:

Philosophes trompés qui criez: 'Tout est bien.'
Accourez, contemplez ces ruines affreuses....
Direz-vous: 'C'est l'effet des éternelles lois
Que d'un Dieu libre et bon néccessitent le choix?'

⁴⁶ Mack, *Collected in himself*, 216.

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Mack then states what he thinks Pope's surprising answer would have been to Voltaire's question:

'Yes,' is not the answer anticipated by Voltaire's question, but it is of course the right answer, if one believes in the benevolence of God. What Voltaire ignores is that the *éternelles lois* are simply a way of conceptualizing the limitations that theology and theodicy have placed on God's omnipotence in order to defend his goodness.⁴⁷

But the question then arises: is in fact Pope 'bleakly' claiming that an all-good deity is willing to prevent evil but not able to do so because his will is bound by nature's eternal laws and, if so, does this reading of Pope's ethical framework return us to Lovejoy's deterministic idea of the Great Chain of Being?

Pope's ethical framework does not derive from any goodness inherent in the *a priori* idea of the fullest possible universe as much as it does from his ethical injunction against pride –which in turn grows out of the inability of humanity to understand, based on limited and finite empirical observations of this remote part of creation, the ineffable and incomprehensible nature of the Lord God, the creator of the whole. Because of this human epistemological limit, we can never fathom God's intent in the whole of creation and so Pope warns us not to let pride lead us into ignoring our limitations:

The bliss of Man (could Pride that blessing find)
Is not to act or think beyond mankind ...

(*Essay*, I, 189-90)

Pope's ethical framework seems once again to be more akin to that of the Newtonians because the ethical framework of nature is, for both, the freely-ordained effect of the Lord God. Whiston, at least, hopes that someday we might understand God's ethical framework as well as we now understand the local operation of nature's laws.

Whiston boldly proclaims that a 'direct Consequence' of the order observed in nature is the conclusion that 'the Maker and Governor of the

⁴⁷ Whiston, *Astronomical principles*, 125-6.

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Universe, is a *Good and Beneficent* Being, and one that takes Care of the Welfare and Happiness of his Creatures'. Nevertheless, Whiston distinguishes between the conditions of nature which contribute to human happiness and the woeful state of the lapsed moral nature of human beings:

I do not here take notice of the Objections against this Goodness and Beneficence of the Divine Nature, from the seeming Irregularities now appearing in the Moral and Rational Part of the Creation; because Divine Revelation always owns such seeming Irregularities at present, and refers the full Solution of them to the *Day of Judgment of God* hereafter; because we are hitherto not sufficiently acquainted with the last Result and Upshot of Things to determine those Matters.

Still, Whiston argues that we may legitimately conclude that the 'wonderful Contrivance of the World about us' permits us to infer that God is beneficent and good and, further, that this conclusion 'cannot but dispose us to believe, that the same Attributes will at last appear equally glorious to the *Moral*, as they do already as to the *Natural World*'.⁴⁸ Understanding just how moral evil is reconcilable with God's goodness is, for the moment, beyond the capacity of empirical reason. As Whiston says, we have not yet observed 'the last Result and Upshot of Things'. In the future, perhaps we may know more but, in the meantime, if human beings rein in their arrogant reason, limited as it is by the finitude of human experience, they will at least understand, if only provisionally, that, despite abundant moral evil, 'WHATEVER IS, IS RIGHT' (*Essay*, I, 294).

'...Nature tremble to the throne of God' (*Essay*, I, 257)

The following lines are highly suggestive of a distinctively Newtonian context as both Mack and Priestley have pointed out.⁴⁹ Pope writes:

⁴⁸ Mack, *Alexander Pope*, 526-7; Priestley, 'Pope and the Great Chain of Being', 221-2.

⁴⁹ Mack, *Alexander Pope*, 526, quotes one of Whiston's sermons from 1708 about how the all-powerful deity, by simply suspending his 'constant Providential Power for one single Hour' might destroy everything in the universe. Priestley cites the same text (from Whiston's sermon about God's power to produce catastrophe at will) and agrees that Whiston is the likely source behind the divinely ordained catastrophe described by Pope in Epistle I, lines 255-7. See Priestley, 'Pope and the Great Chain of Being', 221-2.

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Let Earth unbalanced from her orbit fly,
 Planets and Suns run lawless through the sky,
 ... Being on Being wrecked, and world on world,
 Heav'n's whole foundations to their centre nod,
 And Nature tremble to the throne of God.

(*Essay*, I, 250-7)

It is tempting to speculate that Pope is aware of Whiston's vociferous, prophetically-inspired, apocalyptic catastrophism. However, a miraculous break in natural law, as Whiston well understands,⁵⁰ is not necessary to effect the flinging of planets out of their orbits; a miraculous suspension of natural law is sufficient. In the astronomical lectures attended by Pope in the summer of 1713 (and in the spring of 1715), Whiston is sure to have mentioned the power of gravity which binds the Newtonian system of the world together. Gravity plays a uniquely important role in the Newtonian world system and it is hard to imagine that Whiston would not have mentioned his view that gravity demonstrates both the general and special providence of God. The historical creation of gravity demonstrates God's general providence. The continuous operation of gravity since that point reveals God's special providence.⁵¹

In his *Astronomical principles of religion*, which was published only four years after his 1713 summer lectures on Newtonian astronomy, Whiston emphasizes this point:

... the Creator of the World, does also exercise a continual *Providence* over it, and does interpose his general, immechanical, immediate *Power*, which we call the *Power of*

⁴⁹ As Snobelen has demonstrated, Newton, while circumspect in his published writings about endorsing any hypothesis about the cause of gravity, many people, e.g., Nicolas Fatio de Duillier, David Gregory, Christopher Wren, and William Whiston, knew that Newton connected God to gravity as its cause. Whiston, the honest Newtonian, explicitly makes this causal connection between God and gravity in both his *Astronomical principles* and his public lecture courses on experiment. See Snobelen, 'William Whiston', chap. 3, notes 5, 6, 7, and 8.

⁵⁰ Whiston, *Astronomical principles*, 111-2.

⁵¹ Newton, *The Correspondence of Isaac Newton*, ed. H W Turnbull, et al. (7 vols., Cambridge, 1959-77), III, 336.

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*Gravity, as also his particular immechanical Powers of Refraction, of Attraction, and Repulse, &c. in the several particular Cases of the Phaenomena of the World; and without which all this beautiful System would fall to Pieces, and dissolve into Atoms.*⁵²

Newton also claims, in a memorandum of a conversation with David Gregory in 1694, that ‘a continual miracle is needed to prevent the sun and fixed stars from rushing together through gravity’.⁵²

To unbalance the Earth from its orbit and to cause planets and suns to run ‘lawless’ through the sky, God has only to cease to sustain the law of gravity. Given Pope’s attendance at Whiston’s lectures in 1713, God’s providentially-ordained and providentially-sustained force of Gravity possibly may inform Pope when he writes that all of Nature should consequently ‘tremble to the throne of God’ (I, 256).⁵³

The quest to understand Newton and his influence

Pope obviously draws from a great many sources when crafting his *Essay on man* but, even so, the poem, especially in the first Epistle, possesses distinctively Newtonian echoes. As F E L Priestley first recognizes, Pope holds the Newtonian view of the unfettered power of the divine will and not Lovejoy’s conception of the Great Chain of Being. From this beginning, other similarities follow as Priestley has also shown especially a mistrust of those ‘gloomy clerks’ on the ‘high Piori’ road who pretend to know how God must create the world in accordance with necessary rationalistic principles such as Plenitude and Continuity and a subsequent reliance upon the design inference to a Creator of absolute freedom. However, Pope has a clear understanding about the inherent limitations of the design inference due to the inherent weakness of reasoning causally

⁵² As Snobelen has made clear, a vital physico-theological element of Whiston’s *Scheme of the solar system* which he uses as a prop in the lectures attended by Pope in 1713, is the fact that God has designed the solar system with such care that no “cataclysmic collisions” result when comets return to the solar system from deep space. See note 28.

Holy Grail, (Almost) Wholly Newton

from empirical observations in one part of nature to the cause of the whole. Pope seems to understand the theological implications of this key feature of Newton's methodology even better than Newton who formulates his fourth rule but then largely ignores it in his supremely confident statement of the design inference to an intelligent and sovereign *Pantokrator*. Thus, while Pope is not wholly Newtonian – in the sense of being a lock-step follower of the great natural philosopher's confidence in the design inference – at that precise point Pope is, in fact, a better Newtonian methodologist, than Newton himself. Despite this dissimilarity of emphasis regarding the strength and reliability of the design inference, Pope shares Newton's provisional belief in the binding natural laws ordained – so far – by 'the great directing MIND of All' and, more speculatively, the idea, possibly learned from Whiston, that the power of God is such that by simply ceasing to sustain those laws, planets and suns may run 'lawless' through the sky if God ordains it in the future.

Dan Brown's use of Pope and Newton to propel the plot of his adventure novel may not be historically accurate but it at least serves as the opportunity to reassess Newton and Pope's often similar, and occasionally dissimilar, points of view regarding the limitations of human knowledge, regarding created nature and the nature of God. Certainly, there will be no Hollywood film based on Newton's and Pope's voluntaristic theory of the unfettered power of God but at least there is no exotic, imaginary conspiracy to cover up this particular grail quest.

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NEWTON AND THE PARISIAN ACADEMIE ROYALE DES SCIENCES, 1699-1727*

Lisa Mullins

In his *éloge* of Sir Isaac Newton, Bernard le Bovier de Fontenelle, the secretary of the Paris Académie Royale des Sciences, wrote that Newton's 'philosophy was adopted by all of England: it dominates in the Royal Society and in all the excellent works it produces, like [Newton's work] was marked with respect by the long passage of time'.¹ Fontenelle was not exaggerating: by the middle of the eighteenth century, Newtonianism dominated English natural philosophy, and any natural philosophical practice not constructed on Newtonian doctrine was considered 'absolutely *wrong*'.² Dissent from this Newtonian orthodoxy was often treated with contempt, outright mockery, and attempted banishment from the community of serious natural philosophers. Not only did Newtonian principles dominate natural philosophy, but they were also influencing other intellectual fields, including medicine, theology, and politics.³ In short, Newtonian ideas were taking over British society and culture at large.⁴

* My thanks to Stephen Snobelen and the two anonymous referees for their constructive comments. Special thanks to Patricia Fara, under whose guidance this project began as my MPhil dissertation.

¹ Bernard le Bovier de Fontenelle, 'Éloge de M. Newton', *Œuvres complètes*, ed. Alain Niderst (9 vols., Paris, 1990-2001), VII, 128. All Fontenelle citations come from this edition of his works, unless otherwise noted. All translations from the French are the author's own, unless otherwise noted.

² *Monthly Review*, 20 (1759), as cited by Patricia Fara, *Newton: the making of genius* (London, 2002), 25.

³ J T Desaguliers' allegorical poem, *The Newtonian system of the world, the best model of government* (1727), composed in honour of the coronation of George II, is one of the best examples of such cross-discipline uses of Newton's philosophy.

⁴ For a specific discussion of the role of Newtonianism and industrialism, see Larry Stewart, *The rise of public science: rhetoric, technology, and natural philosophy in Newtonian Britain, 1660-1750* (Cambridge, 1992) and Margaret C Jacobs and Larry Stewart, *Practical matter: Newton's science in the service of industry and empire, 1687-1851* (Harvard, 2004); for an examination (and an often exaggerated argument) of Newtonianism and English politico-religious affairs, see Margaret Jacob, *The Newtonians and the English Revolution 1689-1720* (Ithaca, 1976). Fara provides an

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Alongside the celebration of his work, a complementary sense of awe grew up around Newton the man. Any cursory study of Newton and Newtonianism reveals that even before his death, Newton was being presented as somehow removed from humanity, as semi-divine. Alexander Pope's (in)famous epitaph is one of the best examples of this type of hyperbolic praise: 'Nature, and Nature's Laws lay hid in Night./God said, *Let Newton be!* and All was *Light*'.⁵ Even the inscription on his tomb in Westminster Abbey conveys this idea: 'Let Mortals rejoice That there has existed such and so great an Ornament to the Human Race'.⁶ Throughout the eighteenth century, Newton was increasingly celebrated as a secular saint; copious amounts of poems, statues, paintings and engravings, medallions, and other commemorations were produced in just the first fifty years following his death.⁷

Until the past thirty years or so, modern historians have continued this deification, claiming that Newton and his work were the culmination of the so-called 'Scientific Revolution', and that all work in physics and mechanics in the eighteenth century was simply extrapolated and expanded from Newton's texts. However, across the Channel, another hallmark of the Scientific Revolution did not believe in Newton's theory of universal gravitation until the 1740s. The Parisian Académie Royale des Sciences was the foremost scientific society of the eighteenth century; it was the first modern, state-funded research institution devoted to the study of nature and technology. Before 1727, Newton's work was hardly discussed in the Académie at all. The 'problem' of Newton in France is mentioned frequently by Newton scholars, most echoing Voltaire's

excellent illustration of how Newton became the first 'scientific genius' and a national hero, invading all aspects of English culture in her *Newton: the making of genius*.

⁵ John Fauvel et al., 'Introduction', *Let Newton be!*, ed. John Fauvel et al. (Oxford, 1988), 1. This is just one of literally hundreds of English poems about or dedicated to Newton. For a wider selection, see Fauvel et al., *Let Newton be!*; Fara, *Newton: the making of genius*; and Patricia Fara and David Money, 'Isaac Newton and Augustan Anglo-Latin poetry', *Studies in the History and Philosophy of Science*, 35 (2004), 549-71.

⁶ Fauvel et al., *Let Newton be!*, 20.

⁷ Fara, *Newton: the making of genius*, 3, 18; Fauvel et al., *Let Newton be!*, 20. Numerous examples of the frontispieces, engravings, statutes and artworks done in Newton's honour can also be found in these two works, as well as Milo Keynes, *The iconography of Sir Isaac Newton to 1800* (Woodbridge, 2005).

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explanation for the French reaction to Newtonianism: the French, out of patriotism, national pride, and philosophical stubbornness, were wedded to Cartesian physics and thus resisted the truth of Newton's principles.⁸

This article presents an alternative explanation for the 'problem' of Newton in the Académie: Newton the man. The structure and workings of the Académie were firmly anchored in *ancien régime* values, such as *honnêteté*, *politesse*, and *sociabilité*. Furthermore, the formal and informal institutional structure and work-load of the Académie demanded personal intellectual and social exchange. I argue that it was these expected norms of academic sociability and Newton's inability to conform to these norms that partly explain why the foremost scientific institution of the time did not seriously debate the foremost scientific mind of the time. Once Newton had died, the Académie, through Fontenelle's *éloge*, was free to divorce Newton from Newtonian mathematics, physics and mechanics, and was also able to fashion Newton as a model academician.

The importance of sociability, politesse, and character

From its beginning in 1666, the Académie Royale des Sciences was extremely well-funded and recognized as the leader in all things related to mathematics and the investigation of nature.⁹ However, the institution had no written statutes, and no formal legal recognition. In February 1699,

⁸ Voltaire, *Lettres philosophique ou Lettres anglaises*, ed. Raymond Naves (Paris, 1964), 70-6. J B Shank's *The Newton wars and the beginning of the French Enlightenment* (Chicago, 2008) is the latest and best consideration of Newton in the Académie. However, Shank's focus is on the 1730s, after Newton's death. He does provide several discussions of various academicians' engagement with Newtonian mathematics and mechanics before 1730, but does not consider the dynamics of the Académie as an institution in enough detail. But Shank's 'Before Voltaire: Newtonianism and the Origins of the Enlightenment in France, 1687-1834' (PhD dissertation, Stanford University, 2000) provides a detailed discussion of the mathematical climate in France in the early years of the 1700s, as well as an excellent account of the mathematical reception of Newton's work during his lifetime.

⁹ The best overall study of the Académie is Roger Hahn's *The anatomy of a scientific institution: the Paris Academy of Sciences, 1666-1803* (Berkeley, 1971). For the pre-1699 Académie, see Fontenelle's lengthy introduction to *Histoire et mémoires de l'Académie Royale des Sciences, depuis son établissement en 1666 jusqu'à 1699* (11 vols, Paris, 1729-1733); Alice Stroup, *A company of scientists: botany, patronage and community at the seventeenth-century Parisian Royal Academy of Sciences* (Berkeley,

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after a decade of *renouveau*, or renewal and reorganization, Louis XIV gave the Académie a written constitution that drastically changed the membership and institutional structure of the group. The Académie was enlarged significantly, including permitting the election of foreign members: Newton was elected *associé étranger* 21 February 1699, filling the last of the eight places for foreign associates.¹⁰ The *règlements* of 1699 also officially declared it the judge of all matters scientific in France, demanded publications of its members, explicitly encouraged academicians to engage in correspondence with non-academicians and delineated that the Académie make its activities known to the public in a number of ways.

Hand in hand with the demand of publicity was the role of *secrétaire perpétuel*. Bernard le Bovier de Fontenelle (1657-1757) was elected to the Académie in 1697 as a mathematician. His election was more a reflection of his prodigious literary talents and his friendship with mathematician Pierre Varignon than his success or his promise of success in the sciences. Fontenelle took over as secretary of the Académie shortly after his election, before the job was defined formally. From 1699 to his retirement in 1740, Fontenelle managed the Académie's records, kept minutes of all meetings, managed the day-to-day business of the Académie, oversaw all aspects of its publications, had responsibility for the institution's official communications with other intellectuals and the general public, authored its yearly history, and served as the public persona of French official

1990); and Stroup, 'Royal Funding of the Parisian Académie Royale des Sciences during the 1690s', *Transactions of the American Philosophical Society*, n.s. 77, pt 4 (1987). David Sturdy's *Science and social status: the members of the Académie des Sciences, 1666-1750* (Woodbridge, 1995) contains the best scholarly assessment of the 1699 reform, as well as a fascinating prosopography of the academicians. Fontenelle's 'Histoire du renouvellement de l'Académie Royale des Sciences en M.DC.XCIX', first published as a preface to the first volume of the *Histoire et mémoires* in 1699 is the first history of the Académie to appear in print.

¹⁰ Archives of the Académie des Sciences, *Registres manuscrits des Procès-verbaux des séances de l'Académie royale des sciences de Paris*, vol. 18, f. 125r. The *procès-verbaux* will hereafter be cited as *p-v*.

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science.¹¹ Fontenelle and Abbé Jean-Paul Bignon, Pontchartrain's nephew and *honoraire* academician, were largely responsible for the *réglements*, the identity of the Académie, its internal workings, and its public presentation and success.

The 1699 regulations clearly demonstrated the Académie's desire to appeal to elite society and to partake in the international republic of letters. At the turn of the eighteenth century, the new study of nature was still defining its goals, methods, audience and self-image. The Académie realized that one sure way to legitimate itself and its object of study was to make it appealing to elite society, which, at the time, meant taking the manners of the *salons*, *cafés*, theatres and literary societies of Paris. The most visible strategy of the Académie in its bid for reputation was Fontenelle's appointment as secretary; he was the leading *salonnier* and *homme d'esprit* in Paris.

Politeness and sociability were also important in the republic of letters. At the heart of the republic of letters was the communication of ideas, a practice requiring much social interaction.¹² The simplest medium of communication was conversation, though a *commerce des lettres* was an acceptable equivalent. The importance of personal contact, whether it be via a letter or conversation, should not be underestimated in the diffusion of knowledge. Leibniz's calculus achieved such prominence in the late seventeenth-century and early eighteenth-century Paris because of personal contact. Jacques Bernoulli read Leibniz's 1684 paper on the calculus, and wrote to Leibniz. Enamoured with the new method, Jacques taught it to his younger brother Jean Bernoulli, who, in turn, while visiting Paris in 1691, passed it on to Malebranche and l'Hôpital, who in turn taught it to Varignon and Fontenelle, who then demonstrated it enthusiastically at meetings of the Académie. Leibniz's publication did

¹¹ Stephen Gaukroger's 'The Académie des Sciences and the Republic of Letters: Fontenelle's Role in the Shaping of a New Natural-Philosophical Persona, 1699-1734', *Intellectual History Review*, 18 (2008), 385-402, was brought to my attention too late to incorporate into the present article. However, much of his excellent article is outside the scope of this work.

¹² Anne Goldgar, *Impolite learning: conduct and community in the Republic of Letters* (New Haven and London, 1995), 152-3.

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not have an immediate effect on the mathematical world of Europe; Jean Bernoulli's contact with other savants did.¹³

Regulation xxvii of the *renouveau* established formally the international *commerce de lettres*, dictating that academicians were to correspond with provincial and foreign savants for the advancement of knowledge.¹⁴ Being an active 'republican' was now a positive requirement for promotion in the Académie. And the institution followed its new rules: on 7 March 1699, on instructions from Bignon, Étienne-François Geoffroy wrote to Hans Sloane: 'In that purpose Our Academy desiring to intertain [sic] correspondence with the Royall Society, I have offered my self for imparting the Society, by your means, with it that will be here new, curious, and worthy to be communicated to it. and [sic] also I have given hopes that mutually you will communicate to the Academy that will be there new and curious.'¹⁵ Regulation xxvi instituted another trademark of the republic of letters, that of moderation in disputes: 'In the occasions when several academicians are of different opinions, they will not use any harsh terms of contempt or scorn against one another'.¹⁶ The inclusion of these provisions in the statutes of the Académie demonstrates how important this ideology of *politesse* and *civilité* was thought to be for the production of natural knowledge.

Several of the most striking examples of academicians displaying this ideology come from the voluminous correspondence between Jean I Bernoulli and Pierre Varignon, and Sloane and Geoffroy.¹⁷ Election to the Académie was, to a certain degree, seen as a favour, resulting in an obligation not only to communicate ideas and news, but to do so politely.

¹³ Henry Guerlac, *Newton on the Continent* (Ithaca, 1981), 57. The elder Bernoulli brothers will be referred to as Jacques (Jakob) and Jean (Johann), respectively, as that is how they were known to Parisian academicians. For biographical information on all the academicians mentioned in this article, see the Institut de France's *Index biographique de L'Académie des Science 1666-1978* (Paris, 1979).

¹⁴ [Fontenelle], 'Histoire du Renouveau', *Œuvres complètes*, VI, 60-1.

¹⁵ Geoffroy to Sloane, 7 March 1699, British Library, Sloane Ms. 4038, f. 88r. This correspondence lasted until the death of Geoffroy in 1731. All letters between Geoffroy and Sloane can be found in the British Library Sloane papers.

¹⁶ [Fontenelle], 'Histoire du Renouveau', *Œuvres complètes*, VI, 60.

¹⁷ Any references to Bernoulli or Geoffroy indicate Jean and Étienne-François, respectively. Other members of both families will be identified by first and last name.

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In his letter to Bernoulli of 19 February 1699, in which Varignon recounted the story of the *renouvellement* and Bernoulli's subsequent election as *associé étranger*, Varignon instructed Bernoulli to send two letters of thanks – one to Bignon and one to 'la Compagnie'; Geoffroy makes the same requests of Sloane.¹⁸ Both replied as directed, their letters full of self-abasement, and full of praise for the Académie and Bignon for furthering the study of nature and the republic of letters.¹⁹

Perhaps the best evidence for the importance of a man's character in the Académie comes not from public discussions and practices, but from the private lives of the academicians. Varignon kept an eye on Bernoulli's nephew during his course of study in Paris, lending him money and attempting to keep him out of trouble.²⁰ There were many ties binding academicians together: several had lodgings in the Bibliothèque du Roi, while the astronomers and others had rooms at the Observatory. The academicians attached to the Jardin des Plantes worked together every day.²¹ Meetings of the Académie were small, intimate gatherings; the *procès-verbaux* reveals that there were between seventy and seventy-five meetings a year, with, on average, twenty-six academicians in attendance at each.²² Given the cultural context of the Académie, it is likely that while there were no formal processes of socialization between members, many

¹⁸ Varignon to Bernoulli, 19 February 1699, *Briefwechsel von Johann I. Bernoulli*, ed. O Spiess, Pierre Costabel, and Jeanne Peiffer (3 vols., Basel, 1955, 1988, 1992), II, 217; Geoffroy to Sloane, 21 January 1709, Sloane Ms. 4041, f. 273v.

¹⁹ Bernoulli to Bignon, 28 February 1699, and Bernoulli to Académie Royale des Sciences, *Briefwechsel von Johann I. Bernoulli*, II, 218-20. While Sloane did send both requested letters, as the letter from Geoffroy to Sloane of 8 July 1709 confirms (Sloane Ms. 4041, f. 315r), his replies are lost.

²⁰ See the letters from August 1706 to March 1708. The exchanges between the two mathematicians about Bernoulli's nephew are some of the best moments of the correspondence. Varignon's descriptions of the trouble one young man could get into in early eighteenth-century Paris offers remarkable access to everyday life in Paris, including the cost of common items.

²¹ Stroup, *A company of scientists*, 15, 41; Sturdy, *Science and social status*, 408.

²² The *p-v* for each meeting consists of a list of members present, and the activities of the day: who read what paper, what letters were received and read, what experiments or demonstrations were done before 'la Compagnie', what committees were struck to evaluate a submitted invention or book, the reports of committees, and any appointments to the Académie and the deaths of members.

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would have frequented the same cafés and *salons*.²³ For instance, several academicians, including Fontenelle and Maupertuis, were regulars at the Café Gradot in the late 1720s and 1730s. In Parent's *éloge*, Fontenelle mentioned that Parent named de la Faye to be his executor; in Homberg's *éloge*, it is noted that he married Dodart's daughter. Fontenelle made sure to note that it was a marriage based on mutual affection and nothing more.²⁴ In both their *éloges*, it is noted that Leméry and Regis lodged together for most of their adult lives.

Historian David Sturdy has shown there was a myriad of ties binding academicians together. Quite a few academicians had investments in the same company involved in navigation rights on the River Seine. When Du Hamel fell ill, Du Verney took care of him. Nicole and Montmort shared lodgings for many years, as did Boulduc and Gross. Mathieu-François Geoffroy, father of Étienne-François and Claude-Joseph, both academicians, hosted an informal scientific salon in his apothecary shop which was attended by quite a few academicians, including Cassini I, Du Verney, and Homberg. When Claude-Joseph Geoffroy died, he left his cabinet of natural history to Bernard de Jessieu, a fellow academician.²⁵ Of course, as in any academic institution, some academicians disliked others for both personal and professional reasons, but congenial acquaintance, friendship, and affection were the norm.²⁶

When one considers the ties that bound both domestic and foreign academicians together, it is somewhat surprising, regardless of his achievements, that Newton was elected to the Académie in 1699. The other seven *associé étranger* had firm personal and professional connections to the Académie. In fact, four of the new *associés étrangers* were already academicians.²⁷ Newton, on the other hand, had no

²³ Fontenelle and Marain, for example, were both active members of the salon of Madame Tencin.

²⁴ Fontenelle, 'Éloge de Monsieur Homberg', *Œuvres complètes*, VI, 333.

²⁵ Sturdy, *Science and social status*, 232, 322, 352, 380, 324, 327.

²⁶ The letter from Varignon to Bernoulli, 30 June 1702, *Briefwechsel von Johann I. Bernoulli*, II, 318-19, is just one of many examples of Varignon's intense dislike of Michel Rolle. He also believed a handful of other academicians unworthy of the title.

²⁷ Tschirnhaus, Hartsoëker, Leibniz, and Roëmer were all elected to the Académie in the 1680s. In 1699, with the formal statutes, their membership category changed to that of *associé étranger*.

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connection with any academician; he was the only Englishman proposed for membership. He did not have a *commerce de lettres* with anyone in Paris, had never visited Paris, and was not fluent in French.²⁸ Newton did not send a letter to Bignon, Fontenelle, or the Académie upon his election, as all the other foreign associates did. Interesting remarks on Newton's character are found in a pair of letters from Geoffroy, one from 1709 and the other from 1711, both relating to the election of *associés étrangers* to the Académie. When discussing Sloane's election, Geoffroy mentioned that the position came with responsibilities: every foreign member must subscribe to the 1699 *règlements*, and they must 'contribute to the best of their abilities to the advancement of the sciences and to the illustrious Académie, and to impart to the company from time to time what they have learned regarding the sciences'.²⁹ Newton had done none of these, implying that he was not a good academician. In a letter of 1711, Geoffroy asked Sloane to make sure Lord Pembroke wished to be elected *associé étranger*, and was blatant in the Académie's annoyance at Newton's behaviour towards the Académie: 'But as you know, Mr. Newton, for example, was named in this way, and he scorned this mark of distinction. The Company does not want to risk naming another person who might be indifferent while there are so many others who eagerly work and wish for this election.'³⁰ Though Geoffroy acknowledged that Newton was elected without his approval, he cannot understand why someone such as Newton would turn down such an honour.³¹ Geoffroy's remarks to Sloane cannot be taken as isolated thoughts: Geoffroy was not a close

²⁸ In fact, Newton never left England. Many years after his election to the Académie, in the 1710s, Newton – as President of the Royal Society – received and welcomed visiting academicians to meetings to the Society.

²⁹ Geoffroy to Sloane, 18 April 1709, Sloane Ms. 4041, f. 315v.

³⁰ Geoffroy to Sloane, 2 June 1711, Sloane Ms. 4042, f. 268v.

³¹ In 1698, before the *renouveau* had really begun, Cassini, at the behest of Pontchartrain and most likely Bignon, offered Newton a position in the Académie similar to his own; to claim Louis XIV's generous *pension*, Newton would have to move to Paris. Newton obviously declined the offer. See Westfall, *Never at rest*, 587. Geoffroy, and probably most other academicians, believed the *associé étranger* position was ideal – Newton got more personal glory, was able to contribute to the Académie, yet remained in his native land – making Newton's refusal to participate all the more surprising.

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acquaintance of either Bignon or Fontenelle; the lack of contact from Newton must have been remarked on at meetings, or in discussions between academicians. In a letter to Newton in 1714 on behalf of the Académie (thanking him for a gift copy of the second edition of the *Principia*), Fontenelle scolded Newton for his antisocial behaviour: ‘Presently, Monsieur, you have a place in our Académie ... the Académie begs of you, Monsieur, to from time to time inform it of your new work, like Mr. Leibniz, Mr. Bernoulli, and the other foreign associates do’.³² Newton’s antisocial behaviour was in opposition to most everything the Académie aspired to and the republic of letters idealised.

Newton’s work and the Académie, 1699-1726

From the *procès-verbaux* and the rest of the archives, we can get some sense of the presence of Newton and his philosophy in the early eighteenth-century Académie. Prior to his election, Newton was mentioned by name in the *procès-verbaux* once, in 1672, in a paper by Christiaan Huygens about the reflecting telescope.³³ In 1699, Newton’s name was found once, under the list of elected *associé étrangers*. From 1700 to 1726, Newton was mentioned by name in the meeting records on average three times a year; though in 1702, 1703, 1712, 1720 and 1721, the *procès-verbaux* recorded no mention of Newton at all. Most mentions of Newton are short. A typical Newton reference is found in the 1713

³² Fontenelle to Newton, 4 February 1714, *The correspondence of Isaac Newton*, ed. H W Turnbull et al. (7 vols., Cambridge, 1959-1977), VI, 59-60. Newton and Fontenelle exchanged several letters after 1714. However, they were all administrative, thanking each other for gift copies of various books, and for electing members of the Académie to the Royal Society and vice versa. These letters can all be found in Newton’s published correspondence.

³³ Of course, the *Principia* was reviewed by French-language journals, which academicians read. The most widely read periodical was the Paris-based *Journal des Sçavans*; several academicians over the years were editors and reviews, including Fontenelle. The first French review of the *Principia* is in the *Journal des Sçavans*, 2 August 1688. It also published reviews on the *Opticks* in 1707 and the *Arithmetica universalis* in 1708. For a discussion of contemporary reviews of Newton’s work, see I Bernard Cohen, ‘The review of the first edition of Newton’s *Principia* in the *Acta eruditorum*: with notes on the other reviews’, in *The investigation of difficult things: essays on Newton and the history of the exact sciences, in honour of D T Whiteside*, ed. P Harman and A E Shapiro (Cambridge, 1992), 323-53.

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‘Reflexions sur les observations des Marées’ by Cassini II. The first paragraphs of his essay are summaries of various explanations for the movement of the tides, including Newton’s thoughts from the first edition of the *Principia*. Cassini II did not systematically explain nor refute Newton’s arguments; he recognized the importance of Newton’s work by including the theory as one that should be accounted for when discussing tidal motions, but did not consider it important enough to enter into a serious dialogue with it.³⁴ If Newton came up in any of the mathematical papers in this period, it was not in the context of a discussion of his mathematics or physics, but, rather, as a mention in passing that Newton solved a similar problem using geometry, or that he proposed a similar problem in the *Principia*.³⁵

The one exception to this pattern in the Académie was in 1706-1707. In January 1706, Geoffroy received a copy of the 1704 English edition of the *Opticks* from Sloane.³⁶ Geoffroy diligently read a detailed summary of the work to the Académie over ten months, at ten different meetings. Unfortunately, Geoffroy’s work was not transcribed in the *procès-verbaux*, nor does it survive anywhere in the archives of the Académie. One must assume that Newton’s theory of light and colours and his optical experiments were discussed in some detail, but, judging from the *procès-verbaux* and the *Histoire et Mémoires* for those years and one immediately following, Geoffroy’s reading did not inspire any work on Newtonian optics. There is no question that the majority of academicians had read Newton’s *Principia* and his *Opticks* (once translated), and understood both works.³⁷ There are hundreds of letters between Varignon and Bernoulli discussing both works, and it is clear from their published articles that the rest of the mathematicians, astronomers, *mécaniciens*, and other academicians (like Geoffroy the chemist) were quite familiar with Newton’s work, even though they refused to cite him by name. The Académie was also aware of Newton’s growing fame and importance,

³⁴ *p-v*, 5 August 1713, vol. 32, f. 303v.

³⁵ For such a reference, see Maupertuis’s *Mémoire*, *p-v*, 14 December 1726, vol. 45, f. 324r.

³⁶ Geoffroy to Sloane, 30 January 1706, Sloane Ms. 4040 f. 144r.

³⁷ For more information on French translations of Newton’s *Opticks* and the role of Varignon, see Jean-François Baillon’s contribution to this volume.

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especially in England and Holland. Yet, the academicians refused to discuss Newton's work by name. Newton's work was not discussed in the Académie before his death in any significant way due to his lack of personal contact with other academicians. In addition to conforming to expected standards of *politesse* and sociability, an amiable personality and sustained personal interactions with various academicians was necessary to an academician's intellectual success in the Académie. Academicians who were sociable had more opportunities to present papers during meetings and publish in the annual periodical, *Histoire et Mémoires*.³⁸ This was the case due to several informal practices in the Académie, namely, the tendency to intellectual dialogue and insularity, the publications committee, and the prominence of Bignon and Fontenelle.

However, before looking at these informal structures, there are several significant statutory or formal reasons why Newton's work was not discussed in the Académie; had Newton been a sociable academician, these statutory constraints would have been easily overcome. The epistemology of the Académie, its formal disciplinary structure and its overwhelming workload prevented discussion of inactive members' discoveries and beliefs, especially scientific work that was not easily classified.

From the *renouveau* and the first public declarations of methodology, a pronouncement that was repeated again and again was that 'no general system' of knowledge would dominate the Académie. Systems were dangerous: 'once established, they modify or resist all truths that come after'.³⁹ This fear of knowledge systems was driven by

³⁸ The full title is *Histoire de l'Académie Royale des Sciences. Année ---. Avec les mémoires de mathématiques et de physique, pour la même année. Tirée des registres de cette académie*. This annual periodical comprised two distinct sections: the *Histoire* was written by Fontenelle (the secretary), and self-consciously aimed at a non-specialist audience. It provided summaries of academic papers, book reviews, and *éloges*. The *Mémoires* were essays by academicians. Publication of the volume was usually two to three years behind (*i.e.*, the volume for 1717 was published in 1719). The two sections will be cited as *HARS* and *MARS*, respectively.

³⁹ Fontenelle, 'Préface sur l'utilité des Mathématiques et de la physique et sur les travaux de l'Académie des Sciences', *Œuvres complètes*, VI, 49. This 'Préface' was first published in the 1699 *Histoire et Mémoires*.

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the incredible lasting power of Aristotelian scholasticism, which was still taught in all French schools throughout the period. The claim that the Académie was ‘Cartesian’ is not accurate: the overwhelming majority of academicians did not believe in the entirety of Cartesian physics, but, rather, only pieces of it and the Cartesian method of doubt and self-discovery. Academicians were encouraged to treat nature in small pieces, to gather as many facts as possible; as such, ‘the collections the Académie presents to the public every year [the *Histoire et Mémoires*] will be composed of detached pieces of knowledge, independent of one another’.⁴⁰ This distrust of systems was also inspired by a sense that there were limitations to human knowledge; academicians were encouraged to posit causes for natural phenomena, but not to assume these conjectures to be true. The academicians’ work was never done, and no science was anywhere near complete.⁴¹ This ideology is blatantly evident in the style of astronomy practised in the Académie. In an article called ‘Sur les mouvements de Jupiter et de Mars’ (in which Newton was not mentioned), Fontenelle wrote, ‘We must always observe [the heavens], whether to confirm the hypotheses we have established, or whether to make necessary changes to those hypotheses. We can say that astronomy is always moving, just like the stars.’⁴² So many of the astronomical *memoires* were lists of celestial observations, with little mathematics, interpretation, or philosophical speculation; many articles were about the same event, reported on by different academicians in different locations.⁴³ Given their style, it is clear why Kepler, Halley and Flamsteed were frequently cited and discussed by Académie astronomers. According to Newton himself and his proponents, the greatest quality of Newtonianism lay in the totality of its explanatory power.⁴⁴ Even before they had read the

⁴⁰ Fontenelle, ‘Préface sur l’utilité’, *Œuvres complètes*, VI, 49.

⁴¹ *HARS 1708*, 11.

⁴² *HARS 1706*, 95.

⁴³ See *MARS 1715* and the set of *mémoires* by Maraldi, de la Hire, Cassini II, Louville, and Delisle *le cadet* on the solar eclipse for an example of the comparative style of observational astronomy so characteristic of the Académie.

⁴⁴ Betty Jo Teeter Dobbs and Margaret C Jacob, *Newton and the culture of Newtonianism* (Atlantic Highlands, 1995), 76. Throughout *Never at rest*, Westfall notes and explains Newton’s propensity to derive grand systems from nearly all his work.

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Principia, Newton's work was suspect; a dialogue, whether in conversation or by correspondence, with the author was the only way to overcome such suspicion.

The practice of treating nature in small pieces was reflected in the structure of the Académie, which divided academicians into different subject groups: *géométrie*, *astronomie*, *mechanique*, *anatomie*, *chimie*, and *botanique*. These divisions were not exhaustive, and academicians did move from one subject area to another; however, by assigning academicians to specialities, it created a sense that no one person was capable of creating an all-encompassing system of the world. By classifying projects, the Académie was subjecting work to a set of assumptions, inherent in any classification system, about what a work was. Regarding the category *physique*, the *Histoire* stated: 'Today we are quite persuaded that *physique* must only be treated by experiments.'⁴⁵ The academicians were convinced of Newton's work on light and colours after seeing the successful replication of his self-described 'crucial' experiment. While mathematics had a role to play in the design of experiments and the explanation of the results, there was no necessary connection. The Académie created a divide between pure mathematics and applied mathematics; an illustration of this is Fontenelle's comments on the problem of estimating the carrying capacity of a ship, known as *jaugeage*: '[M. Bouguier] compared the actual values to the ones determined by M. Varignon and M. Hacquart ... All things said, pure geometry, in good grace, must excuse itself on the issue of *jaugeage*, leaving it to the care of imperfect geometry, which proceeds by trial and error.'⁴⁶ On geometry, Fontenelle wrote, 'Nature is not obligated to execute all the abstract ideas of geometers'.⁴⁷ Much of the mathematics done in the Académie was done for the pure enjoyment of solving complicated mathematical problems. Most discussions or mentions of Newton's work fell under *géométrie* in the *Histoire et Mémoires*, and only

⁴⁵ *HARS 1724*, 1. It is difficult to find a modern English equivalent for the *physique* – it resembles modern physics somewhat, but it also encompasses aspects of natural history and geology, and even some biology.

⁴⁶ *HARS 1721*, 51.

⁴⁷ *HARS 1710*, 120.

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occasionally in *astronomie* and *mechanique*; the Académie considered Newton's works as ones of mathematics and nothing more. The academicians had a very particular understanding of Newton's *Principia* because of this disciplinary divide: only those classed as *géomètres* were considering its ideas (or at least some of its ideas) seriously.⁴⁸ When aspects of Newton's work were discussed, rarely was Newton's name attached to these discussions, a practice that was quite rare in the extremely personal Académie.

Perhaps the most significant reason why non-participant academicians' work was not discussed is related to the busy workload of the Académie. Article xxi of the 1699 *règlements* designated the Académie as judge and arbiter of all technological and scientific patent applications and legal disputes. This function took up more time as our period progressed. Also, Article xxx dictated that all texts by academicians had to be examined by a committee before publication. Ad hoc committees made up of two or three academicians were charged with these reviewing functions; they had to examine the work or patent application in question, and write out a detailed report, which had to be delivered at meetings. The Académie was a busy institution, and its members had many commitments (in addition to external occupations); it was much more likely that academicians would investigate a problem that they could expect detailed comments on, something that they could discuss with other academicians. Furthermore, in any given year Newton's work had absolutely no place in roughly fifty percent of discussions in the Académie. Equal time and attention were given to all six academic categories, and to other disciplines not included formally, like cartography. It was not the case that academicians discussed mathematics, physics and mechanics all the time and failed to discuss Newton's works. In meetings, there were more

⁴⁸ This is an extremely general characterization of mathematics in the Académie. For a more detailed discussion, see Shank, 'Before Voltaire' and *The Newton wars*; Gaukroger, 'The Académie des Sciences and the republic of letters'; Michel Blay, 'Du fondement du calcul différentiel au fondement de la science du mouvement dans les *Éléments de la géométrie de l'infini* de Fontenelle', *Studia Leibnitiana*, 17 (1989), 99-122; and Blay, *Reasoning with the infinite: from the closed world to the mathematical universe*, trans. M B DeBevoise (Chicago, 1998).

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papers devoted to anatomy and observational astronomy than mathematics or physics. In the *Histoire*, articles were spread evenly across the disciplines, while various subjects occasionally dominated in the *Mémoires*, depending on the year. However, mathematics, physics, and mechanics were never in a position of domination.⁴⁹

Informal practices in the Académie also worked against discussion of Newton's work. In many respects, the Académie was intellectually insular. A glance at the *procès-verbaux* for any year reveals a remarkable dialogue between academicians, over many essays and experiments, over the course of many months. In 1700 and 1705, for example, almost a quarter of all papers read at meetings had to do with experiments with the barometer. Even Bernoulli participated in these debates by sending his results and papers to Varignon to read at meetings.⁵⁰ The majority of published *mémoires* were responses to other *memoires* or papers read at meetings or published in previous volumes. The academicians depended on one another to inspire work or to push it in new directions. Even in print, academicians were sociable with one another.

Another informal structural feature of the Académie that affected the reception of Newton's work was the committee responsible for the *Histoire et Mémoires*. Until 1731, there were no official regulations for the *Comité de Librairie*, which controlled the entire published output of the Académie. In 1700, the academicians decided for themselves that the *comité* would be composed of a handful academicians, but no more than six – Fontenelle, as secretary, was the only permanent member.⁵¹ The committee met once a month in secret, edited all papers, and all of its decisions were final. The *Mémoires* are in no way the sum of all the topics

⁴⁹ For example, in 1713, mathematics made up sixteen percent of articles, whilst anatomy and medicine made up twenty percent; chemistry articles were twenty percent, astronomy ten percent, and natural history and botany ten percent.

⁵⁰ For example, see the letters between Bernoulli and Varignon from 4 September 1700 to 30 December 1700, in *Briefwechsel von Johann I. Bernoulli*, II.

⁵¹ Archives of the Académie des Sciences, Dossier Général 31, 'Collection Réglements et Délibérations de L'Académie Royale des Sciences', 23. For more on the Comité de Librairie, see James E McClellan III, 'Specialist Control: The Publications Committee of the Académie Royale des Sciences (Paris) 1700-1793', *Transactions of the American Philosophical Society*, n.s. 95 (2003).

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discussed during the year at the Académie; the committee had a large selection of material to choose from. It was not a coincidence that Varignon, one of Fontenelle's closest friends, was one of the most frequently-published academicians. Fontenelle alone wrote the *Histoire*, which was by far the most read part of the periodical; it sold out every year, and was subject to several unauthorized reprints. While he was too well schooled in the polite ways of the republic of letters and salon society to be outright rude or dismissive of a savant's work, Fontenelle still made his views known. For example, in 1718, Geoffroy published his innovative paper on chemical affinities, very loosely based on Newton's idea of attraction at a distance. Fontenelle completely ignored it in the *Histoire*. On the other hand, he devoted pages and pages of various *Histoire* volumes to Varignon's pure mathematics work. Had Fontenelle wished, he could have easily discussed Newton's work in any of the *Histoire* articles about astronomy, physics, mechanics or mathematics; he could have brought out the many Newtonian features of Varignon's work. Bernoulli, who wrote regular letters to Fontenelle as well as Varignon, was well-represented in the *Histoire*, as were several other sociable *associé étrangers*. In theory, no one academician was in control of research and work in the Académie; in practice, the Académie was subject to the unofficial control of Fontenelle, at least in terms of publication. If an academician communicated regularly with Fontenelle, or worked on a subject that he found particularly interesting, his papers would be published and written about, giving him wider exposure to the Parisian literary and cultural elite who read the *Histoire* each year. Newton did not correspond with Fontenelle about scientific matters, and, unlike several other foreign members of the Académie, Newton did not have a friendly acquaintance to read his work in meetings, or promote it.

Fontenelle's *éloges*

Personal connections were vital to success in the Académie, but the importance of an academician's character was also expressed publicly. The Académie's emphasis on sociability and a man's character were most explicit in Fontenelle's celebrated *éloges*; these short orations were the Académie's public statements on what intellectual and moral qualities

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were necessary to be an academician. Public meetings were the most important tool in the Académie's bid for reputation and respectability; these meetings were reported in the leading periodicals, and attended by all the intellectuals of the capital, many saloniers, and the *gens de qualité* of Parisian society. It is at these sessions that the Académie, through Fontenelle's *éloges*, defined its image to Parisian elites and to itself. Of course, problematic for the Académie in its quest for a positive image in society was the traditional reputation scholars enjoyed in elite culture in the late seventeenth and early eighteenth century.⁵² The Académie raised its status in the eyes of the Parisian elite by appealing to elite sensibilities, while demonstrating that it was concerned with a new type of knowledge and a new type of savant, the scientific Academician.⁵³ Fontenelle's *éloges* were the primary means for the creation of this new identity.

⁵² Scholars were thought to be solitary by nature; when they came out into society, they were pedants, who lectured rather than conversed. They were temperamentally unbalanced; their knowledge was based on books and authority, rather than upon worldly experience. What they did know was impractical and of no use to society; they subverted social harmony in order to debate matters of little interest and little importance to polite society. The test of proper knowledge was its ability to contribute to conversation, polite society and civil society – like in the republic of letters, bad manners was a sign of bad knowledge. See Steven Shapin, “‘A Scholar and a Gentleman’: the Problematic Identity of the Scientific Practitioner in Early Modern England”, *History of Science*, 29 (1991), 279-327; “‘The Mind Is Its Own Place’: Science and Solitude in Seventeenth-Century England”, *Science in Context*, 4 (1991), 191-218.

⁵³ The use of the adjective ‘scientific’ is problematic, however, there is not another term that exists to describe what the academicians of the Académie Royale des Sciences were; ‘natural philosopher’ does not have a French equivalent, and the term carries connotations that simply did not exist in France. A discussion of historical terminology is obviously outside the scope of the present work, though such a discussion is quite important and deserves more attention than it is usually given. For a good account of many problems the historian of science of the eighteenth century faces, see Geoffrey Cantor, ‘The Eighteenth Century Problem’, *History of Science*, 20 (1982), 44-63. For a discussion of the term ‘natural philosopher’, see Andrew Cunningham, ‘The Identity of Natural Philosophy: a Response to Edward Grant’, *Early Science and Medicine*, 5 (2000), 259-78, and his ‘How the *Principia* Got its Name: or, Taking Natural Philosophy Seriously’, *History of Science*, 29 (1991), 377-92.

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Literally meaning ‘praise’, ‘*éloge*’ is commonly taken to be the equivalent of ‘eulogy’, which it most certainly is not.⁵⁴ Fontenelle transformed the *éloge* from a cheap rhetorical device into a serious literary, biographical, and historical genre.⁵⁵ The idea of an *éloge* was not uncommon: similar honorific orations were found in royal academies, at court festivals, and in churches. However, Fontenelle transformed the genre to the point of creating a new one, known as the ‘*éloge historique*’, defined for the first time by d’Alembert in the *Encyclopédie*. The *éloges* are short texts, only 3,200 words on average, and every one followed the same pattern: a short discussion of genealogy and childhood; an account of education and/or specialist training; adulthood and non-academic successes; intellectual triumphs with a summary of important works; final years and death; and, finally, a peroration on character.

Fontenelle delivered the *éloges* orally at the public session immediately following the academician’s death. In the case of Newton and a few others, they died too close to the public assembly for Fontenelle to have time to compose a suitable oration, so their *éloges* were delivered at the next public meeting. These texts were then published in the *Histoire* for the year of their death, in collections under Fontenelle’s name, and occasionally, as with Tournefort, Tsar Peter the Great, and Newton, as stand-alone pamphlets.

The most obvious function of the *éloges* was to raise the reputation of those engaged in the study of nature and their work. English historian Herbert Butterfield perhaps best described Fontenelle’s written portraits when he likened them to classical epic poetry – the *éloges* are the epics of the Scientific Revolution, and, like any epic, have individual heroes at their heart.⁵⁶ For Fontenelle, each *éloge* was the story of a man becoming, acting, and then dying a hero. By emphasizing their high moral character alongside their intellectual achievements, Fontenelle demonstrated to elite Parisian society that his academicians were not only *honnêtes hommes*,

⁵⁴ The French ‘*éloge*’ comes from the Greek word *eulogia*, for ‘praise’. Of course, the English ‘eulogy’ has the the same Greek origin.

⁵⁵ Charles B Paul, *Science and immortality: the ‘éloges’ of the Paris Academy of Sciences (1699-1791)* (Berkeley, 1980), 2, 5, 9.

⁵⁶ Cited by Paul, *Science and immortality*, 108.

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but could be heroes as well; he was creating what is now known as the ‘scientist’, the objective, selfless seeker of nature’s secrets and truths. These short texts were establishing an identity for the academician, and for all those who studied nature. The *éloges* also instituted a new elitism that was compatible with that of the salons, an elitism based on personal qualities – in this case, intellectual vigour in the sciences – rather than birth. D’Alembert and Voltaire, one of Fontenelle’s harshest critics, both gave Fontenelle sole credit for making the sciences respectable in France.⁵⁷ Each *éloge* was yet another persuasive attempt by Fontenelle to make the Académie, its work and its members integral parts of *ancien régime* society, government, industry, and empire.

The *éloges* created heroes based on their general temperament, spirit, and method of mind rather than on specific works. In the *éloges* of many, Fontenelle noted the academician’s willingness to sacrifice personal financial reward for the love of their subject and greater public good. Fontenelle wrote that Claude Bourdelin was ‘rather unique, for in a country where every profession becomes that of a courtier, he was never anything but a doctor, and he did nothing but his job, forsaking the creation of his court’.⁵⁸ A related theme, that of public service, was also found in many *éloges*. Fontenelle praises those academicians who undertook often mundane tasks for the greater good: Cassini and Viviani solved a number of problems with river water levels in their native Italy, even though it was ‘not a sufficient occupation for them, given what they were’, that is, continental Europe’s greatest astronomers.⁵⁹ Fontenelle emphasizes Newton’s tenure as Master of the Mint, and Jean Méry’s willingness to work in the state-funded hospital for the poor.

Another recurring virtue or moral found throughout the *éloges* is that of perseverance, and the related virtues of patience and focus. When Pierre Varignon was seriously ill, he was ‘Ordered by his doctors, his friends, and himself to give up all work’, but found that he ‘could not

⁵⁷ Nicolas Charles Joseph Trublet, *Mémoires pour servir à l’histoire de la vie et des ouvrages de Mr. de Fontenelle: tirés du Mercure de France 1756, 1757 & 1758* (Amsterdam, 1759), 32-4.

⁵⁸ Fontenelle, ‘Éloge de Monsieur Bourdelin’, *Œuvres complètes*, VI, 259-60.

⁵⁹ Fontenelle, ‘Éloge de Monsieur Viviani’, *Œuvres complètes*, VI, 87.

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obey – as soon as he was alone in his room, he started reading mathematics books, which he hid very quickly if he heard anyone coming'.⁶⁰ Varignon could not exist without his mathematics. In the *éloge* of Hartsoëker, Fontenelle remarks that Hartsoëker's first efforts to produce a high-quality lens were failures, yet he never stopped trying, and eventually became celebrated for his optical instruments.⁶¹ Fontenelle, however, qualified this emphasis on perseverance and singularity of purpose by emphasizing the academicians' moderation and humility, noting that Newton would have preferred to remain unknown to avoid fame and quarrels.⁶² He called attention to the Marquis de l'Hôpital's tendency to profess sincerely his ignorance in matters of geometry, though l'Hôpital was one of Europe's greatest mathematicians.⁶³

A trait that Fontenelle emphasized in almost every *éloge* is that of sociability. In his *éloge* of Homberg, Fontenelle wrote that 'it is not philosophy that excludes pleasurable and tasteful things: it is the injustice of the philosophers, who, like the rest of men, only care for things that distinguish them'.⁶⁴ Fontenelle's philosophers have 'lively, restless and cheerful temperament[s]' and are stimulating conversationalists.⁶⁵ The academician is held up in opposition to the traditional philosopher, that solitary, pedantic, uncivilized bore. Practising the various sciences brings happiness. For Pierre Remond de Montmort, 'days passed like minutes', thanks to the pleasures of complex algebra and probability theory.⁶⁶ Varignon 'laughed merrily as he discussed geometry. Anyone seeing him would be led to believe he studied it to amuse himself. No state of being is more enviable than his.'⁶⁷

The recurring virtues throughout the *éloges* are a mix of traditional Christian ones, such as patience, honesty, humility, modesty, and charity,

⁶⁰ Fontenelle, 'Éloge de Monsieur Varignon', *Œuvres complètes*, VII, 27.

⁶¹ Fontenelle, 'Éloge de Monsieur Hartsoëker', *Œuvres complètes*, VII, 76-7.

⁶² Fontenelle, 'Éloge de Monsieur Newton', *Œuvres complètes*, VII, 133.

⁶³ Fontenelle, 'Éloge de M. le Marquis de l'Hôpital', *Œuvres complètes*, VI, 106.

⁶⁴ Fontenelle, 'Éloge de Monsieur Homberg', *Œuvres complètes*, VI, 326.

⁶⁵ Fontenelle, 'Éloge de M. L'Abbé Gallois', *Œuvres complètes*, VI, 173.

⁶⁶ Fontenelle, 'Éloge de Monsieur de Montmort', *Œuvres complètes*, VI, 470.

⁶⁷ Fontenelle, 'Éloge de Monsieur Varignon', *Œuvres complètes*, VII, 22.

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and of ‘modern’ Enlightenment ones, like sociability, wit, intelligence, perseverance, and a disregard for personal wealth. These men were happy and content, thus, heroic.⁶⁸ They were truly heroic in every sense of the word, as Fontenelle also painted them as classical warriors, and brave adventurers. Fontenelle highlighted the bravery of academicians in the face of real physical danger. He wrote that curiosity and love of learning led Tschirnhaus to join a war, and that ‘the love of the sciences became a warrior’s courage’, as Sauveur entered the Siege at Mons, worried that he might miss geometry in action should he remain behind the lines.⁶⁹ Fontenelle even managed to make mathematics into a physically demanding, active, adventurous pursuit by using dramatic language and action-verbs: ‘But algebra, pushed beyond ordinary use, is so dense, so complicated, so full of immense calculations, and in short, so terrifying, that very few men have the heroic courage to throw themselves into this dark and profound abyss.’⁷⁰ Fontenelle’s fellow academicians were the foremost minds in their field, and also the foremost men in society.

Newton assessed by the Académie: his *éloge*

When Newton died, Fontenelle’s first resource for *éloge* writing – himself – was unhelpful: he knew nothing about Newton the man. This was one of the times, if not the only time, that Fontenelle did not have some personal knowledge of his subject’s character, or at least a reliable source in the Académie who could help. The exchange between Fontenelle and John Conduitt, perhaps more than anything else, reveals how little Newton was discussed in the Académie. On 27 March 1727, Conduitt, Newton’s nephew-in-law, wrote Fontenelle an unsolicited letter, offering to provide details on Newton’s life for Fontenelle’s upcoming *éloge*. The *éloges* of the Paris Académie were famous, and were taken quite seriously

⁶⁸ Much more could and should be said about Fontenelle’s fusion of Christian and Enlightenment morality, though article length prevents such a discussion. Given Fontenelle’s ambivalent Catholicism, his open hostility to organised religion, and his ardent support of the ‘moderns’, it is somewhat surprising he never positions Christianity and Enlightenment as binaries. Unlike many of his contemporaries, Fontenelle’s nuanced position is rather closer to that of the modern historian.

⁶⁹ Fontenelle, ‘Éloge de Monsieur Sauveur’, *Œuvres complètes*, VI, 366.

⁷⁰ Fontenelle, ‘Éloge de Monsieur Rolle’, *Œuvres complètes*, VI, 480-1.

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by fellow academicians and the republic of letters. Family members of deceased academicians wrote vehement letters to Fontenelle if they believed his *éloge* was too short or too critical.⁷¹ These short, seemingly unassuming texts were the most recognisable production of the Académie. Fontenelle was thrilled with Conduitt's offer of help, and wrote back immediately:

I am in need of everything you know about Mr. Newton, without exception. The day and place of his birth, the name of his father and mother, his education, his first studies, the first signs of genius he presented, some remarkable traits of his childhood or youth, the savants who influenced him if there were any, readings he liked the most or that he pulled the most from, what drove him to mathematics, how he wrote his *Principia* and the optical experiments, oppositions or challenges he was faced with, if there were any, the honours he received from other savants or princes, his career and fortunes, how he acted, what he was like in private life, his liaisons, his correspondence, what was his character, his habits, his particular thoughts on life, on governments, etc. his thoughts on celebrated authors, his occupations in later life, the way in which he died.⁷²

Conduitt sent Fontenelle a 4,000 word biography of Newton, in which he only speaks of Newton's life and character, not his works.⁷³ Delivered on 27 November 1727, Fontenelle's *éloge* of Newton was the first published biography of the English natural philosopher, and remained the primary

⁷¹ For just one example of how seriously the *éloges* were taken, see Bernoulli to Varignon, 22 March 1707, *Briefwechsel von Johann I. Bernoulli*, II, 220.

⁷² Fontenelle to Conduitt, 14 April 1727, *Œuvres complètes*, IV, 32-3.

⁷³ Conduitt to Fontenelle, 21 July 1727, King's College, Cambridge, Keynes MS 129(C), available online at: www.newtonproject.sussex.ac.uk/view/texts/normalized/THEM00147. The full text of Conduitt's biography of Newton, in both English and French, can also be found on the website of The Newton Project. Also available is the Fontenelle-Conduitt correspondence.

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source for all work about Newton until the mid-nineteenth century.⁷⁴ Fontenelle's account of Newton's life comes directly from Conduitt's letter; however, the extensive account of Newton's works is all Fontenelle's own interpretation.

From the brief general overview of the *éloges* in the previous section, it is obvious that Fontenelle's biographical commemoration of Newton was significantly different from those that followed in the eighteenth and nineteenth centuries. Unlike his British contemporaries, Fontenelle was *not* emphasizing Newton's individuality. Newton, according to Fontenelle, was just as remarkable as the other forty-nine academicians he had already honoured with *éloges*.⁷⁵ What comes out of all of Fontenelle's *éloges* is that the natural philosopher is unusual, and that the whole group of academicians is unlike any other social order, or professional group. It is important to stress that Fontenelle was emphasizing the similarities of all these academicians, and did not want to single out any academician for overtly special treatment. One reason why the literary structure of the *éloges* remained constant was to create a greater semblance of similarity between these very different men; as the *éloges* were delivered seven months apart, the repetitive narrative structure also linked each individual oration together. Even with his beloved Descartes, Fontenelle warned readers and listeners not to believe blindly everything Descartes wrote; in his *éloge* of Hartsoëker, he wrote: 'All the schools have done is change masters – they are still slaves ... We must always admire Descartes, and believe him sometimes.'⁷⁶ The idea that the academicians were men, not gods or super-humans, is one feature that makes his creation of the academician as hero so different from other eulogizers and popularizers of science, especially those in England,

⁷⁴ Rob Iliffe, 'Introduction', *Early biographies of Isaac Newton 1660-1885*, ed. Rob Iliffe and Rebekah Higgitt (2 vols., London, 2006), vol. I. Eighteenth-century English translations of Fontenelle's *éloge* can be found in *Early biographies of Isaac Newton*, ed. Iliffe vol. I, chapter 5, and in *Isaac Newton's papers & letters on natural philosophy*, ed. I Bernard Cohen and assisted by Robert E Schofield (Cambridge, 1958), 427-43.

⁷⁵ Before he retired in January 1740, Fontenelle composed a total of sixty-nine *éloges*.

⁷⁶ Fontenelle, 'Éloge de Monsieur Hartsoëker', *Œuvres complètes*, VII, 87.

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writing about Newton. Fontenelle remarked on the nature on Newton's genius: 'Men with superior intelligences also have a progression of ideas, though they fly while we crawl.'⁷⁷ There was nothing inherently different in Newton. This is a theme throughout the *éloge*. At the beginning of his discussion of the *Principia*, Fontenelle stated that everyone was struck by its brilliance, mentioning that minds like Newton's are only found in three or four men in each great nation of Europe.⁷⁸ Fontenelle takes every opportunity to praise Newton's genius, but always does so in the context of other academicians; Newton is never a lone genius. This is quite the opposite of Conduitt's memoir, in which Newton's singularity was emphasized. By writing an *éloge* for most academicians – those who revolutionised their sciences to those who simply plodded along – Fontenelle is holding up the entire class of academicians for emulation, and not just one or two individuals. The virtues his heroes possessed are those that the Académie embodied, and the practice of science inspired. There is no place for the virtuoso, the eccentric, or the singular genius.

Fontenelle's *éloge* of Newton is like the others; it is not the longest *éloge*, nor is it the most eloquent. Fontenelle does discuss Newton's work in more detail than most *éloges*, though such a practice is common for *associé étrangers* that Fontenelle did not know as well as the Parisian academicians. Even the paragraph on Newton's religion is typical of the *éloges*. Fontenelle had great sympathy for non-conformist Catholics and Protestants of all stripes. He always praised those who were sincere in their piety and religious beliefs, regardless of what religion, and he offered even more praise and sympathy for those who were tolerant, as he did for Newton, or for those who suffered persecution.⁷⁹ Fontenelle's sympathy

⁷⁷ Fontenelle, 'Éloge de Monsieur Newton', *Œuvres complètes*, VII, 112.

⁷⁸ *Ibid.*, 114.

⁷⁹ Fontenelle, 'Éloge de Monsieur Newton', *Œuvres complètes*, VII, 134. See Fontenelle's 'Éloge de M. Leméry' for just one other example of this. Fontenelle's brief discussion of Newton's religion comes largely from Conduitt.

See King's College Keynes Ms. 129(A), f. 12v available online at: www.newtonproject.sussex.ac.uk/view/texts/normalized/THEM00145. The French version of Conduitt's text that was sent to Fontenelle is King's College Keynes Ms. 129(C), which is also available online at: www.newtonproject.sussex.ac.uk/view/texts/normalized/THEM00147. Fontenelle's last line, that the book Newton read most was the Bible, is not in the English version of Conduitt's text, but a similar sentiment

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is easily explained: he was born and raised in Rouen, a bastion of French Protestantism both before and after the Edict of Fontainebleau in 1685, and had many Huguenot friends who suffered horribly. A sure sign that Newton was no more special than any other academician was the fact that his was not the only *éloge* read at the public meeting. On 12 November 1727, Fontenelle delivered three addresses – an *éloge* of Newton, an *éloge* of Malézieu, and he read the preface to his own *Éléments de la géométrie de l'infini*. The *Éléments* was over 500 pages on the new calculus, trying to provide philosophical as well as mathematical justification for using the concept of mathematical infinity; this preface received more coverage than either of the *éloges* in the Paris periodicals.

However, what is interesting about Newton's *éloge* is how Fontenelle manipulated Conduitt's letter to make Newton fit into the ideal portrait of the academician that Fontenelle had spent more than twenty years creating. Typical of Fontenelle's changes is what he did with the story of Newton's solution to a complicated mathematical problem. In his letter, Conduitt writes: 'I must not omitt telling you that Sir I. received the famous problem which was intended to puzzle all the Mathematicians in Europe at 4 a clock in the afternoon when he was very much tired with the business of the Mint where he had been employed all day, & yet solved it before he went to bed that night.'⁸⁰ The problem in question had to do with the trajectory of a curve, proposed by Leibniz and Bernoulli. Conduitt included this to demonstrate Newton's mathematical superiority over Leibniz (the priority dispute was never far from Conduitt's mind), Newton's unique ability and superior intellect. In the *éloge*, the same story reads:

He [Newton] received the problem at 4 in the afternoon, and would not sleep until he got to the bottom of it, even though he was tired from a day at the Mint. Not only did he serve all of savant Europe with his speculative knowledge, he also served

is in the French. The idea of the Bible as a favourite and most read book was often used by Fontenelle in the *éloges*.

⁸⁰ King's College Keynes MS 129(A) f. 4r.

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his country [*sa patrie*] in immediately sensible and useful affairs, a pleasure that is longed for by all good citizens. Though in all his spare time, he gave himself over to the curiosity of his mind [*esprit*], which loved all types of knowledge, and knew how to be nourished by all things. Among his papers can be found many writings on antiquity, on history, even on theology – so far away from the sciences, which is what he is known for.⁸¹

Fontenelle inserted this anecdote at the end of the *éloge*, turning it around to show evidence of Newton's love and dedication to mathematics and to his country, fitting in with countless other great and ordinary academicians who worked on behalf of the public good.

What was surprising in Fontenelle's treatment of the *Principia* was that he did not treat it mathematically, as did Varignon, and as were Maupertuis, Nicole and the other academicians in 1727; Fontenelle discussed its significance in terms of planetary motion and actual physical phenomena.⁸² He wrote that two main theories dominated the *Principia*, the idea of central forces and the resistance of centres of bodies to movement, and the idea of attraction. Fontenelle's fairly extensive summary is one that you would expect to find in any twentieth-century high school textbook; given his audience of non-specialists, that was not surprising. Fontenelle was critical of Newton's theory of attraction; he felt that Newton's explanation was incomplete, as he did not offer any cause for the phenomenon, simply a discussion of its effects. Fontenelle was worried that Newton was sliding back into the occult forces of the ancients that the Académie had worked so hard to overcome.⁸³ He then wrote that 'sometimes even his conclusions seem derived from observations and facts that the astronomers are not aware of, criticising Newton's lack of direct observational astronomy so prevalent in the Académie, and echoing the oft-repeated claim that Newton's theory of universal gravitation does not necessarily conform to observations.'⁸⁴

⁸¹ Fontenelle, 'Éloge de Monsieur Newton', *Œuvres complètes*, VII, 130-1.

⁸² For a detailed discussion of Maupertuis, Nicole and Clairaut's mathematical use of Newton in the late 1720s, see Shank, *The Newton wars*.

⁸³ *Ibid.*, 125-6.

⁸⁴ *Ibid.*, 119.

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Fontenelle's *éloge* of Newton set the stage upon which Newton was to be posthumously discussed in the Académie. By making him just another academician, Fontenelle encouraged others to engage in debate over his works, as they would do with any other academician. Once dead, Newton the person was easily separated from his work. This was the case with Joseph Piton de Tournefort, the botanist, and Malebranche: both of these savants worked on contentious subjects – botanical classification and the new calculus, respectively – though both were far too respected by academicians for their work to receive serious scrutiny. They were both active academicians, constantly presenting papers at meetings and occasionally publishing them. Only after their deaths did the disagreements and severe criticisms of their personal work appear in the Académie.⁸⁵ Like he did in Malebranche's *éloge* with the theory of occasionalism, Fontenelle forced Newton's theory of attraction to become a matter of debate in the Académie by focusing on it so much and actually criticising it, something Fontenelle rarely did so candidly.⁸⁶ Most significantly, Fontenelle moved Newton out of *géométrie* and into *physique* and *mechanique* quite specifically by using both terms frequently in his *éloge*.

Conclusion

When Newton's philosophy was discussed in the Académie before 1727, it was not, generally, in any detail, and often contained implicit criticisms. In one of his *mémoires* of 1700, Varignon gave a detailed summary of part of book 2 of the *Principia*, and notes that Newton made 'central forces' famous by applying them to the planets. Varignon dismisses this out of hand, and treats them only hypothetically, or mathematically.⁸⁷

⁸⁵ See Fontenelle, 'Éloge de Monsieur Fagon', 'Éloge du Père Malebranche', and 'Éloge de Monsieur de Tournefort'. Malebranche's work on the new calculus was often criticised, but always alongside of every other proponent of the 'new' analysis.

⁸⁶ Fontenelle discussed Malebranche's occasionalism in his *éloge* in terms of how it related to Malebranche's mathematical work and his belief in Cartesian physics. See Fontenelle, 'Éloge du Père Malebranche', *Œuvres complètes*, VI, 341-5.

⁸⁷ *MARS 1700*, 83.

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Bernoulli, in a *mémoire* of 1711, explicitly criticised some of Newton's mathematics, writing several times that 'M. Newton is again in error in his Proposition ... of the *Principia*'.⁸⁸ Saurin's *mémoire* of 1709 is the only one during the entirety of Newton's membership in the Académie to connect Newton's name with an explicit critique of attraction and a defence of Cartesian vortices, though it did not provoke any sort of response or further work on Newtonian physics.⁸⁹ Again, most mentions of Newton in the Académie prior to 1727 were brief.

More interesting were those places where Newton was not mentioned in meetings and in *Histoire et Mémoires*. In his 1720 *mémoire*, 'Construction et théorie des tables du Soleil', Louville based his whole work on a simple but correct exposition of Newtonian gravity, claiming that these concepts were derived from Kepler.⁹⁰ A Rupert Hall argues that Louville, who met Newton in England, was being deliberately vague and disingenuous in order to avoid causing the inevitable conflict over Newton's physics in the Académie.⁹¹ The evidence to support this view, however, is dubious at best, given that Newton was simply not a frequent topic of conversation in the Académie – why would there be inevitable conflict?⁹² There are countless articles in the *Histoire et Mémoires* where one would expect to find a mention of Newton's philosophy at least, if not a serious discussion of it. In two *Histoire* articles called 'Sur les mouvements de Jupiter et de Mars' and 'Sur les forces centrales des

⁸⁸ *MARS 1711*, 50-3.

⁸⁹ *MARS 1709*, 148.

⁹⁰ *MARS 1720*, 35.

⁹¹ A Rupert Hall, 'Newton in France: A New View', *History of Science*, 13 (1975), 233-50.

⁹² As Shank shows, discussions of universal gravitation and attraction were occurring throughout the republic of letters, including the Académie occasionally. If Louville really wanted to avoid conflict, he would not have discussed the topic at all; mentioning Newton's name would possibly have made the topic more contentious, but it seems unlikely. Regardless of what Fontenelle and other academicians claimed or desired, intellectual conflict was rampant in the Académie, and contentious topics were discussed frequently. See Shank, *The Newton wars*, ch. 1-4; and Shank's 'Before Voltaire' for some of the mathematical controversies in the first decade of the 1700s in the Académie. The Varignon-Bernoulli correspondence also gives plenty of evidence of the contentious nature of experiments with the barometer in and around 1705.

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planetes', respectively, Fontenelle cited Kepler, Ptolemy, Galileo, l'Hôpital and Bomie, but not Newton.⁹³ In 1721, in an article discussing rainbows and prism experiments, Fontenelle neglected to mention Newton, yet cited Descartes, Huygens and Maraldi.⁹⁴ In a *mémoire* of 1724 on the movement of bodies in vortices, Saulmon mentioned the application of his work to celestial bodies, but nowhere mentions Newton.⁹⁵

The absence of Newton in the Académie prior to his death cannot be explained by anti-English sentiments, or continental insularity, as English astronomers are cited frequently by academicians, as are botanists, physicians and mathematicians; academicians received the *Philosophical Transactions*, and did have a fair idea of the goings on in the Royal Society. In his *éloge* of Newton, Fontenelle praised the British government for recognizing the important contributions learned men make to society.⁹⁶ The lack of Newton in the Académie also cannot be explained by any Cartesian sympathy the Académie might have had. Nor can it be explained by the fact that Newton was an *associé étranger*: foreign members published *mémoires*, and were cited by other academicians. It is true that there were no official structures to make use of non-resident members' participation; however, foreign associates utilized unofficial means to participate in academic life. In 1700, Leibniz initiated a correspondence with Fontenelle, asking for news of work being done in the Académie, and contributed *mémoires*; the Bernoulli brothers wrote letters to the Académie and various academicians that were all read out at meetings. If an academician corresponded with others, his work was discussed and considered seriously in the Académie. There is no evidence in either Newton's papers or the Académie archive that Newton communicated *substantially* with academicians at all. Newton did send copies of the second edition to the *Principia* to individual academicians (including Fontenelle) through other hands, but no personal notes

⁹³ *HARS 1706*, 95; *HARS 1707*, 97.

⁹⁴ *HARS 1721*, 4.

⁹⁵ *MARS 1714*, 273.

⁹⁶ Fontenelle, 'Éloge de Monsieur Newton', *Œuvres complètes*, VII, 127-8, 132.

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accompanied them.⁹⁷ In his response to Abbé Bignon's thank-you letter, Newton, surprisingly, included a rather pointed personal remark:

I rejoice exceedingly that my little gift was not unwelcome to you. And I shall think it particularly attributable to your judgement if, in the future, the learned do not take a dislike to those matters which are discussed in my book. For they can be read over but by very few indeed because of the difficulty of the topics; they have been made rather obscure by excessive brevity, and run counter to the philosophical hypotheses commonly received.⁹⁸

Newton was aware his philosophy was not generating acclaim in the Académie; implying that the academicians did not understand the *Principia* was not the way to win over support, nor did it conform to the expected standard of *politesse*. Ironically, Newton took the questioning or rejection of his work quite personally, yet was unaware (or perhaps just unwilling) of the close connection between personal ties and knowledge in the Académie and the republic of letters.⁹⁹

In the late 1730s, after three decades of neglect, Newtonian physics was widely discussed and readily accepted by the majority of the members of the Académie. This was not the case because Newton's physics was suddenly proved true; in 1740, the theories of the *Principia* could not predict planetary nor satellite motions any better than the Cassinis or Kepler. The detailed calculations from Maupertuis's voyage to Lapland, widely seen as a test of Newtonianism, did not convince

⁹⁷ There are letters between Newton and members of the Académie. In all cases, the correspondence was of an impersonal nature. Newton and Varignon were in regular correspondence after 1713, as Varignon was trying to broker a peace agreement between Bernoulli and Newton, and seeing a French edition of the *Opticks* through the press. They did not discuss mathematics in any detail, and their letters never moved beyond the standard formality of a *commercium epistolicum* of the republic of letters. There are letters between Newton and other academicians, but none are scientific in nature, and remain impersonal.

⁹⁸ Newton to Bignon, late 1713, in *Correspondence of Newton*, VI, 40-1 (translated from the Latin original).

⁹⁹ Right from the beginning of his mathematical career, Newton took any questioning of his work as an insult. See Westfall, *Never at rest*, ch. 7.

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anyone of the truth of universal gravitation, nor did Maupertuis' impassioned and intellectual rhetoric about the truth of Newton's physics.¹⁰⁰ On the eve of the Enlightenment, personal ties were still very much affecting intellectual work in the Académie. A significant factor in the reception of Newton's philosophy in the Parisian Académie Royale des Sciences during his membership was Newton himself. Only after his death, when he did not have the option of participating in the Académie and Fontenelle had glorified his character, did Newton's philosophy receive serious, systematic investigations and discussions in the Académie.

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¹⁰⁰ Shank, 'Before Voltaire', chapters 8-9 and 11; Mary Terrall, *The man who flattened the earth: Maupertuis and the sciences in the Enlightenment* (Chicago, 2002).

HUME'S ATTACK ON NEWTON'S PHILOSOPHY*

Eric Schliesser

Introduction and Summary

In this paper, I argue that major elements of Hume's metaphysics and epistemology are not only directed at the inductive argument from design which seemed to follow from the success of Newton's system,¹ but also have far larger aims. They are directed against the authority of Newton's natural philosophy; the claims of natural philosophy are constrained by philosophic considerations.² Once one understands this, Hume's high

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¹ Robert H Hurlbutt, *Hume, Newton, and the design argument* (Lincoln, 1985, revised edn.).

² Forerunners of aspects of my view can be found in S K Wertz, 'Hume and the Historiography of Science', *Journal of the History of Ideas*, 54 (1993), 411-36; and Wayne Waxman 'The Psychologistic Foundations of Hume's Critique of Mathematical Philosophy', *Hume Studies*, 22 (1996), 123-68. Yoram Hazony, 'Hume's Program as an Alternative to Naturalism in Contemporary Epistemology and Philosophy of Mind', presented at Hume Society, Halifax, 2009, discerns much of the same position in Hume.

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ambitions for a *refashioned* 'true metaphysics'³ or 'first philosophy', that is, Hume's 'Science of Human Nature',⁴ can be seen and evaluated in their proper light.⁵ Hume has three motives for his attack on Newton: his work is informed by and gives cover to superstitious beliefs; his project is not useful to the public; and its success generates a challenge to the independent authority of philosophy.

This essay consists of five sections in addition to this introduction. First, I discuss Hume's attitude toward Newton. Newton claims that natural philosophy should be the foundation for other sciences, while in the 'Introduction' to the *Treatise* Hume asserts the supremacy of the 'science of man'.⁶ For Hume the human sciences can attain the high epistemic status of 'proof', while much of the physical sciences must do with lower forms of 'probability'. Furthermore, Hume's 'rules by which to judge of causes and effects' do not replicate Newton's fourth Rule; this opens a gap between the ontologies and methodologies of Newton and Hume. Moreover, Hume's account of causation is designed to undercut the reductionist bias of natural philosophy. According to Hume the parts of natural sciences that go beyond common life can be evaluated from the point of view of the science of man. I end with remarks on the philosophic origins and significance of Hume's attack on Newton's natural philosophy.

³ David Hume, *An enquiry concerning human understanding* (EHU), ed. Tom L. Beauchamp (Oxford, 1999), 1.12. I quote Hume from the following editions: *A treatise of human nature* (Treatise), ed. David Fate Norton and Mary J Norton (Oxford, 2007); *Essays, moral, political, and literary* (EMPL), ed. with foreword, notes and glossary by Eugene F Miller (Indianapolis, 1985, revised edn.); *An enquiry concerning the principles of morals* (EPM), ed. Tom L. Beauchamp (Oxford, 1998); *Dialogues concerning natural religion* (Dialogues), ed. with intro. and notes by Martin Bell (London, 1990); *The history of England* (History), (6 vols., Indianapolis, 1983); and *The natural history of religion* (Natural history), ed. with intro. by James Fieser (New York, 1992).

⁴ Hume, *Treatise*, 1.1.1.12ff.

⁵ I use Hume's phrases, 'science of man', 'science of human nature', and 'moral philosophy' as rough synonyms, meaning in our terminology, 'social science' in a very broad sense. I use 'natural philosophy' as a broad synonym for what we tend to call 'physical science'.

⁶ See also Louis E Loeb, *Stability and justification in Hume's Treatise* (Oxford, 2002).

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I depart from two independent traditions of interpreting Hume. One tradition makes many references to Newton's influence on Hume.⁷ On a more detailed level, proponents of this view may call attention to Hume's 'rules',⁸ his 'Experiments' and 'Anatomy',⁹ his method of investigation,¹⁰ and the application of Newtonian metaphors (e.g., an 'attraction' in the 'mental world' on a par with that in the 'natural world' – the principles of association are, then, analogous to the laws of motion).¹¹ Hume's 'science of man' is said to be inspired by Newton's science of nature.¹²

⁷ See, e.g., James Force, 'Hume's Interest in Newton and Science', *Hume Studies*, 13 (1987), 180-7, which provides an excellent overview of different approaches to understanding the relationship between Hume and Newton. See also Graciela De Pierris, 'Causation as a Philosophic Relation in Hume', *Philosophy and Phenomenological Research*, 64 (2002), 499-545; and Barry Stroud, *Hume* (London and New York, 1977), chapter 1. In their debate over the New Hume, included in *Reading Hume on human understanding*, ed. Peter Millican (Oxford, 2002), both Galen Strawson, 'David Hume: Objects and Power', 237, 245, 247, 249, 251, 256 n. 46, and Simon Blackburn, 'Hume and Thick Connexions', 266, appeal to Hume as a follower of Newton. For a corrective see Michael Barfoot, 'Hume and The culture of Science in the Early Eighteenth Century', *Studies in the philosophy of the Scottish Enlightenment*, ed. M A Stewart (Oxford, 1990).

⁸ Hume, *Treatise*, 1.3.15.

⁹ Hume, *Treatise*, 1.4.6.23.

¹⁰ See, e.g., Norman Kemp Smith, *The philosophy of David Hume*, (London, 1941), 53-62, 550, and 559 n. 1; James Noxon, *Hume's philosophical development: a study of his methods* (Oxford, 1973); and De Pierris, 'Causation as a Philosophic Relation in Hume'. Nicholas Capaldi, *David Hume, the Newtonian philosopher* (Boston, 1975), stakes out the most extreme position of this kind. My dissertation, 'Indispensable Hume: from Isaac Newton's natural philosophy to Adam Smith's science of man' (PhD diss., University of Chicago, 2002), also reflects this orientation.

¹¹ Hume, *Treatise*, 1.1.4.6; see, e.g., David Owen, *Hume's reason* (Oxford, 1999), 77-8. Cf. Jerry A Fodor, *Hume variations* (Oxford, 2006), 121-3.

¹² Janet Broughton, 'Hume's Ideas about Necessary Connection', *Hume Studies*, 13 (1987), 217-44; Martin Bell, 'Hume and Causal Power: The Influence of Malebranche and Newton', *British Journal for the History of Philosophy*, 5 (1997), 67-86; Kenneth P Winkler, 'The New Hume', in *The new Hume debate*, ed. Rupert Read and Kenneth A Richman (London, 2000), 52-87, move beyond the strategy of noticing similar metaphors by describing what they take to be the parallel nature of Newton's and Hume's positions; they then use these parallels to resolve interpretive disputes about Hume.

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On this view, Hume wants his readers to feel that he is modeling his project on the successes of natural philosophy, exemplified by Newton. In the 'Introduction' to the *Treatise* and more explicitly in the opening pages of *EHU*,¹³ Hume suggests that his 'science of man' can parallel recent achievements in natural philosophy (especially planetary astronomy). Thus, my claim is not that Newton did not figure importantly in Hume's philosophy,¹⁴ but, instead, that Hume's project is in many respects more hostile to Newton's achievements – as available to well-informed eighteenth-century readers – than many recent interpreters have realized.

There is a different tradition that argues Hume simply did not understand Newton. Hume's philosophy, thus, cannot do justice to Newtonian science.¹⁵ Hume's lack of mathematical competence is said to be a barrier to his understanding of Newton's mathematical natural philosophy. One finds this attitude behind the cranking of Bayesian machinery in Earman's attack on Hume's treatment 'Of Miracles'.¹⁶ However, this tradition begs the question; it takes the authority of 'science' for granted in Hume.

Against this second tradition I argue that Hume did understand salient features of Newton's methodology and position, although in ways often unappreciated by the first tradition mentioned above. For example, in his comments on Newton in the *History of England*, Hume discerns the (broad) outlines of Newton's commitment to the method of analysis and synthesis (see Newton's *Opticks*, Query 31) and how it differs from

¹³ 1.15.

¹⁴ Stephen Buckle, *Hume's Enlightenment tract: the unity and purpose of an enquiry concerning human understanding* (Oxford, 2001).

¹⁵ See Howard Stein, 'On Philosophy and Natural Philosophy in the Seventeenth Century', *Midwest Studies in Philosophy*, 18 (1993), 177-201. See also Eric Schliesser, 'Hume's Missing Shade of Blue Reconsidered from a Newtonian Perspective', *Journal of Scottish Philosophy*, 2 (2004), 164-75. For an earlier version, see P Jones, *Hume's sentiments: their Ciceronian and French context* (Edinburgh, 1982), 12-13.

¹⁶ John Earman, *Hume's abject failure: the argument against miracles* (Oxford, 2002) 47, calls Hume's arguments 'blunderbuss' and his conception of inductive inference 'impooverished'. See also James Franklin, 'Achievements and Fallacies in Hume's Account of Infinite Divisibility', *Hume Studies*, 20 (1994), 85-102.

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Boyle's methodology.¹⁷ So Hume has a subtle understanding of Newton's methodology – even if one were to grant that he lacks appreciation of the role of mathematics in Newton's natural philosophy.¹⁸ Leaving open the question whether Hume understood all the details of Newton's system, Hume's *departures* from Newton are best interpreted not as 'ironic',¹⁹ but as philosophically motivated.

I offer one methodological-historical comment. In the main body of this paper I treat Hume's philosophic program statically as if there were no changes in the larger aims of his program during the progressive construction of his oeuvre. This presentation allows the argument to be stated in its most extreme and, thus, clearest form. Yet, this needs important qualification on two fronts.

First Newton is never mentioned in the *Treatise*; only in the 'Appendix', which Hume wrote after he had published the first two volumes, does he use the phrase, 'Newtonian philosophy.' In contrast to *EHU*, which has a Newtonian rhetoric, some explicit mention of Newton, and increasing focus on the status of 'laws', the *Treatise* is remarkably unaffected by Newtonian themes, concepts, or methods.²⁰

¹⁷ See section 3 of Eric Schliesser 'Hume's Newtonianism and Anti-Newtonianism', *The Stanford Encyclopedia of Philosophy* (edn. Winter, 2008), ed. Edward N Zalta, URL = <http://plato.stanford.edu/archives/win2008/entries/hume-newton/>. On the method analysis and synthesis in Newton, see G E Smith, 'The Methodology of the *Principia*', in *The Cambridge companion to Isaac Newton*, ed. I B Cohen and G E Smith (Cambridge, 2002), 138-73; and Leonidas Montes, *Adam Smith in context: a critical reassessment of some central components of his thought* (Basingstoke, 2004), 132-44.

¹⁸ Graciela De Pierris, 'Hume and Locke on Scientific Methodology: The Newtonian Legacy', *Hume Studies*, 32 (2006), 320.

¹⁹ Dale Jacquette, 'Hume on the Infinite Divisibility of Extension and Exact Geometrical Values', in *New essays on David Hume*, ed. Emilio Mazza and Emanuele Ronchetti (Milan, 2008), 81. Cf. Eric Schliesser, 'Critical Notice of New Essays on David Hume edited by Mazza et al.', *Journal of Scottish Philosophy*, 6 (2008), 203-8.

²⁰ Martin Bell, 'Hume and Causal Power: The Influence of Malebranche and Newton', *British Journal for the History of Philosophy*, 5 (1997), 67-86. Bell calls attention to how the language of *EHU* is more Newtonian than the *Treatise*. Given that Hume ascribed the relative failure of the *Treatise* to its rhetoric (see 'Advertisement' to *EHU*), it makes sense for him to appeal more to public prejudice among the educated in favour of Newtonianism after 1740. For more on Hume's changes, see Eric Schliesser, 'Two Definitions of Causation, Normativity, and Hume's Debate with Newton', in *Future perspectives on Newton scholarship and the Newtonian legacy in Eighteenth-century science and philosophy*, ed. Steffen Ducheyne (Brussels, 2009), 47-69.

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Second, the changed rhetoric and orientation between *Treatise* and *EHU* can be explained, in part, by the timing of both works. When Hume drafted the *Treatise* while at La Flèche in 1734-1737, Newton's system was not a 'settled fact' – there were serious outstanding empirical issues (regarding shape of the Earth and the lengthening of the pendulum with latitude) that were not decided until French expeditions to Lapland and the Equator.²¹ Maupertuis' *Sur la figure de la terre* appeared in 1738 (it also appeared in English translation that year). Hume's close friend, Adam Smith, mentions this result as decisive evidence for Copernicanism and the Newtonian system in his 'History of Astronomy'.²² That year (1738) Voltaire published his influential piece of Newtonian propaganda *Elémens de la philosophie de Newton*; an English translation appeared in the same year. I have no idea when Hume became aware of the relevant empirical evidence, but probably not at La Flèche. It is, of course, possible that when back in Britain between the publication of the first two volumes of the *Treatise* and the drafting of the 'Appendix', which was added to the third volume published in November 1740, he became aware of these recent developments.

So, to be clear, when Hume drafted the first two volumes of the *Treatise*, Continental Cartesians accepted celestial inverse-square gravity, and it was accommodated within various systems (Leibniz, Huygens, Rohault). But outside Britain Hume could have found himself in a large and important company for thinking that the terrestrial (and, thus, universal)

²¹ See Eric Schliesser and George E Smith, 'Huygens' 1688 Report to the Directors of the Dutch East India Company on the Measurement of Longitude at Sea and the Evidence it Offered Against Universal Gravity', *Archive for the History of the Exact Sciences*, forthcoming; and K Maglo, 'The Reception of Newton's Gravitational Theory by Huygens, Varignon, and Maupertuis: How Normal Science may be Revolutionary', *Perspectives on Science*, 11 (2003), 135-69.

²² Adam Smith, *Essays on philosophical subjects*, ed. W P D Wightman and J C Bryce, vol. III of *The Glasgow edition of the works and correspondence of Adam Smith* (Indianapolis, 1982), section IV: 'The History of Astronomy'. See Eric Schliesser, 'Realism in the Face of Scientific Revolutions: Adam Smith on Newton's "Proof" of Copernicanism', *British Journal of the History of Philosophy*, 13 (2005), 687-732.

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gravity part of Newton's claims was still speculative.²³ After 1738, learned opinion moved decisively into Newton's camp across Europe, and Hume's increasing employment of Newtonian language and themes reflects this. But while Hume changed his position on some issues, I argue that he held steadfast to some important larger themes. I do not address the possibility that the texts I cite from Hume's essays and histories might be taken as evidence of a genuine shift in his understanding of and his relationship to Newton. Here these works are merely treated as a rich source in illuminating the intentions and meaning of the *Treatise* and the *EHU*.²⁴

One may think that the subtitle of the *Treatise*, 'Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects', shows Hume's self-conscious debt to Newton.²⁵ After 1712 in the context of his polemic with Leibniz, Newton and his followers increasingly refer to his own philosophy as 'experimental'.²⁶ Even so, Newton always emphasizes that his are *Mathematical principles of natural philosophy*.²⁷ The subtitle of the *Treatise* probably illustrates Hume's *methodological* commitment to Boyle.²⁸

²³ This was Locke's position to his death. See Mary Domski, 'Locke's Qualified Embrace of Newton's *Principia*', in *Interpreting Newton*, ed. A Janiak and E Schliesser, Cambridge, in press.

²⁴ Lorne Falkenstein, 'Hume on "Genuine", "True", and "Rational" Religion', *Eighteenth-Century Thought*, ed. James G Buickerood, 4 (2008), 171-201 offers a careful analysis of Hume's publication *History* and reconciles apparent inconsistencies in Hume's stance on religion.

²⁵ See Kemp Smith, *The philosophy of David Hume*, 58-62 or Buckle, *Hume's Enlightenment tract*, 70ff.

²⁶ For example, see Newton's fourth Rule of Reasoning, which was added to third edition, quoted in body of text. Newton also uses the phrase 'experimental philosophy' in the General Scholium to the *Principia* (added to second edition of 1713). See Alan Shapiro, 'Newton's Experimental Philosophy', *Early Modern Science and Medicine*, 9 (2004), 185-217.

²⁷ De Pierris, 'Hume and Locke on Scientific Methodology', 320.

²⁸ For more on this see the section on Hume's experimentalism at: <http://plato.stanford.edu/entries/hume-newton/#Exp>. The experimental method of Boyle and Newton are often lumped together, e.g., Buckle, *Hume's Enlightenment tract*, 82.

*Hume's Attack on Newton's Philosophy***The Science of Man as an Attack on Newton's Foundations**

In this section I first introduce a concept, 'Newton's Challenge', in order to explain why Hume might have thought Newton's success generates a challenge to the independent authority of philosophy. Second, Hume argues against Newton's claim of the superiority of natural philosophy, and for the epistemic equality of moral and natural philosophy. Also, I offer evidence for at least two reasons for Hume's moral hostility to Newton's project: Hume thinks that Newton's philosophy gives cover to superstition, and that it is not useful to the public.

The nature of Hume's ambitions is more evident when we put them in context of a text by Newton widely noted by Hume's contemporaries.²⁹ A query was added to the first Latin edition of the *Opticks* (*Optice*, 1706) by Newton and maintained in subsequent editions that is significant for our purposes: 'And 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'.³⁰ It accords well with the *inductive* argument for God's existence in the General Scholium, added to the second edition (1713) of the *Principia*: 'to treat of God *from* phenomena is certainly a part of natural philosophy' (emphasis added).³¹ In Newton's *published* works he says, 'We know [the Deity] only by his

²⁹ See, e.g., the discussion of George Turnbull's *The principles of moral and Christian philosophy* in Paul Wood 'Thomas Reid and the Tree of the Sciences', *Journal of Scottish Philosophy*, 2 (2004), 124-5.

³⁰ Newton, *Opticks, or a Treatise of the reflections, refractions, inflections and colours of light* (4th ed., 1730; New York, 1952), 405. This is not to say that Newton would have expressed his full views; on Newton's esotericism, see S Snobelen, 'To Discourse of God: Isaac Newton's Heterodox Theology and his Natural Philosophy', *Science and Dissent in England, 1688-1945*, ed. Paul Wood (Aldershot, 2004), 39-65.

³¹ See Howard Stein, 'Newton's Metaphysics', in *The Cambridge companion to Newton*, 261. See also Hurlbutt, *Hume, Newton, and the design argument*, which is still quite useful. I quote from Isaac Newton, *The Principia: mathematical principles of natural philosophy*, trans. I Bernard Cohen, Anne Whitman and Julia Budenz (3rd edn., 1726; Berkeley, 1999), 943. In Hume's *Dialogues* (Part II), Cleanthes concedes that the a posteriori argument offers probable evidence.

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most wise and excellent contrivances of things, and final causes.’ For Newton the study of motion, duty, and unchanging, first causes are part of a shared enterprise (see also his claim in the General Scholium that although we will know nothing of God’s substance, we can ‘have ideas of God’s attributes’).³² Newton accords our knowledge of the existence of the Deity a lower epistemic status than the evidence that convinces us of the existence of a (beautiful) systematic arrangement of our solar system and the bodies within it, and the existence of similar such systems at an immense distance. According to Newton ‘these regular motions do not have their origin in mechanical causes’ (General Scholium).³³

In order to discuss these passages, I introduce a concept: ‘Newton’s Challenge’.³⁴ By this I refer to the fact that the authority of natural science is used to settle debates within philosophy. I distinguish among: (NC1) a philosopher claims that natural philosophy must be consulted in the process of doing metaphysics; (NC2) a philosopher claims that natural philosophy is epistemically prior to metaphysics; (NC3) a philosopher appeals to the authority of a natural science (or natural philosophy) which is in some sense (institutionally, methodologically) not philosophy to settle arguments over doctrine, method, etc. NC1 has an ancient pedigree; NC2-3 are more prominent after 1700. While it may not have originated with or even been intended by Newton, Newton facilitated ‘Newton’s Challenge’ by allowing Cotes (the editor of the second edition of the *Principia*) to publish a highly influential, lengthy preface (1713), in which two competing approaches to philosophy, the scholastic and mechanical philosophy, are severely criticized from the point of view of ‘observations and experiments’.

³² Newton, *Principia*, 942; 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; *idem*, ‘How the *Principia* Got Its Name; Or, Taking Natural Philosophy Seriously’, *History of Science*, 29 (1991), 377-92. Cunningham, along with Andrew Janiak in his *Newton as philosopher* (Cambridge, 2008), claim that Newton’s physics presupposes his theology. See also G A J Rogers, ‘Newton and the Guaranteeing God’, in *Newton and religion: context, nature and influence*, ed. James E Force and Richard H Popkin (Dordrecht, 1999), 221-37.

³³ Newton, *Principia*, 942.

³⁴ See also Eric Schliesser, ‘The Newtonian Refutation of Spinoza’, in *Interpreting Newton*, in press and *idem*, ‘Newton’s Challenge to Philosophy’, unpublished typescript.

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In the passage from the *Opticks* Newton claims that natural philosophy can guide the search for first causes, or metaphysics (NC2). Moreover, natural philosophy is clearly the more secure, foundational enterprise to other forms of knowledge (that is, commitment to NC3). Newton's infamous rejection of hypotheses (General Scholium) is also a version of NC3.

Let us now turn to Hume's 'Introduction' to the *Treatise*:

'Tis evident, that all the sciences have a relation, greater or less, to human nature; and that however wide any of them may seem to run from it, they still return back by one passage or another. Even Mathematics, Natural Philosophy, and Natural Religion, are in some measure dependent on the science of Man; since they lie under the cognizance of men, and are judged of by their powers and faculties . . . [W]e ourselves are not only the beings, that reason, but also one of the objects, concerning which we reason

.....

And as the science of man is the only solid foundation for the other sciences, so the only solid foundation we can give this science itself must be laid on experience and observation.³⁵

Hume's 'science of man' either displaces or is a reinterpretation of more traditional metaphysics as the fundamental form of knowledge of the order of things; knowledge of it is required if 'certainty' and 'security' are *possible* at all. Hume's 'science of man' is not merely a goal in its own right, interesting as that may be, but may also be requisite to help better understand the other sciences.³⁶ Hume also talks of the 'changes

³⁵ Hume, *Treatise*, Intro., 4-7. In this 'Introduction' Hume inverts Descartes' tree of the sciences; the roots are not metaphysics as Descartes thought, but a theory of human nature. See John Passmore, *Hume's intentions* (London, 1968), 12. Hume follows Locke and Malebranche in emphasizing the importance of a science of man.

³⁶ Hume, *Treatise*, Intro., 6. Thomas Reid caught some of this spirit in the opening paragraph of a work otherwise deeply critical of Hume: 'The human mind is curious and wonderful ... a subject highly worthy of inquiry on its own account, but still more worthy on account of the extensive influence which the knowledge of it hath over every other branch of science' (Chapter 1, Section I of *An inquiry into the human mind: or the principles of common sense*). In a Humean vein, Reid talks about an 'anatomy of the mind' (12) in the same section.

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and *improvements* we might make in these sciences'.³⁷ Thus, the 'science of man' can instruct the other sciences. How this is supposed to work, and in what sense it is a 'foundation', is left unclear; maybe this is why Hume employs the more tentative sounding, 'some measure'.

I do not rehearse Hume's well-known attack on the argument from design in Section XI of *EHU* or in the *Dialogues* here. No doubt Hume is in large part motivated to undercut Newtonian attempts to enlist natural theology in debates over moral philosophy.³⁸ (In the *Dialogues*, Cleanthes is the spokesperson for this view). Such an enterprise fits squarely in the tradition of physico-theology, popular among Boyle lecturers; these are approvingly mentioned by, for example, the Scottish Newtonian Colin Maclaurin.³⁹ Physico-theology makes natural philosophy a handmaiden to theology. One can interpret Hume as correcting Newton, and the eighteenth-century Newtonian natural religion advocates, on internal 'Newtonian' grounds.⁴⁰ This interpretation underestimates the programmatic ambition of Hume.

For in the Introduction to the *Treatise*, Hume claims, first, that the 'science of man' is the *only* solid 'foundation' for the other sciences; it is the condition of possible certainty and security;⁴¹ second that it 'will not be inferior in certainty' to other forms of knowledge;⁴² our knowledge of 'mental powers and œconomy' can, despite some practical difficulties, have 'equal success' as our knowledge in natural philosophy.⁴³ As Hume says in 'Of the Balance of Trade': 'We need not have recourse to a

³⁷ Hume, *Treatise*, Intro., 4; emphasis added.

³⁸ See Hurlbutt, *Hume, Newton, and the design argument*, especially chapters 1 and 9, and Buckle, *Hume's Enlightenment tract*, chapters 2-3.

³⁹ Colin Maclaurin, *An account of Sir Isaac Newton's philosophical discoveries* (London, 1748), 62. See Jonathan Israel, *Radical Enlightenment: philosophy and the making of modernity 1650-1750* (Oxford, 2001), 456-71. Maclaurin is not mentioned; a better treatment on these matters is Hurlbutt, *Hume, Newton, and the design argument*, see especially 65ff.

⁴⁰ See Buckle, *Hume's Enlightenment tract*, 29 n. 8, 286.

⁴¹ Intro. 6; See also Louis E Loeb, *Stability and justification in Hume's Treatise*.

⁴² Hume, *Treatise*, Intro., 10.

⁴³ Hume, *EHU*, 1.15.

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physical attraction ... There is a moral attraction, arising from the interests and passions of men, which is full as potent and infallible.⁴⁴

Hume's 'Introduction' to the *Treatise*, then, signals the start of an ambitious program that departs from Newton's project. We do not need the perfection of natural philosophy to make progress in moral philosophy. Moreover, Hume indicates that the science of man may be required to make further progress in natural philosophy. Hume makes it clear where his priorities are: 'Nor ought we to think, that this latter improvement in the science of man will do less honour to our native country than the former in natural philosophy, but ought rather to esteem it a greater glory, upon account of the greater importance of that science, as well as the necessity it lay under of such a reformation.'⁴⁵ In sum, Hume's 'science of man' is 'much superior in utility to any other of human comprehension'.⁴⁶

When Hume comments more directly on Newton, the lack of utility of Newton's works is an important part of Hume's analysis: 'Were we to distinguish the Ranks of Men by the Genius and Capacity more than by their Virtue and Usefulness to the Public, great Philosophers would certainly challenge the first Rank, and must be plac'd at the Top of human Kind. So rare is this Character, that, perhaps, there has not, as yet, been above two in the World, who can lay a just Claim to it. At least, Galilaeo [*sic*] and Newton seem to me so far to excel all the rest.'⁴⁷ Newton has unusual philosophic talent. Despite much Newtonian propaganda for the utility of Newton's work,⁴⁸ Hume thinks it is not very useful to the rest of mankind. For Hume there is a moral point of view from which Newton's

⁴⁴ Hume, *EMPL*, 313; see also the concluding line of the 'Dissertation of the Passions': 'It is sufficient for my purpose, if I have made it appear, that, in the production and conduct of the passions, there is a certain regular mechanism, which is susceptible of as accurate a disquisition, as the laws of motion, optics, hydrostatics, or any part of natural philosophy' (Hume, *The philosophical works of David Hume*, ed. T H Green and T H Grose [4 vols., London, 1886-89], II, 166.

⁴⁵ Hume, *Treatise*, Intro., 8

⁴⁶ Intro., 10; see also Intro., 6 quoted above.

⁴⁷ Hume, 'Of the Middle Station of Life', *EMPL*, 550.

⁴⁸ Larry Stewart, *The rise of public science: rhetoric, technology, and natural philosophy in Newtonian Britain, 1660-1750* (Cambridge, 1992).

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achievements have to be re-directed to more praiseworthy aims.⁴⁹ By contrast, ‘There is no question of importance, whose decision is not compriz’d in the science of man.’⁵⁰

Moreover, Hume thinks that Newton shares in the superstitious prejudices of his time. While defending the stylistic abilities of King James I, Hume comments: ‘[King James I] has composed a commentary on the Revelations, and proved the pope to be antichrist; may not a similar reproach be extended to the famous writer Napier; and even to Newton, at a time when learning was much more advanced than during the reign of James? From the grossness of its superstitions, we may infer the ignorance of an age; but never should pronounce concerning the folly of an individual, from his admitting popular errors, consecrated by the appearance of religion.’⁵¹ Hume thinks that Newton’s writings show that they are the product of an age of religious superstition.⁵² This criticism of Newton is significant because Hume’s ‘true metaphysics’ is meant as an attack on the ‘considerable part of metaphysics’, which results (in part) ‘from the craft of popular superstitions’.⁵³ Among the many ‘positive advantages, which result from an accurate scrutiny into the powers and faculties of human nature’,⁵⁴ it serves ‘only to discover larger portions of our ignorance’.⁵⁵

⁴⁹ Eric Schliesser, ‘The Obituary of a Vain Philosopher: Adam Smith on Hume’s My Own Life’, *Hume Studies*, 29 (2003), 327-62, discusses Hume’s commitment to public service.

⁵⁰ Hume, *Treatise*, Intro., 6.

⁵¹ Hume, *History*, V, 155.

⁵² Hume appears to be making a claim about Newton’s religious sincerity. See also: ‘It is for the same reason, I maintain, that Newton, Locke, Clarke, etc. being Arians or Socinians, were very sincere in the creed they professed: And I always oppose this argument to some libertines, who will needs have it, that it was impossible, but that these philosophers must have been hypocrites’ (*Natural history*, Section XII, note 133).

⁵³ Hume, *EHU*, 1.11

⁵⁴ Hume, *EHU*, 1.13

⁵⁵ Hume, *EHU*, 4.1.12. Hume appears to have thought there was something flawed in Newton as a *model* for other philosophers (such as Socrates among Ancient sects, or himself in ‘My Own Life’, see Schliesser, ‘The Obituary of a Vain Philosopher’); for discussion of *The history of England*, VI, 542), see, <http://plato.stanford.edu/entries/hume-newton/#HumEvaNew>.

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In this paper, I offer cumulative evidence that Hume is concerned with more substantial parts of Newton's edifice. Recall that even mathematics, natural philosophy, *and* natural religion are included among the list of sciences in some measure 'dependent on the science of man'.⁵⁶ Thus, if Hume can constrain the authority of natural philosophy, he does not only cut off one pillar of support for the superstitious natural religion fashionable among the learned (typified by Maclaurin),⁵⁷ but also permits the building of a refashioned and, thus, more useful first philosophy, the 'science of man' of the *Treatise* or the 'true metaphysics' of *EHU*. In the next section, I analyze evidence of the epistemic priority of the 'science of man' in Hume.

Proofs of Common Life

In this section I argue that Hume's fundamental epistemic categories privilege common life and moral philosophy over parts of natural philosophy. I clarify the relationship between Hume's mitigated scepticism and common life.

Hume distinguishes between three epistemic categories in descending degrees of certainty: 'demonstrations', 'proofs', and 'probabilities'.⁵⁸ It is a bit confusing that sometimes proofs are presented as a species of probabilities, but in context it is clear when he is distinguishing proofs

⁵⁶ Hume, *Treatise*, Intro., 6; Wayne Waxman, *Hume's theory of consciousness* (Cambridge, 1994), 183-4, suggests that Hume has the Newtonian achievement in mind here.

⁵⁷ Schliesser, 'The Newtonian Refutation of Spinoza'. Hume follows Berkeley, who, in response to Newton's success, tries to minimize the scope and content of natural philosophy's authority. See Eric Schliesser, 'On the Origin of Modern Naturalism: the significance of Berkeley's response to a Newtonian Indispensability Argument', *Philosophica*, 76 (2005), 45-66.

⁵⁸ See especially, Hume's footnote at the beginning of Section 6 of *EHU*. Peter Millican called my attention to M J Ferreira, 'Hume's Naturalism—"Proof" and Practice', *The Philosophical Quarterly*, 35 (1985), 45-57, which anticipates claims in this section. See also De Pierris, 'Hume and Locke on Scientific Methodology'. See Don Garrett, *Cognition and commitment in Hume's Philosophy* (New York, 1997), 143ff. or Loeb, *Stability and justification in Hume's Treatise*, 101-2. Cf. Kevin D Hoover, *Causality in macroeconomics* (Cambridge, 2001), 9ff. In the *Treatise*, Hume distinguishes between knowledge, proof, and probability to mark 'several degrees of evidence' (1.3.11.2).

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from lesser probabilities. Demonstrations are restricted to relations of ideas, while proofs and probabilities concern matters of fact.⁵⁹ Claims about ‘objects’ immediately present to the senses and memory can be proved.⁶⁰ The realm of proof, which can be compared to what other philosophers of the period often call moral certainty,⁶¹ involves common sense claims, for example, ‘I see fire burning’; ‘the apple is green’; ‘I recall that it rained on Tuesday’. The mitigated sceptic does not doubt these provable facts from common life.⁶² Causal reasoning enables claims that go beyond the immediate evidence of the senses or memory; such claims produce probable belief of varying degrees.⁶³ The proofs in the realm of common-life, however, can involve causal claims;⁶⁴ Hume can claim that he knows ‘with certainty’ that if a friend were to throw himself out of the window, ‘and meet with no obstruction, he will not remain a moment suspended in the air’.⁶⁵ In order to avoid confusion it is important to emphasize that the certainty involved in ‘proof’ is subjective.⁶⁶

It is clear that for Hume at least some experimental results in natural philosophy can be part of common life and proven. For example, Hume allows some prism experiments in optics to be a source of very strong ‘proof’.⁶⁷ Such experiments can produce high epistemic confidence, presumably because the varying experimental effects of the prism, which separates sunlight into different rays, are immediately present to one’s eyes. Hume’s language fits in nicely with the *rhetoric* of Boyle’s

⁵⁹ Hume, *EHU*, 4.1.1.

⁶⁰ Cf. the footnote at start of Hume, *EHU*, 6 with 4.1.3-4.

⁶¹ See, e.g., Descartes’ *Principles of philosophy*, IV, 205.

⁶² See also Hume, *EHU*, 12.3.25 and the ‘wise man’ at 10.4.

⁶³ Cf. Hume, *EHU*, 4.1.3-4 and 4.2.19.

⁶⁴ Hume’s definition of ‘proof’ at Hume, *Treatise*, 1.3.11.2, ‘by proofs, those arguments, which are deriv’d from the relation of cause and effect, and which are entirely free from doubt and uncertainty’, suggests that proofs are, in fact, *limited* to causal arguments. I follow the broader definition of Hume, *EHU*, 6, n. 1: ‘By proofs meaning such arguments from experience as leave no room for doubt or opposition.’

⁶⁵ Hume, *EHU*, 8.1.20. See Peter Millican, ‘Hume’s Sceptical Doubts Concerning Induction’, in *Reading Hume*, 114 n. 18.

⁶⁶ See Robert J Fogelin, *A defense of Hume on miracles* (Princeton, 2003), 26ff.

⁶⁷ Hume, *Treatise*, 2.3.9.19; see also Hume, ‘Dissertation of the Passions’, 140.

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experimentalism, which emphasizes the importance of direct experience.⁶⁸

Moreover, Hume discusses examples of economic activities as part of common life. For example, when, in the context of the rule of law, even 'the poorest artificer' brings goods to market and 'offers them at a reasonable price', he can be assured that he will 'find purchasers'.⁶⁹ As he did with the result of prism experiments, Hume links experimental reasoning with high epistemic confidence. In his political economy Hume treats causal reasoning, even when 'abstruse', as part of common life.⁷⁰ This is why the language of 'proof' appears throughout his political economy.⁷¹ In Part I of the *Dialogues*, even Philo, the arch sceptic, agrees to accept that speculations concerning 'trade, or morals, or politics, or criticism' appeal to 'common sense and experience' and 'remove (at least, in part) the suspicion which we so justly entertain with regard to every reasoning that is very subtle and refined'.

So, at least four kinds of 'matters of fact' are susceptible to 'proofs': (1) claims about objects immediately present to senses and memory; (2) common sense (causal) claims; (3) results of some experiments in natural philosophy, especially if immediately present to the eyes; (4) causal claims in moral sciences (e.g., economics and politics).

Common sense and common life play an important role in the two species of mitigated scepticism.⁷² In the first 'common sense and reflection' are a medicine against pride and dogmatism. Here 'common sense and reflection' means being 'sensible of the strange infirmities of human understanding, even in its most perfect state, and when most accurate and cautious'. Practitioners of the second species of mitigated scepticism (cf. the modest scepticism of the Appendix to the *Treatise*) will not 'be tempted to go beyond common life, so long as they consider

⁶⁸ See Steven Shapin, *A social history of truth: civility and science in seventeenth-century England* (Chicago, 1994), 375-6.

⁶⁹ Hume, *EHU*, 8.1.17.

⁷⁰ 'Hume, 'Of Commerce', *EMPL*, 253.

⁷¹ See, Hume, 'Of Refinement in the Arts', *EMPL*, 276, 'Of Balance of Trade', *EMPL*, 311, and 'Of Interest', *EMPL*, 297, etc.).

⁷² Hume, *EHU*, 12.3.24-5.

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the imperfection of those faculties which they employ, their narrow reach, and their inaccurate operations'.⁷³

Thus, Hume's 'science of man' emphasizes the weakness of even humanity's best cognitive capacity and it is *at the same time* offering an argument for staying within confines of (potential) ordinary experience.⁷⁴ In fact, mitigated scepticism is said to be 'nothing but' reflections of common life 'methodized and corrected'.⁷⁵ Hume's public endorsement of the two species of mitigated scepticism, which like the 'science of man', may 'be ... durable and useful',⁷⁶ and 'be of advantage to mankind'⁷⁷ is not supposed to undermine the reasoning of common life.⁷⁸ He insists that 'experimental inference and reasoning concerning the actions of others enters so much into human life, that no man, while awake, is ever a moment without employing it'.⁷⁹

So, causal claims of metaphysics and even natural philosophy that go beyond common life (e.g., the 'origin of worlds') cannot be 'proven'. This conclusion is anticipated at the start of *EHU*: 'The only method of freeing learning, at once, from these abstruse questions, is to enquire seriously into the nature of human understanding, and show, from an exact analysis of its powers and capacity, that it is by no means fitted for such remote and abstruse subjects.'⁸⁰

One might think⁸¹ that mitigated sceptics endorse all of natural philosophy because of two passages. First, Hume asserts that 'laws of

⁷³ Hume, *EHU*, 12.3.25.

⁷⁴ Cf. Hume, *EHU*, 1.12.

⁷⁵ Hume, *EHU*, 12.3.25; 'Of Miracles' shows that this can still create considerable distance between how ordinary human beings are likely to react to certain experiences and what the cultivated judgment informed by the 'reflections of common life' is willing to endorse. For Hume, 'common sense' is quite fragile.

⁷⁶ Hume, *EHU*, 12.3.24.

⁷⁷ 12.3.25.

⁷⁸ Cf. Hoover, *Causality in macroeconomics*, 9.

⁷⁹ Hume, *EHU*, 8.1.17.

⁸⁰ 1.12.

⁸¹ See, besides Buckle, Hume's *Enlightenment tract*, De Pierris, 'Causation as a Philosophic Relation in Hume', 501, and De Pierris, 'Hume and Locke on Scientific Methodology'.

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nature' have been 'established' by 'firm and unalterable experience'.⁸² There is no evidence that here Hume has Newtonian laws or some other natural philosophy in mind. Rather, in context, the natural reading of 'laws of nature' refers to the collective experience of humankind going back to pre-history.⁸³ By contrast, the evidence of, say, universal gravity is based on highly-detailed (and unusual) 'phenomena'. But, Newton's 'phenomena' are not simple observed events as is clear from a look at the six phenomena Newton lists just after the Rules of Reasoning in Book III. They are best understood as robust empirical generalizations accepted by natural philosophers. (Phenomenon 1 reads, for example: 'The satellites of Jupiter, by radii drawn to the center of Jupiter, describe areas proportional to the times, and their periodic times—the fixed stars being at rest—are as $3/2$ powers of their distances from that center'). They are known to and accepted by only a very narrow part of the collective experience of mankind. Once one understands Newton's system of the world, it is not easy to overlook how strange his conception of the universe is to common life, even when 'corrected and methodized'.⁸⁴ It is hard to see how the collective experience of humankind would establish universal attraction without some extraordinary inferences. In fact, this 'collective experience' did not prepare ordinary people or astronomers for Newton's theory, which was initially welcomed with incredulity even by learned commentators.⁸⁵ So while the reading I oppose can be sustained on logical grounds, there is only very weak textual and historical evidence for it.⁸⁶

⁸² Hume, *EHU*, 10.12.

⁸³ See also 'laws of nature' at Hume, *EHU*, 4.1.8-9.

⁸⁴ For example, the most distant particles of the universe attract each other. In *EPM*, Appendix 2.7, Hume shows, by quoting Fontenelle, awareness of this.

⁸⁵ See Eric Schliesser and George E Smith, 'Huygens' 1688 Report', forthcoming.

⁸⁶ There is a passage (at *Treatise*, 1.3.11.2), where Hume writes that 'One would appear ridiculous, who wou'd say, that 'tis only probable the sun will rise tomorrow, or that all men must dye.' Here Hume is clearly using common-sense language and not the language of natural philosophy in describing orbits of the Sun and Earth. Hume appears to be following Berkeley's Baconian advice – offered in discussion of the Copernican refutation of the common sense idea that the Sun rises! – that, 'we ought to think with the learned and speak with the vulgar' (*Principles*, 51; cf. Philo's comments on Bacon's 'fool' in Part I of *Dialogues*.)

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There is a second passage that causes more problems for my reading: ‘There are some causes, which are entirely uniform and constant in producing a particular effect; and no instance has ever yet been found of any failure or irregularity in their operation. Fire has always burned, and water suffocated every human creature.’ For Hume these are clearly examples of matters of fact based on proof. He then continues, ‘the production of motion by impulse and gravity is an universal law, which has hitherto admitted of no exception’.⁸⁷ Clearly Hume is inclined to assimilate a law of nature to the category of proof, given that this appears to be a nod to Newton’s famous law that gravity is inversely proportional to distance.⁸⁸ Yet, Hume’s phrasing is considerably weaker than the statement of Newton’s Inverse-Square Law. Without the phrase ‘universal’ Hume’s comment borders on the banal. And unlike the cases of burning fire and suffocating water, Hume qualifies that the law is exceptionless provisionally. Moreover, against the argument built on either or both passages, ‘Of Miracles’ teaches quite clearly that it is ‘testimony’ that ‘assures’ us of the veracity of the ‘laws of nature’; claims relying on testimony, while provable, can still permit counterbalancing testimony.⁸⁹

In principle, the ‘science of man’ can be the subject of more reliable knowledge than important parts of natural philosophy. *Some* parts of natural philosophy can be proven – recall the discussion of prism experiments above – and can be part of common life. For the mitigated sceptic there is a distinction between ‘corrected and methodized’ and, thus, provable common life and claims of lower probability found in the more surprising parts of natural science far removed from common life.⁹⁰ Hume castigates the greedy embrace by philosophers of theories that have ‘the air of a paradox’, who are, thereby, distancing themselves from the ‘unprejudiced notions of mankind’.⁹¹

⁸⁷ Hume, *EHU*, 6.4

⁸⁸ The editor of *EHU*, Tom L Beauchamp, has no doubt about this (233). See also De Pierris, ‘Hume and Locke on Scientific Methodology’.

⁸⁹ This is especially clear in a letter to Hugh Blair 1761 (HL, i 349-5). I thank Peter Millican for calling attention to and discussion of this passage.

⁹⁰ Recall Hume, *EHU*, 12.3.25.

⁹¹ Hume, *Treatise*, 1.2.1.1

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I have no direct textual evidence for the importance of the distinction between provable common life and claims of lower probability found in natural science in Hume's philosophy. However, immediately in Part I of the *Dialogues*, in response to Philo's very Humean comments, Cleanthes attacks the distinction sharply: 'the most abstruse and remote objects are those which are best explained by philosophy ... In vain would the sceptic make a distinction between science and common life, or between one science and another.' So Hume is aware that a reading like mine is a natural response to his philosophy.⁹²

I conclude this section by discussing briefly how Hume adapted Newton's Rules of Reasoning.⁹³ I claim that these rules explain how the mitigated sceptic can correct and methodize common life; they underwrite his 'proofs'. I then focus on the lacks of equivalence in Hume to Newton's fourth Rule.

Hume states eight 'rules by which to judge of causes and effects'. The source of these rules is ambiguous. Although they 'might have been supply'd by the natural principles of our understanding',⁹⁴ Hume provides no evidence for this. Nevertheless, Hume thinks it is 'proper' to employ them in his 'reasoning'.⁹⁵ Earlier in the *Treatise*, he was even more adamant about the regulative character of these rules: 'We shall afterwards take notice of some general rules, by which we ought to *regulate* our judgment concerning causes and effects; and these rules are form'd on the nature of our understanding, and on our experience of its operations in the judgments we form concerning objects' (emphasis

⁹² See Millican, 'Hume's Sceptical Doubts Concerning Induction', 64 n. 42. Hume's awareness of Adam Smith's 'The *History of Astronomy*' may account for the need to respond to criticism of the distinction (see also Wertz, 'Hume and the Historiography of Science'). The *Dialogues* are in part Hume's effort to educate the students of natural religion and show how intellectual friendship, or 'true liberty' is *possible* despite superstitious, doctrinal disagreements; the work does not state Hume's positive 'science of man' or 'true metaphysics'.

⁹³ For a fuller version of this, see section 4.5 of Eric Schliesser, 'Hume's Newtonianism and Anti-Newtonianism'.

⁹⁴ Hume, *Treatise*, 1.3.15.11.

⁹⁵ 1.3.15.11; 1.3.15.2.

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added).⁹⁶ So, while these rules may be derived from reflection on how our minds work or some may be derived ‘from experience’,⁹⁷ they prescribe how *we* should ascribe causes to ‘objects’ in the world.⁹⁸ They may be what Hume has in mind in the when he speaks of ‘rules of just reasoning’.⁹⁹ But on Hume’s definition of a cause, rules 4–8 are at most useful stipulations that help one identify causal relations.¹⁰⁰

Hume may have these rules in mind when he describes how the mitigated sceptic corrects and methodizes common life.¹⁰¹ For, the formulation of these rules *methodizes* common life, while the difficult application of them is frequently a tool in *correcting* common life by directing our ‘judgment’.¹⁰² It is, thus, a way to *imagine* philosophically what common sense is or should be. To reason ‘justly’ does not, of course, guarantee correctness, but it is the best we can do in common life.¹⁰³ Hume tacitly relies on the rules throughout his political economy.¹⁰⁴ This is *prima facie* evidence for the conceptual unity of Hume’s thought.

A crucial difference between Hume’s and Newton’s rules is Hume’s lack of an equivalent to Newton’s Rule IV. It reads:

In experimental philosophy, propositions gathered from phenomena by induction should be considered either exactly or very nearly true notwithstanding any contrary hypotheses, until yet other phenomena make such propositions either more exact or liable to exceptions.

This Rule should be followed so that the arguments based on inductions may not be nullified by hypotheses.¹⁰⁵

⁹⁶ 1.3.13.11. See Graciela De Pierris, ‘Hume’s Pyrrhonian Skepticism and the Belief in Causal Laws’, *Journal of the History of Philosophy*, 39 (2001), 351.

⁹⁷ 1.3.15.6.

⁹⁸ See Marie A Martin, ‘The Rational Warrant for Hume’s General Rules’, *Journal of the History of Philosophy*, 31 (1993), 245–57.

⁹⁹ Hume, *EHU*, 10.1.1.

¹⁰⁰ Hume uses ‘to fix’ at *Treatise*, 1.3.15.2.

¹⁰¹ Hume, *EHU*, 12.3.25.

¹⁰² Cf. Hume, *Treatise*, 2.3.3.2

¹⁰³ See the ‘Indian prince’, *EHU*, 10.1.10 and Cardinal de Retz at *EHU*, 10.2.26.

¹⁰⁴ See Eric Schliesser, ‘Causal reasoning in Hume’s political economy’, unpublished typescript.

¹⁰⁵ Newton, *Principia*, 796.

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The rule is that we should treat well confirmed propositions as true (or nearly true) until there are deviations that promote new research, which, in turn, lead us to refine our original propositions or reject them for new ones. But while one has a theory, one must not be distracted by possible differing explanations for the found regularities until one has empirical reason. One accepts a theory as true as a *means* to developing a better theory. As Newton writes in the Preface to the *Principia*, 'the principles set down here will shed some light on either this mode of philosophizing or some truer one' (emphasis added). That is, Newton accepts that physical inquiry is forward-looking and may be open-ended.¹⁰⁶ Newton's Rule IV implicitly accepts that the future may bring surprises and new evidence. Many are right to see in this an anticipation of Hume's fallibilistic insights;¹⁰⁷ it is overlooked, however, that this attitude is in contrast to Hume who had claimed in his interpretation of Newton's results to know, in advance, what the *limits* and the 'ultimate causes and principles which we shall ever discover in nature', *could* be.¹⁰⁸

Newton's Rule IV is (1) a proposal of how to treat a theory, that is, as true until proven otherwise.¹⁰⁹ It underwrites what I call 'Newton's Challenge' to philosophy. It is also (2) an encouragement to find and exploit known deviations from established regularities in order to make them 'more exact'. I discuss the second point elsewhere.¹¹⁰ Here I focus on the first.

With only slight anachronism, one can describe Newton's position as an attitude toward ontic commitment with regard to one's theory: one is committed to its truth until proven otherwise. While Newton formulates the claim as a research stance, he does not permit a second-order level, as

¹⁰⁶ See Smith, 'Newton's Methodology' and Stein, 'Newton's Metaphysics'.

¹⁰⁷ Hume, *EHU*, 4.2.18-21.

¹⁰⁸ Hume, *EHU*, 4.1.12, but there he hedges his bets a bit; note his use of 'probably'. Cf. Buckle, *Hume's Enlightenment tract*, 83-9, who rates *Newton* as inconsistent on this point (87, 89).

¹⁰⁹ See Force, 'Hume's Interest in Newton and Science', 180-7, especially footnotes 30 and 40.

¹¹⁰ Eric Schliesser, 'Galilean Reflections on Milton Friedman's Methodology of Positive Economics: with thoughts on Economics in the Laboratory', *Philosophy of the Social Sciences*, 35 (2005), 50-74.

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it were, in which alternative hypotheses get a hearing. Hume's omission of an equivalent rule has several implications. First, without commitment to the truth of a whole 'scientific' theory, Hume can appeal to extra-Newtonian criteria in evaluating Newton's claims. Second, Hume has conceptual space for his distinction between the provable, experimental claims of common life (including parts of natural philosophy), and the lesser, probable commitments of the more abstract parts of natural philosophy. Third, within common life we have natural and habituated principles of association that will make us *feel* committed to all kinds of things. In common life we can feel moral certitude based on habits. The moral philosopher (if he is a mitigated sceptic) systematizes and corrects these with Hume's rules of reasoning to generate proofs, but does not have to defer to the natural philosopher.

In this section, I argued that Hume's epistemic categories underwrite the epistemic priority of the realm of the science of man over natural philosophy, most of which is subject to lesser, probable belief. In the next section, I show that this argument derives support from Hume's treatment of causation.

Hume's Causal Anti-Reductionism¹¹¹

From an explanatory point of view, for Hume the 'science of man' is prior or at least equal to the other sciences. In this section I show that Hume's celebrated treatment of causation undercuts reductionist strategies. First, I offer a distinction between 'pre-Newtonian mechanical philosophy' and 'Newtonian mechanical philosophy' to remove some common confusion.

Quite diverse thinkers proposed various mechanistic systems and principles. Here I mean this in the broadly pre-Newtonian sense, that is, a view that not only rejects substantial forms and occult qualities, but also expects (hypothetical) explanations to be cast in terms of colliding

¹¹¹ A longer version of this section was published in Schliesser, 'Two Definitions of Causation'.

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bodies.¹¹² The rules of their impact become fundamental.¹¹³ By 1668/9 Huygens, Wren, and Wallis agreed on the proper mathematical analysis of these, and had created a stable field of enquiry relatively immune from theological and metaphysical argument.¹¹⁴

For Newton, explicitly building on the achievement of Huygens, Wren, and Wallis, by contrast, rational mechanics 'will be the science, expressed in exact propositions and demonstrations, of the motions that result from any forces whatever and of the forces that are required for any motions whatever.'¹¹⁵ So, we need to be careful to distinguish Newton's

¹¹² In the *Principia's* 'Author's Preface to the Reader' Newton does not mention the 'Moderns' demand for an explanation in terms of colliding bodies because this he rejects in his famous phrase from the General Scholium, 'Hypotheses non fingo'. For representative examples, see Huygens' negative reactions to Newton's earliest published work on colors and his demand for a 'hypothesis, that should explain mechanically and by the nature of motion' the colors yellow and blue in his 'An Extract of a Letter Lately Written by an Ingenious Person from Paris, Containing Some Considerations upon Mr. Newtons Doctrine of Colors, as Also upon the Effects of the Different Refractions of the Rays in Telescopical Glasses', *Philosophical Transactions of the Royal Society*, 96 (21 July 1673), 6086-7, which can be found on the Newton Project website at: www.newtonproject.sussex.a.uk/view/texts/normalized/NATP00016.

¹¹³ See Descartes' seven rules of collision in the *Principles of philosophy*, II, 26-42

¹¹⁴ See Richard S Westfall, *Force in Newton's physics: the science of dynamics in the seventeenth century* (Amsterdam, 1971) for an introduction to these. In the Scholium to Corollary VI of the laws of motion Newton calls 'Sir Christopher Wren, Dr. John Wallis, and Mr. Christian Huygens, easily the foremost geometers of the previous generation' (Newton, *Principia*, 424).

¹¹⁵ Buckle (*Hume's Enlightenment tract*, 77), quotes this passage in the middle of an argument attempting to show that Hume and Newton agree that natural philosophy can only attain mathematical description (that is, a kind of instrumentalism), but not knowledge of nature, without noticing that *Newton* is committed to the *reality* of forces and makes it a centerpiece of his new form of explanation. For corrective to Buckle, see Andrew Janiak, 'Newton and the Reality of Force', *Journal of the History of Philosophy*, 45 (2007), 127-47; Steffen Ducheyne, 'Newton's Training in the Aristotelian Textbook Tradition: From Effects to Causes and Back', *History of Science*, 43 (2005), 217-37; and *idem*. 'Reid's Adaptation and Radicalization of Newton's Natural Philosophy as an Anticipation of Positivism', *History of European Ideas*, 32 (2006), 173-89.

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‘mechanical principles’, which are framed in terms of invisible forces, from the pre-Newtonian sense.¹¹⁶

In the *Treatise*, Hume quite elegantly analyzes how ‘our’ notion of causality¹¹⁷ – one applying to events that are contiguous, exhibit temporal priority of the cause, and have constant conjunction – is derived from experiencing constant conjunction of objects that produce a union in the imagination.¹¹⁸ Hume’s analysis is a useful first approximation of, and unifies what ‘Moderns’ tend to mean by ‘causation’. In his hands, a redefined version of Aristotelian ‘efficient causation’ is the only kind of ‘causation’ available for use.¹¹⁹ There is, thus, a *stipulative* quality to Hume’s discussion.¹²⁰ It *rules out*, for example, the general ‘final causes’ that Newton appeals to in his General Scholium (recall the quotation in the second section of this paper) or the more local final causes that, for example, Colin Maclaurin appeals to in his arguments against Spinoza.¹²¹ Hume was by no means the first to attack the four Aristotelian causes; the use of final causes, especially, had been a target for over a century.¹²²

¹¹⁶ Newton, ‘Author’s Preface to the Reader’, *Principia*. See Stein, ‘Newton’s Metaphysics’, especially pp. 282ff. Kant’s distinction between a ‘mathematical-mechanical’ and a ‘metaphysical-dynamical’ is, although slightly different, useful in this regard; see Michael Friedman, *Kant and the exact sciences* (Cambridge, Mass., 1992), 137-40 and 181-3.

¹¹⁷ At Hume, *Treatise*, 1.3.14.31, Hume gives two definitions of ‘cause’. For discussion see Garrett, *Cognition and commitment in Hume’s Philosophy*, Chapter 5; cf. Schliesser, ‘Two Definitions of Causation’, for an exploration of many differences in the definitions between the *Treatise* and *EHU*.

¹¹⁸ 1.3.6.16. The relation of a necessary connection is also very important to Hume’s thinking on causation (see, 1.3.2.11; 1.3.14, and *EHU*, 6). See Broughton, ‘Hume’s Ideas about Necessary Connection’ and De Pierris, ‘Causation as a Philosophic Relation in Hume’.

¹¹⁹ Hume, *Treatise*, 1.3.14.32

¹²⁰ Recall Hume, *Treatise*, 1.3.15.

¹²¹ Maclaurin, *An account*, 17 and 36. See also Hume’s letter to Hutcheson dated 17 September 1739.

¹²² For attempts at ‘banishing’ the search for final causes, see Descartes, *Principles of philosophy*, I, 28, and especially the Appendix to Part I of Spinoza’s *Ethics*. Of course, prior to Hume few philosophers managed to eliminate final, formal, or material causes from their explanatory practices. See Margaret J Osler, ‘From Immanent Natures to Nature as Artifice: The Reinterpretation of Final Causes in Seventeenth-Century

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While Hume and Newton both appeal to the authority of 'experience', there are tensions between Hume's account of causation and the *contents* of Newton's natural philosophy.¹²³ The behaviour of the moon in its orbit and that of, say, apples falling to the earth have the same cause: namely, the force of gravity, or weight, towards the earth.¹²⁴ This conflicts with the contiguity requirement, which Hume considers 'essential' to causation.¹²⁵ It is hard to see how contiguity could be made consistent with the universal nature of attraction. The most distant particles of the universe attract each other. More important, the acceleration produced by the exercise of a force is *simultaneous* with that exercise – thus defying temporal priority. It is hard to see how to make sense of this in light of Hume's approach, which explicitly attacks the possibility of an effect being simultaneous with its cause.¹²⁶ Hume claims that the temporal priority of the cause is 'of no great importance', yet it appears explicitly or implicitly in all of his definitions of 'cause' and his examples.¹²⁷

Natural Philosophy', *The Monist*, 79 (1996), 388-408. On the curious fate of formal causation, see Thomas S Kuhn, 'Concepts of Cause in the Development of Physics', in *idem*, *The essential tension: selected studies in scientific tradition and change* (Chicago, 1977), 21-30. See also Eric Schliesser, 'Emanative Causation and Ontology in Newton, Measurement, and the Baconian Laws of Nature', *Foundations of Science* in press.

¹²³ See Stein, 'On Philosophy and Natural Philosophy in the Seventeenth Century'. De Pierris, 'Hume and Locke on Scientific Methodology' cites Stein's authority, but ignores this aspect.

¹²⁴ Newton, *Principia*, Book III, Scholium to Proposition IV, Theorem IV

¹²⁵ Hume, *Treatise*, 1.3.2.6. At *Treatise*, 2.1.11.5, contiguity plays a striking role in explaining why blood-relation is a species of causation. Don Garret, 'The Representation of Causation and Hume's Two Definitions of 'Cause'', *Noûs*, 27 (1993), 179, n.1, correctly points out that contiguity disappears from the definitions of 'cause' in Hume, *EHU*, 7.2.29. But Hume's examples, i.e., the billiard balls at 7.2.30 and a vibrating string at 7.2.29, still seem to rely on intuitions using contiguity. By the time he wrote *EPM* Hume was certainly aware that natural philosophers thought that the behavior of the moon in its orbit and that of bodies falling to earth have the same cause, see 6.1.6.

¹²⁶ Hume, *Treatise*, 1.3.2.7-8

¹²⁷ 1.3.2.8. Perhaps, the following is perhaps a counter-example to my claim: Hume clarifies one of his definitions of 'cause' as follows: 'if the first object had not been, the second never had existed' (*EHU*, 7.2.29). In the clarification, 'first' and 'second' are not obviously temporal in kind. But in the original definition, Hume talks about one object 'followed' by another, and this is temporal.

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It is the great virtue of Hume's analysis to make clear what several generations of natural philosophers could have presupposed in discussing efficient causes.¹²⁸ It is no surprise that Hume's examples – for example the illustration of billiard balls¹²⁹ – *seem* to presuppose something like what has been called a mechanistic world view.¹³⁰ Of course, Hume's examples of mental causation obviously are not mechanistic in the pre-Newtonian sense, although he calls 'instincts ... mechanical tendencies';¹³¹ they are about the association of ideas, not bodies.¹³² Nevertheless, there is a fundamental similarity between Humean causes and pre-Newtonian mechanical causes: they have the same structure, namely, the priority of the cause over the effect, contiguity, and constant conjunction.

The full extent of Hume's indebtedness to pre-Newtonian mechanical philosophy becomes evident once we realize that he accepts the mechanists' view of what counts as a proper explanation. Hume writes about the nature of Newton's achievements: 'While Newton seemed to draw off the veil from some of the mysteries of nature, he shewed at the same time the imperfections of the mechanical philosophy; and *thereby* restored her ultimate secrets to that obscurity, in which they ever did and ever will remain'.¹³³ Hume treats Newton's refutation of the mechanical philosophy not as a decisive *advance* in knowledge but, instead, as decisive evidence for the claim that nature will remain unknowable in

¹²⁸ For a different argument with same conclusion see Buckle, *Hume's Enlightenment tract*, 48ff.

¹²⁹ E.g., Hume, *Treatise*, 1.3.14.18 and *EHU*, 7.2.30; Marina Frasca-Spada, *Space and the self in Hume's 'Treatise'* (Cambridge, 1998), 92, correctly points out that Hume uses it in the 'Abstract', but she is wrong to claim it does not appear in the *Treatise*.

¹³⁰ Malebranche's influence on Hume's account of causation has been mined ever since the seminal articles by R W Church, 'Malebranche and Hume', *Revue Internationale de Philosophie*, 1 (1938), 143-61 and C W Doxey, 'Hume's relation to Malebranche', *Philosophical Review*, 25 (1916), 692-710.

¹³¹ Hume, *EHU*, 5.2.22.

¹³² Hume, *Treatise*, 1.1.4.

¹³³ Hume, *History*, VI, 542, emphasis added.

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principle.¹³⁴ The way to make sense of Hume's remark is to see that it reveals that he implicitly accepts¹³⁵ the mechanists' insistence that theirs was the only program that offered the possibility of intelligible explanation,¹³⁶ even if it only offered hope of post-facto rational reconstruction.¹³⁷

Nevertheless, although Hume's conception of 'cause' appears to be inspired by pre-Newtonian mechanical philosophy, as has been shown, from an ontological point of view Hume is not in all things a pre-Newtonian mechanical philosopher. He rejects the reductionism of the mechanical philosophy.¹³⁸ Hume's anti-reductionism is made evident by

¹³⁴ Buckle (*Hume's Enlightenment tract*, 85ff) reads Hume's remarks as an echo of Newton's famous 'hypotheses non fingo' and, thus, that Hume's (sceptical realist) position is quite compatible with Newton's. Hume is correct to state that Newton had 'shewed the imperfections of mechanical philosophy'. But Buckle does not realize that 'hypotheses non fingo' is a rejection of the norms of evaluation and, especially, of the criteria of intelligibility promoted by the mechanical philosophy. For Newton one can accept the reality and intelligibility of forces even if one cannot provide an underlying 'physical-mechanical' account because he rejects the demand for one. But this does not mean that for Newton nature's secrets will therefore remain, in principle, unknowable forever. (As the queries to the *Opticks* reveal, Newton thinks that it is worthwhile to speculate about all kinds of potential causal explanations of the phenomena). Thus, it is far too strong to assert that this means that Newton does not think there is a need to look for further, underlying causes, or that they will remain unavailable on epistemic grounds. Cf. Strawson, 'David Hume: Objects and Power', 237, 247-8, 250-1.

¹³⁵ Cf. Broughton, 'Hume's Ideas about Necessary Connection', 234.

¹³⁶ Cf. Section III of *The natural history of religion*: 'Could men anatomize nature, according to the most probable, at least the most intelligible philosophy, they would find, that these causes are nothing but the particular fabric and structure of the minute parts of their own bodies and of external objects; and that, by a regular and constant machinery, all the events are produced, about which they are so much concerned.' Thus, Hume thinks the mechanical philosophy is the most intelligible, even 'most probable'.

¹³⁷ See the quotations from Boyle in Lisa Downing, 'The Status of Mechanism in Locke's Essay', *The Philosophical Review*, 107 (1998), 386 and 399. Another *locus classicus* is Huygens' Preface to the *Treatise of light* (Leiden, 1690). For Hume's approach to intelligibility see Winkler, 'The New Hume', especially the postscript which is not part of the version published earlier in *Philosophical Review*.

¹³⁸ See T Pitson, *Hume's philosophy of the self* (London, 2002), chapters 1-2. See De Pierris, 'Hume and Locke on Scientific Methodology' for more differences between Hume's conception of causation and the mechanical philosophy.

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the important assumption in his account of causation that all matters of fact are, in an important sense, alike. In the *Treatise*, he writes, ‘there is but one kind of necessity, as there is but one kind of cause, and that the common distinction betwixt moral and physical necessity is without any foundation in nature.’¹³⁹ Moreover, ‘Passions are connected with their objects and with one another; no less than external bodies are connected together. The same relation, then, of cause and effect, which belongs to one, must be common to all of them.’¹⁴⁰ Hume thinks that we apply the same type of inference about matters of fact, and that all facts have the same causal structure. In causal explanations there is, thus, no reason to privilege the motion of small bodies or *any* ‘lower level’ causes. Further evidence for his anti-reductionism comes from Hume’s eight ‘rules by which to judge of causes and effects’ because it is ‘possible for all objects to become causes or effects to each other.’¹⁴¹ Thus, the relative neglect by scholars of Hume’s historical, economic, and political works is odd because these should reveal as much about his views on causation as do those on more ‘philosophic’ topics.

In this section, I argued that Hume’s treatment of causation is anti-reductionist and anti-physicalist. Moreover, his approach to causation is quite general: there is no fundamental difference between natural or moral causes. Within Hume’s epistemology, physical causes need not be prior to moral causes in any sense. Hume’s argument relies on the exclusive claims to intelligibility of the pre-Newtonian mechanical philosophy.¹⁴² In the next section I show how Hume rejects Newton’s metaphysics.

Hume’s Rejection of Newton’s Metaphysics¹⁴³

There is no doubt that Hume respects Newton’s intellectual achievement:

¹³⁹ 1.3.14.33; *EHU*, 8.1.19 and 8.1.16. Hume distinguishes between particular and general facts *EHU*, 12.3.30-1.

¹⁴⁰ 1.3.2.16; 1.3.12.16, 1.3.14.33.

¹⁴¹ 1.3.15.

¹⁴² One may think that Hume’s treatments of the example of the collision of billiard balls shows that even the standard, pre-Newtonian mechanical example of (efficient) causation is, in fact, unintelligible. (See also Locke’s *Essay*, II, xxiii.28). Fair enough.

¹⁴³ The argument of this section bears on the debate generated by John Wright, *The sceptical realism of David Hume* (Manchester, 1983), but I have no space to work out the implications here.

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'The severest scrutiny, which NEWTON'S theory has undergone, proceeded not from his own countrymen, but from foreigners; and if it can overcome the obstacles, which it meets with at present in all parts of Europe, it will probably go down triumphant to the latest posterity.'¹⁴⁴ Nevertheless, in this section I give further evidence of Hume's lack of commitment to Newtonian ontology and methodology. Hume does not only reject the reductionism of pre-Newtonian mechanical philosophers, he also rejects Newton's claim that forces are a fundamental part of our explanatory framework. Moreover, I show that Hume distinguishes Newton from his followers.

For Hume, we build up our causal theories from experience of *particular* events.¹⁴⁵ This is an important *constraint* for Hume because it allows him to ask who has ever perceived an instance of a power or force in action – a crucial move for Hume's attack on theoretical and invisible entities.

It is well known that for Hume all our ideas are derived from impressions.¹⁴⁶ Hume's attacks on inflated claims about substance, essence, force, power, and – most importantly – God, all rely on his rhetorically-powerful ability to ask to what impression such notions can be traced.¹⁴⁷ For, '[i]deas always represent the objects or impressions, from which they are derived.'¹⁴⁸ This has become known as the 'copy principle'. If no such 'external' objects or impressions are to be found, then we must conclude that such ideas are the product of 'internal' 'passions and emotions', a 'trivial suggestion of the fancy', or 'some imperfection in [the] faculties [of mind]'.¹⁴⁹ The thrust of Hume's account is to make talk of, say, substance or force (power, God, etc.) seem either

¹⁴⁴ Hume, 'Of the Rise and Progress of the Arts and Sciences', *EMPL*, 121.

¹⁴⁵ Hume, *Treatise*, 1.3.14.6-15; also footnote at *EHU*, 11.26. Pitson also notes the methodological importance of this footnote, but the interpretive situation is complicated because it occurs in the middle of a dialogue.

¹⁴⁶ Hume, *Treatise*, 1.2.3.2-3.

¹⁴⁷ E.g., Hume, *Treatise*, 1.1.6; 1.2.5.28; 1.4.14, and 1.4.5.3-4; on idea of God, see *EHU*, 2.6. Spada-Frasca, *Space and the self*, 71, argues that for Hume the idea of space is different.

¹⁴⁸ Hume, *Treatise*, 1.2.3.11.

¹⁴⁹ Hume, *Treatise*, 1.1.6.1, 1.4.7.6, and 1.1.7.8.

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meaningless or restricted to the particular qualities of bodies from which the idea is derived.¹⁵⁰ At best, they have reference to ‘an effect, or some other event constantly conjoined with’ the cause.¹⁵¹ As Hume says in a late addition to the *Treatise*, we must ‘confine our speculations to the *appearances* of objects to our senses, without entering into disquisitions concerning their real nature and operations’.¹⁵² This imperative is, in fact, for Hume not derived from Newton, but the ‘*Newtonian* philosophy...rightly understood’.¹⁵³ Newton’s speculations in the last paragraph of the General Scholium about ‘a certain very subtle spirit pervading gross bodies and lying hidden in them’, or Newton’s posthumously-published relational account of gravity as an inessential property of matter,¹⁵⁴ may well have been Hume’s targets.

Hume’s approach to natural philosophy means that when the sciences talk about forces or powers, these words must be reinterpreted.¹⁵⁵ According to Hume ‘force’ and ‘power’ have, at most, a reference to ‘an effect, or some other event’. And ‘Force, Power, Energy ... [these] words, as commonly used, have very loose meanings annexed to them; and their ideas are very uncertain and confused’.¹⁵⁶ Hume denies here the fundamental achievement of the *Principia*.¹⁵⁷ What Hume refuses to

¹⁵⁰ Hume, *Treatise*, 1.1.6.1 and *EHU*, 4.2.16.

¹⁵¹ Hume, *EHU*, 7.2.29; Reid described the strategy as ‘a tribunal of inquisition erected by certain modern philosophers before which every thing in nature must answer’ (*An Inquiry*, Chapter 6, Section VIII, 98; cf. W V Quine’s ‘tribunal of experience’ in ‘Two dogmas of empiricism’, *Philosophical Review*, 60, no.1 (Jan.1951)).

¹⁵² See Philo’s comments in Part IX of the *Dialogues*.

¹⁵³ 1.2.5.26 n. 12, emphasis in original.

¹⁵⁴ See Eric Schliesser, ‘Without God: Newton’s Relational Theory of Attraction’, *Vanishing matter and the laws of motion from Descartes to Hume*, ed. D Jalobeanu and P Anstey (under review).

¹⁵⁵ See Millican, ‘Hume’s Sceptical Doubts Concerning Induction’, 144-5. The note to Hume, *EHU*, 4.2.16 tells us to look for this in section 7.

¹⁵⁶ Hume, *EHU*, 7.2.29; Cf. *Treatise*, 1.3.14.27.

¹⁵⁷ Hume cannot be taken at face value when he describes the ‘philosopher’ [i.e., Newton] who had ‘determined the laws and forces, by which the revolutions of the planets are governed and directed’ (*EHU*, 1.8). This passage must be interpreted in light of his claims later in the book. Hume lets his reader believe that he is embracing Newton’s achievements before he offers full attack. Cf. Buckle, *Hume’s Enlightenment tract*, 51.

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accept is that Newton's achievement shows that the 'pre-Newtonian' mechanical philosophy offers a *false* choice between hypothetical reconstructions in terms of colliding bodies or no explanations at all.

In fact, despite Newton's abhorrence of hypotheses, Hume is eager to propose and discuss his hypotheses in his 'science of man'.¹⁵⁸ Hume's willingness to introduce and describe hypotheses in his main argument brings him closer to, say, Boyle's methodology.¹⁵⁹

In the *Treatise*, Hume makes no obvious move in the direction of deriving the basic principles of, say, physics, from his theory of human nature. He is quite explicit: 'this belongs not to my present purpose'. He thinks it is 'beyond the reach of human understanding' to 'penetrate into the nature of bodies, or explain the secret causes of their operations'. He cannot 'approve' of the ambition to go beyond knowing bodies by their external properties.¹⁶⁰ For Hume, 'we have no idea of substance, distinct from that of a collection of particular qualities'.¹⁶¹

One may think that Hume was inspired by Newton's (Lockean) remarks in the General Scholium to the *Principia* (in the context of a discussion of our knowledge of God's attributes): 'In bodies we see only their figures and colours, we hear only the sounds, we touch only their outward surfaces, we smell only the smells, and taste the savours; but their inward substances are not to be known, either by our senses or by any reflex act of our minds: much less, then, have we any idea of the substance of God.'¹⁶² Hume and Newton agree that our inquiries should be guided by experienced properties of bodies; they agree that we can have no knowledge of what Newton calls 'innermost' substances (or Lockean real

¹⁵⁸ See, for example, Hume, *Treatise*, 1.1.7.16; 1.3.8.14; 1.3.9.2; 1.3.9.10; 1.3.9.16; 1.3.12.25; 1.3.16.3; 1.4.1.8-9; 1.4.6.7, and many more.

¹⁵⁹ Robert Boyle, 'About the Excellency and Grounds of the Mechanical Hypothesis', in *Excellency of theology* (1674) reprinted in volume VIII of Boyle, *The works of Robert Boyle*, ed. Michael Hunter and Edward B Davis (14 vols, London, 1999-2000).

¹⁶⁰ Hume, *Treatise*, 1.2.5.25.

¹⁶¹ 1.1.6.1

¹⁶² I quote from Motte's translation (London, 1729) because it facilitates understanding Newton's meaning more so than Newton, *Principia*, 942. I thank Howard Stein for discussion of the Latin in this passage.

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essences). The General Scholium may have been the textual source for Hume's claim (quoted before) about Newton restoring nature's 'ultimate secrets to that obscurity, in which they ever did and ever will remain'.¹⁶³ Yet, Newton's position is less constraining than Hume's. For, while substances are not known to us by our senses or by reflection, Newton does not rule out that future inquiry may give us some access to ideas of such substances as is hinted at by his claim about having 'much less' an idea of the substance of God. Newton's words imply that in principle we can at least know something about the features of our ignorance about the ideas of substances of bodies and perhaps learn something positive about invisible properties associated with bodies with Newton's method of inquiry.¹⁶⁴ Newton's General Scholium obscures that Newton's natural philosophy has no need for a notion of substance – the concept does not work in the *Principia* and *Opticks*.¹⁶⁵ Newton's pessimism about our ability to possess ideas of innermost substances is not evidence of general scepticism about knowledge of nature, but rather a change in how to conceive what knowledge of nature is about: the (Newtonian) 'mechanical principles' centreing on the discovery of nature's forces and the original and connate properties of bodies.

Moreover, in the final paragraph of the General Scholium, Newton hints at a program of research, perhaps inspired by the success of Francis Hauksbee's electrical experiments, to penetrate into the nature of matter.¹⁶⁶ This program was by no means finished by the time of Newton's death. As my discussion of Newton's Rule IV indicates, it is characteristic of Newton's willingness to think of his results as programmatic for further research. This attitude is even apparent in Newton's famous lines in the General Scholium when he admits about his treatment of gravity that he

¹⁶³ Hume, *History*, VI, 542.

¹⁶⁴ Newton's optical research had revealed many surprising parts of the internal constitution of light. See Howard Stein, 'The Enterprise of Understanding and the Enterprise of Knowledge', *Synthese*, 140 (2004), 1-2. See also Stephen D Snobelen 'God of Gods, and Lord of Lords: The Theology of Isaac Newton's General Scholium to the *Principia*', *Osiris*, 16 (2001), 169-208.

¹⁶⁵ This radical, innovative position is quite explicit in a work now known as 'De gravitatione', but unknown in Hume's time. *Isaac Newton philosophical writings*, ed. Andrew Janiak (Cambridge, 2004), 29-32. See Stein, 'Newton's Metaphysics', 281-2.

¹⁶⁶ Cohen, 'Guide to Newton's *Principia*', in Newton, *Principia*, 280-92.

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has 'not yet assigned a cause to it' and that he has 'not *as yet* been able to deduce from phenomena the reason for these properties of gravity'¹⁶⁷ (emphasis added).

One may think that Hume's use of 'Newtonian philosophy' in the *Treatise* suggests that Hume has described *Newton's* natural philosophy (as understood by Hume). But this is not likely because elsewhere he writes: 'It was never the meaning of Sir ISAAC NEWTON to rob second causes of all force or energy; though some of his followers have endeavoured to establish that theory upon his authority.'¹⁶⁸ So, first, *Hume's* Newton accepts *some* real causes in nature;¹⁶⁹ Hume's Newton is neither a sceptic about causation nor an occasionalist (Leibniz had raised this concern in his exchange with Clarke). Second, Hume is careful to distinguish Newton from the Newtonians.¹⁷⁰ Elsewhere, in the context of a discussion of the doctrine of occasionalism, Hume emphasizes the differences between Newton and the Newtonians again: 'Sir *Isaac Newton* (tho' some of his Followers have taken a different Turn of thinking) plainly rejects it, by substituting the Hypothesis of an Ætheral Fluid, not the immediate Volition of the Deity, as the Cause of Attraction.'¹⁷¹

Thus, a more likely interpretation is that Hume believes he has offered a prescriptive interpretation of how Newtonian philosophy should be viewed in light of the results of his 'science of man', which shows the limitations of our cognitive capacity, and his restrictive form of empiricism which contribute to his 'modest' or mitigated scepticism. Hume is aware that Newton's universe is filled with invisible interactive causal forces. He sees himself as arguing that the authority of experience

¹⁶⁷ Ducheyne, 'Reid's Adaptation and Radicalization'.

¹⁶⁸ Footnote at the end of Hume, *EHU*, 7.1.25; a note on Hume's Terminology: God would be the 'first cause;' 'second causes' are causes that operate in nature without divine interference (Bell, 'Hume and Causal Power', 72).

¹⁶⁹ Broughton, 'Hume's Ideas about Necessary Connection', 234.

¹⁷⁰ This is why Broughton, 'Hume's Ideas about Necessary Connection', 229-34, and Winkler, 'The New Hume', 68-9, should not appeal to eighteenth-century Newtonian textbook-writers, however important and popular as authoritative guides to interpreting Hume's likely views of Newton.

¹⁷¹ Hume, *A letter from a gentleman to his friend in Edinburgh*, ed. Ernest C Mossner and John V Price (Edinburgh, 1967 [1745]), 28-9.

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does not require us to accept Newton's own understanding of his achievement.¹⁷²

Conclusion: Hume's attitude toward Newton's impact on philosophy
Hume and Newton both appeal to the authority of experience; it is their shared 'foundation'.¹⁷³ Nevertheless, the copy principle, what is known as the separability principle,¹⁷⁴ and Hume's 'rules of reasoning', guide how Hume believes 'experience' should be analyzed. Hume's Newton has shown merely the road *to* the 'true philosophy'.¹⁷⁵ One way to understand Hume's self-understanding of the 'science of man' is to see it, then, as the fulfillment of the Newtonian philosophy 'rightly understood' – that is, of course, by Hume.¹⁷⁶

Hume's unified account of causation is a rejection of Newtonian final causes, Newtonian simultaneous causes, and the foundational priority of

¹⁷² Cf. Broughton, 'Hume's Ideas about Necessary Connection', 230, where she contrasts Berkeley and Hume. Broughton (237) interprets Hume as not 'robbing 'second causes of all force or energy''. (Broughton is quoting one of Hume's discussions of Newton). Yet, on 235-37, Broughton attributes a broadly instrumentalist reading to Hume. (Bell, 'Hume and Causal Power', 84-5, also ascribes a broadly instrumentalist reading of Hume). Her note 26 (243) expresses with admirable honesty the difficulty of settling on the appropriate description of Hume's stance. There is, however, an independent argument against Broughton's claim (237) that for Hume finding or 'marking' facts 'is investigating the forces and powers in nature' (emphasis in Broughton). For, she is attributing to Hume a view about the nature of natural philosophy (the collection or ordering of bare facts), which he explicitly claims is appropriate to moral philosophy/science of man, but not natural philosophy (Hume, *EHU*, 1.13).

¹⁷³ Millican, 'Hume's Sceptical Doubts Concerning Induction', 149-51 argues that Hume's phrase, 'founded on' means 'derives authority from'.

¹⁷⁴ See Garrett 1997, chapters 2-3.

¹⁷⁵ Hume, *History*, VI, 542. Wertz, 'Hume and the Historiography of Science', argues that Harvey is exemplary natural philosopher for Hume.

¹⁷⁶ Ernan McMullin interprets Newton as a kind of instrumentalist, thus Berkeley and Hume are not re-interpreting Newton, but drawing on a strain within Newton ('The Impact of Newton's *Principia* on the Philosophy of Science', *Philosophy of Science*, 68 [2001], 279-310). For criticism of McMullin's view, see G E Smith's comments in the same volume or Janiak, 'Newton and the Reality of Force' and Ducheyne, 'Newton's Training in the Aristotelian Textbook Tradition'. The footnote in Hume, *EHU*, 7.1.25 is a decisive refutation of McMullin's position in so far as it pertains to Hume's self-understanding.

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natural philosophy. Hume may have thought that his unified and restrictive account of causation relieved him of the need to offer the kind of detail we find in, for example, Berkeley's analysis of natural philosophy.¹⁷⁷ Of course, Hume does offer some guidance on how to interpret aspects of mathematics and natural philosophy.¹⁷⁸ Perhaps, a more detailed account would have been offered in a work mentioned in his correspondence, 'Considerations previous to Geometry and Natural Philosophy', now lost.¹⁷⁹

I argued that major currents in Hume's philosophy can be read as a (tacit) attack on the authority of Newton's philosophy. First, they have potentially negative religious consequences; second they are not useful if not appropriately re-interpreted.¹⁸⁰ Third, Hume may be responding to 'Newton's Challenge'. Here I expand briefly on the third.

As Cleanthes points out, in Hume's time it had become a sign of severe ignorance to oppose natural philosophy: 'even monks and inquisitors are now constrained to withdraw their opposition [to Copernicanism]'.¹⁸¹ Maclaurin, for example, argues from the empirical success and authority of Newtonian natural philosophy to *rejection of* alternative positions, methodologies, and foundations within philosophy. Yet, by Hume's lights, many crucial elements of Newton's natural philosophy do not have a

¹⁷⁷ This follows from Hume's deflationary attitude toward philosophical relations that are not identical to natural relations, see Schliesser, 'Two Definitions of Causation'.

¹⁷⁸ E.g., Hume, *Treatise*, 1.2, especially 1.2.4.31; *EHU*, 4.1.13. See Waxman, 'The Psychologistic Foundations of Hume's Critique of Mathematical Philosophy' and Millican, 'Hume's Sceptical Doubts Concerning Induction', 126. Recently, Hume's approach to mathematics has been receiving more favorable interpretations: see Dale Jacquette, 'Hume on the Infinite Divisibility of Extension and Exact Geometrical Values'; Graciela de Pierris, 'Hume on Space, Time and Mathematics' (delivered on 24 February 2008, San Francisco State University); and Aaron Koller, 'Hume's critique of the infinite divisibility of space', unpublished typescript.

¹⁷⁹ See Hume's letter to Andrew Millar, 12 June 1755. In his letter to William Strahan, 25 January 1772, Hume explains that Lord Stanhope had discouraged him from printing it. Both reprinted in *The letters of David Hume*, ed. J Y T Greig (Oxford, 1932)

¹⁸⁰ Elsewhere (Schliesser, 'Newtonian Refutation'), I call attention to the 'Socratic problem', that is that social forces (religious, political, moral) can threaten independence and authority of philosophy. Hume's first two criticisms of Newton are a version of it.

¹⁸¹ Hume, *Dialogues*, Part I.

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proper foundation. While offering the perspective of the ‘abstract’ philosophy in *EHU*, Hume writes that it is a ‘reproach’ that ‘philosophy should not yet have fixed, beyond the controversy, the foundations of morals, reasoning, and criticism’.¹⁸² The context suggests that the foundation would be the ‘source of ... distinctions’ for ‘truth and falsehood, vice and virtue, beauty and deformity’.

It is worth recalling that Hume starts the *Treatise* with the following observation: ‘philosophy’ seems to have ‘drawn disgrace’ upon ‘itself’. There is widespread ‘prejudice against metaphysical reasonings of all kinds’.¹⁸³ Only after articulating this state of malaise *surrounding* and *within* philosophy does Hume offer the science of man as a ‘foundation’ for the other sciences. Hume’s attack on Newton’s authority is thus connected to his general attempt to resurrect the prestige and independence of a reinterpreted and morally constrained first philosophy. My paper explains Hume’s otherwise puzzling passage: ‘religion, and politics, and consequently metaphysics and morals. All these form the most considerable branches of science. Mathematics and natural philosophy ... are not half so valuable.’¹⁸⁴

Hume’s ambitions for the science of man are grander and more controversial than his many admirers and critics realize. Hume offers what he takes to be a useful and virtuous philosophy that can regulate Newtonian natural philosophy. Oddly enough the simultaneously enduring successes of science and Hume’s account of causation are to blame for the state of affairs that makes Hume’s aims so difficult to see for us. Hume’s stipulative account of causation narrowed the possible space in which reflection on the sciences by philosophers and scientists alike was to take place. *We* take the terms with which he redefined the problem so much for granted, it is difficult for us to evaluate his attempted lasting contributions, regardless of their merits, to philosophy.

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¹⁸² Hume, *EHU*, 1.2

¹⁸³ Hume, *Treatise*, Introduction 1-3.

¹⁸⁴ Hume, ‘Of the Rise of Arts and Sciences’, *EMPL*, 126

ISAAC NEWTON, HERESY LAWS AND THE PERSECUTION OF RELIGIOUS DISSENT *

Stephen D Snobelen

The Church may reprove or excommunicate but she has as little authority to guide the arm of the Magistrate as to handle his sword: for this is to make her self the judge & him but the executioner. She may excommunicate but not force into communion.¹

Newton and the law

Joseph Priestley, in the dedication to William Tayleur prefaced to his *Letters to a philosophical unbeliever* (1787), speaks of his dedicatee's happy 'attachment to mathematical and philosophical studies' as well as his 'just preference of theological ones'. Priestley then compares Tayleur with Isaac Newton and goes on to praise the latter for 'uniting two pursuits which are too often considered as the reverse of each other'.² Priestley next turns to Tayleur's adoption of Unitarian Dissent, noting the difficulties this could engender: 'Fortitude in such a cause as this, while the world in general is too ready to acquiesce in every thing that has the countenance of *fashion* and of *power*, is truly worthy of a christian philosopher; and such an example as you have set cannot be too generally known, being so rare, and therefore so much wanted.' Priestley then adds: 'The great Newton, though an unitarian, had not the courage to declare himself, and act as one.'³ Priestley, who had already by this time endured many attacks from clerical opponents for his views (and who would soon suffer more active persecution for his Unitarian faith), knew of what he spoke.

* For helpful comments and advice, I am grateful to Rob Iliffe, Scott Mandelbrote, John Marshall, Alan Ruston and Jeffrey Wigelsworth, along with the two regular editors of this journal. I alone am responsible for any remaining faults in this paper.

¹ Newton, Jewish National and University Library, Jerusalem, Yahuda MS 39, f. 1r. Most quotations from Newton's manuscripts in this paper come from the normalized transcriptions available on the website of The Newton Project.

² Priestley, *Letters to a philosophical unbeliever. Part I* (2nd edn., Birmingham, 1787), ix.

³ Priestley, *Letters to a philosophical unbeliever*, x.

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A decade earlier another eminent convert to Unitarianism had also drawn attention to Newton's anti-Trinitarianism, albeit in an arguably more charitable way. Theophilus Lindsey does this in a statement about the imperialistic enforcement of Trinitarian doctrine:

It was first the imperial, and afterwards the papal power, that established the Athanasian doctrine of the Trinity in the east and west, *i.e.* over all Christendom, and made it unsafe to profess any other. This impious usurpation and invasion of the rights of conscience, in favour of this metaphysical doctrine, was unhappily continued by almost all protestant states at the reformation. Nay, even at the revolution, that glorious epoch of our civil liberties, a law was suffered to pass, by which, had it been put into execution, and strict inquisition made into mens opinions and writings, the famous Mr. *Locke*, that ornament of our country and of human kind, would have been exposed to all the cruelties and disabilities of that law, and suffered to languish in a prison; and Sir *Isaac Newton*, *Whiston*, *Clarke*, *Hoadley*, *Emlyn*, *Peirce*, *Lowman*, *Lardner*, &c. &c. might have been checked in their glorious researches into truths of the highest importance to men, or doomed to undergo the same fate.⁴

The 'revolution' to which Lindsey refers is the Glorious Revolution of 1688-9. The law (identified by Lindsey in a footnote) is the Blasphemy Act of 1698.

A half-century before Lindsey had published his thoughts on the constraints placed on Newton by anti-heresy laws, another English anti-Trinitarian pointed to Newton's unorthodoxy. Still smarting from his 1710 expulsion from his Cambridge Professorship for espousing in public a form of the heresy Newton believed in secret, William Whiston, Newton's successor as Lucasian Chair of Mathematics, reminded his readers in one of the first published declarations of Newton's heresy

that they Banished and Persecuted me for pretended *Heresy*, the pretended *Arian Heresy*: and to put them in mind, that they Banished, they Persecuted me for the very same Christian

⁴ Lindsey, *A sequel to the apology on resigning the vicarage of Catterick, Yorkshire* (London, 1776), 8-10.

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Doctrines which the great Sir *I.N.* had discovered and embraced many Years before me; and for which Christian Doctrines, had He ventured as plainly and openly to publish them to the World as I thought myself oblig'd to do in my own Discoveries, they must 30 or 40 Years ago have *Expell'd and Persecuted the Great Sir Isaac Newton, also.*⁵

One can perhaps forgive Whiston for his evident bitterness and reflect instead on the very real contradiction Whiston's revelation captures. Whiston is correct: had Newton openly proclaimed his anti-Trinitarian faith in the same way that his protégé had in the lead-up to his 1710 expulsion, Newton himself would have certainly been ejected from his Professorship and University and, given the earlier period, possibly even suffered worse persecution than Whiston.

Despite his heresy, to which he converted in the 1670s, Newton was a lifelong conformist Anglican. Aside from some rumours about his unorthodoxy on the Trinity in his own lifetime, there was little public evidence that Newton had sympathies with religious heterodoxy, let alone anti-Trinitarian heresy, mortalism and perhaps even Anabaptism.⁶ Such beliefs would have made Newton a damnable heretic by the standards of the orthodox in his own day. But little of this was known to Newton's own contemporaries. Thus, when the first published biography of Newton spoke of his sympathies for the Nonconformists, this revelation may have raised a few eyebrows. Bernard le Bovier de Fontenelle's 1728 *éloge* of Newton contains the following statement:

⁵ Whiston, *Authentick records* (London, 1728), part II, 1080.

⁶ On Newton's heresies, see Snobelen, 'Isaac Newton, heretic: the strategies of a Nicodemite', *The British Journal for the History of Science*, 32 (1999), 381-419. See also 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, which suggests that Newton's religious ethos was in a certain sense that of Nonconformity; Larry Stewart, 'Seeing through the Scholium: religion and reading Newton in the eighteenth century', *History of Science*, 34 (1996), 123-64, which demonstrates that some in Newton's own day considered the theology of the General Scholium heretical; and James E Force, 'Sir Isaac Newton: "gentleman of wide swallow"? Newton and the Latitudinarians', in Force and Richard H Popkin, *Essays on the context, nature, and influence of Isaac Newton's theology* (Dordrecht, 1990), 119-41, which argues that Newton's heresies put him beyond the pale even for the Latitudinarians.

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Tho' he was of the Church of England, he was not for persecuting the Non-conformists in order to bring them over to it. He judged of men by their manners, and the true Non-conformists with him were the vicious and the wicked. Not that he relied only on natural religion, for he was persuaded of Revelation; and amongst the various kind of books which he had always in his hands, he read none so constantly as the Bible.⁷

In addition to making clear to his readers that Newton was no deist (a not unimportant detail, given subsequent mistaken associations of Newton with deism), Fontenelle presents his subject as a conformist Anglican who was liberal-minded and in favour of the toleration of religious Dissent – information that came in part from Newton's half-nephew-in-law John Conduitt.⁸

Why, though a heretic, did Newton conform to the Church of England? If anti-heresy laws were part of the dynamic of his conformity, what was the nature of these laws and the degree of their severity? Do they help show the reasonableness of Lindsey's sympathetic view of the constraints placed on Newton's religion? Or could Newton have been more open about his anti-Trinitarian faith, as both Priestley and Whiston evidently wished he had been? But if Newton had been more open about his heresy, what consequences might he have faced? In an attempt to provide a basis

⁷ Fontenelle, *The elogium of Sir Isaac Newton* (London, 1728), 31.

⁸ Although Fontenelle's statements fit into the formula for his *éloges*, much of the information comes from material sent to him by Conduitt. While we do not have the original French text that Conduitt sent to Fontenelle, the draft of this text does survive among the Newton papers. In this draft Conduitt – who had access to Newton's manuscripts and knew his relation's heresy – tries his best to put Newton's religion in a good light despite his evident discomfort with its unorthodoxy. Thus, Conduitt's French draft states that Newton 'attended' ('frequentoit') the Church of England, that Newton's Christian religion was not founded on a narrow base, that he did not show coldness to those who disagreed on indifferent things and that he abhorred persecution (Conduitt, King's College, Cambridge, Keynes MS 129(C), f. 9v; Keynes MS 129(A), f. 12v). Unless Conduitt added the term to the French text that he sent to Fontenelle, the word 'Non-Conformistes' was introduced by Fontenelle. It is nevertheless appropriate in interesting ways. For more on Fontenelle's use of Conduitt's biographical material, see the paper by Lisa Mullins in this volume.

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for answering these questions, this paper sets out the legal backdrop to Newton's secret heresy, which included dissimulation, simulation and concealment. In particular, this paper seeks to do two things. First, it describes legislation directed against both anti-Trinitarian heresy and Protestant Dissent enacted immediately before and during Newton's lifetime. Although Newton was a conformist heretic rather than a Dissenter in the usual sense of that designation, the persecution of Protestant Dissent beginning with the Restoration helps demonstrate general levels of intolerance, which in turn provide a broader punitive framework within which the greater crime of religious heresy was judged and punished. Second, this paper shows how heresy laws would have directly impinged on Newton's religious stance at various junctures during his career – sometimes in stunning ways. I use the evidence presented in this paper to argue that Newton's practical religion stood in a feedback relationship with the restrictions of various parliamentary acts and laws as well as the actual prosecution of anti-Trinitarianism. I also show how Newton on occasion became intimately entangled in the effects and even the implementation of them. On more than one occasion, he contemplates or comes close to contravening these laws but in the end never did. In sum, an understanding of these legal restrictions helps shed light on Newton's heterodox religion and why he kept it a private matter.⁹

⁹ This paper represents an expansion and elaboration of a much shorter survey I presented a decade ago in Snobelen, 'Isaac Newton, heretic', 393-6. In the interests of consistency and balance, 'Presbyterian', 'Dissent' and 'Nonconformity', along with the crucial terms 'Unitarian' and 'Trinitarian' (including their cognates and compound forms) are capitalised in this paper. Because this paper is concerned in large part with legislation and persecution against anti-Trinitarianism in general rather than with the precise nuances of the various theological options, 'Unitarian' is used as a catch-all term for all forms of non-Athanasian anti-Trinitarianism, including Socinianism, Arianism and Modalism. The term 'heresy' and its cognates are used in relative rather than absolute terms; that is, when I speak of heresy I refer to what the majority orthodox party considered heresy. Finally, while I sometimes generalise about those who dissented from the established Church and thus discuss both Trinitarian and anti-Trinitarian Dissenters, it is important to stress that the majority of Trinitarian Dissenters viewed anti-Trinitarians as abhorrent and that the term 'Dissent' is normally used as a formal term for those Protestant Dissenters who were essentially orthodox in doctrine. 'Rational Dissent' emerged out of 'Old Dissent' (Presbyterians, Independents and Baptists) in the early eighteenth century and included Unitarians. On this, see R K Webb, 'The emergence of Rational Dissent', in *Enlightenment and religion: Rational Dissent in eighteenth-century Britain*, ed. Knud Haakonssen (Cambridge, 1996), 12-41.

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Anti-Unitarian laws and prosecutions: James I to Cromwell

On 11 April 1612, a man was burned at the stake in the West Midlands town of Lichfield for heresy, including soul-sleep and the denial of the Trinity.¹⁰ The man was Edward Wightman, a draper who hailed from Burton upon Trent in Staffordshire. Wightman had already been brought to the stake on 20 March, but in the torment of the flames had cried out that he would recant. However, after being rescued from the flames he reconfirmed his heresy, which led to his second burning – one from which his prosecutors made sure he did not escape. Many tend to remember the English Renaissance for its production of works of tremendous beauty; this event helps remind us that during this period the green and pleasant land also produced acts of great brutality. After all, the same country that saw this event only one year before had seen the publication of the King James Bible and Shakespeare's *Tempest*, two of the most beloved and beautiful works of English literature. Nevertheless, the times were changing. Wightman was to go down in history as the last person to be burned at the stake for heresy in England.¹¹ That being said, only three

¹⁰ For a brief overview of British anti-Unitarian legislation in the seventeenth through eighteenth centuries (not all of which is exclusively anti-Unitarian), see Robert E Florida, 'British Law and Socinianism in the 17th and 18th Centuries', in *Socinianism and its role in the culture of XVI-th to XVIII-th centuries*, ed. Lech Szczucki (Warsaw, 1983), 201-10. See also F Kenworthy, 'From authority to freedom in Church life: the Act of Uniformity and Unitarian Dissent', *Transactions of the Unitarian Historical Society*, 12 (1962), 141-54 and R M Montgomery, 'A Note on Acts of Parliament dealing with denial of the Trinity', *Transactions of the Unitarian Historical Society*, 6 (1937), 209-12. For a general account of persecution and toleration in England from the beginning of the reign of Elizabeth I to the Glorious Revolution, see John Coffey, *Persecution and toleration in Protestant England, 1558-1689* (Essex, 2000). For the sixteenth and seventeenth centuries, see Alexandra Walsham, *Charitable hatred: tolerance and intolerance in England, 1500-1700* (Manchester, 2006). W K Jordan, *The development of religious toleration in England from the accession of James I to the Convention of the Long Parliament (1603-1640)* (Cambridge, Mass., 1936; vol. 3 of a 4 vol. series with unique titles), although historiographically dated, is still valuable for the period under consideration in this section.

¹¹ Ian Atherton and David Como, 'The burning of Edward Wightman: Puritanism, prelaycy and the politics of heresy in early modern England', *English Historical Review*, 120 (2005), 1215-50; Stephen Wright, 'Wightman, Edward (1580?-1612)', *Oxford Dictionary of National Biography* (Oxford, 2004) (hereinafter *ODNB*); Bryan W Ball, *The soul sleepers: Christian mortalism from Wycliffe to Priestley* (Cambridge, 2008), 69-72; and Jordan, *Development of religious toleration in England*, III, 47-50.

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weeks earlier, on 18 March 1612 and in Smithfield, London, another man was burned at the stake for actively repudiating the doctrine of the Trinity. This was Bartholomew Legate, a cloth-merchant who had argued that Christ was a man and that he was referred to as God in the Bible on account of his office rather than his essence. Like Wightman, Legate had a radical Puritan background. Although there had been some doubt as to whether the Elizabethan Act of Uniformity had repealed the statute, it seems that Legate was charged and condemned with the legal sanction of the 1401 anti-Lollard statute *de haeretico comburendo* ('On the heretic to be burned'), which called for the burning of heretics 'that such punishment may strike fear into the minds of others'.¹² Smithfield is notorious as the site of the burning of heretics, but this seems to have been the last such burning at this location.¹³ Wightman and Legate were not only the last to be burned for heresy in England, they were the last to be put to death in that country for holding anti-Trinitarian beliefs.¹⁴ Public

¹² Jordan, *Development of religious toleration in England*, III, 45. For the Latin text and English translation of *de haeretico comburendo*, see *Statutes of the Realm* (1816), II, 125-8, 2 Henry IV (quotation from p. 128).

¹³ H John McLachlan, *Socinianism in seventeenth-century England* (Oxford, 1951), 32-3; David R Como, 'Legate, Bartholomew (d. 1612)', *ODNB*; and Jordan, *Development of religious toleration in England*, III, 44-7.

¹⁴ McLachlan identified eight individuals burned at the stake in England for denying the Trinity between the mid-sixteenth century and 1612 (McLachlan, *Socinianism in seventeenth-century England*, 31-3). One of these was the Flemish surgeon George van Parris, who was burned at Smithfield on 25 April 1551. He believed 'that God the Father is only God, and that Christ is not very God' (George Huntston Williams, *The Radical Reformation* [3rd edn., Kirksville, 1992], 1197; see also Robert Wallace, *Antitrinitarian biography* [3 vols., London, 1850], II, 124-7). Earlier in the reign of Edward VI, on 28 December 1548 at Lambeth, the Lincolnshire priest John Assheton was forced to recant his anti-Trinitarian beliefs that the Holy Spirit was not God but a 'power of the Father' and that Christ was not God but 'a holy prophet and speciallie beloved of God the Father' (Williams, *Radical Reformation*, 1196; Wallace, *Antitrinitarian biography*, II, 122-4). Anti-Trinitarianism thus had deep roots that date back to the time of the English Reformation. Although it was mostly those who were prosecuted or who published their views that have been recorded by history, there were others whose names are now lost to history. A now-deceased fellow of Clare College, Cambridge once told me that his wife's family had been secret Unitarians since the reign of Elizabeth I. Heresy, when proscribed by law, does not tend to leave behind an overabundance of documentation for modern historians to ponder. On early Unitarianism in England, see both

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sympathy for the cruel treatment of these two men – although extreme heretics in the eyes of most – appears to have affected James I, who thereafter relied on imprisonment for such heretics.¹⁵

This is not to say that subsequent to these dark events life became easy for anti-Trinitarians – especially those who were vocal about their faith. In a move that was courageous, naïve or both (but certainly impolitic) the 1609 Latin edition of the Polish Brethren's Racovian Catechism was printed with a dedication to King James of England.¹⁶ Copies of this Raków imprint made their way to England and eventually came to the attention of the king and his Parliament and in April 1614 the latter condemned the work and ordered it burnt,¹⁷ dramatically illustrating what the fate of any domestic anti-Trinitarian work would have been at that time. By the 1630s, Socinianism had come under the sharp gaze of archbishop William Laud. In 1640 Laud formulated a series of Canons, the fourth of which was directed against Socinianism. This canon outlawed on pain of excommunication both the printing of Socinian works and the preaching of Socinian doctrines. Socinian books were to be burned and 'diligent inquiry [was to] be made after all such that shall maintain and defend' Socinian teachings. Despite Laud's best (or worst) intentions, these Canons were not implemented and, viewing them to be 'against the fundamental laws of the realm and the rights of Parliament',

McLachlan, *Socinianism in seventeenth-century England* and Early Morse Wilbur, *A history of Unitarianism: in Transylvania, England, and America* (Cambridge, Mass., 1952), 166-270. For a shorter account that includes a consideration of prejudice against Socinianism in seventeenth-century England, see Alan Ruston, 'English Approaches to Socinianism', in *Faustus Socinus and his heritage*, ed. Lech Szczucki (Krakow, 2005), 423-33. Finally, Sarah Mortimer's important new account of the controversies surrounding seventeenth-century Socinianism should be mentioned, although it appeared too late to be used in this study (Mortimer, *Reason and religion in the English Revolution: the challenge of Socinianism* [Cambridge, 2010]).

¹⁵ Jordan, *Development of religious toleration in England*, III, 51. The king had taken a personal interest in the cases of both Legate and Wightman to the point of personally interrogating the former (44-5).

¹⁶ *Catechesis Ecclesiarum* (Raków, 1609), sigs. a2r-a6v.

¹⁷ McLachlan, *Socinianism in seventeenth-century England*, 36-7. As McLachlan notes, despite the edict, some copies of this printing survived in England (120).

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the English Parliament resolved on 15 December 1640 to render them null and void.¹⁸ The failure of these Canons notwithstanding, their contents provide an indication of both the persecuting spirit and the vitriol displayed by the orthodox against those who dissented from the received doctrine of the Trinity.¹⁹

Two notable examples of those who did just that in the middle of the seventeenth century are Paul Best and John Biddle, both of whom also published anti-Trinitarian works.²⁰ Best, an English convert to Continental Socinianism, languished in London's Gatehouse prison for two and a half years for the sin of active anti-Trinitarianism. On 28 March 1646, during parliamentary proceedings against him, an ordinance was passed 'for punishing *Paul Best* with Death, by hanging him by the Neck, till he be dead'.²¹ Thus, although the manner was to be the gallows rather than the stake, Best was for a time under the threat of death for his heresy. A month later, on 29 April, Parliament called for a general Ordinance for suppressing blasphemy and heresy; this was eventually passed on 2 May 1648.²² The Ordinance mandated death 'without benefit of Clergy' for a

¹⁸ McLachlan, *Socinianism in seventeenth-century England*, 41-2. The text of the fourth canon is printed in Wallace, *Antitrinitarian biography*, I, 65-7.

¹⁹ Socinianism was most maligned for its non-Trinitarian theology, but by the 1640s it had also become a source for liberal, rational and irenic Protestantism, as seems to have been the case with the intellectuals associated with 'The Great Tew Circle'. See Hugh Trevor-Roper, 'The Great Tew Circle', in *idem*, *Catholics, Anglicans and Puritans: seventeenth century essays* (London, 1988), 166-230 and McLachlan, *Socinianism in seventeenth-century England*, 63-95.

²⁰ For general background on persecution and toleration in this period, see Jordan, *The development of religious toleration in England from the Convention of the Long Parliament to the Restoration, 1640-1660* (Cambridge, Mass., 1938), and, as they relate to anti-Trinitarianism, *idem*, 'Sectarian Thought and Its Relation to the Development of Religious Toleration, 1640-1660; Part III: The Socinians', *Huntington Library Quarterly*, 3 (1939-40), 403-18. See also John Coffey, 'A ticklish business: defining heresy and orthodoxy in the Puritan revolution', in *Heresy, literature and politics in early modern England*, ed. David Loewenstein and John Marshall (Cambridge, 2006), 108-36, which stresses that for the Puritans in this period, 'anti-Trinitarianism was the archetypal heresy' (131).

²¹ *Journals of the House of Commons 1547-1714* (17 vols., London, 1803), IV, 493.

²² *An Ordinance of the Lords & Commons assembled in Parliament, for the punishing of blasphemies and heresies* (London, 1648). This text is reprinted in C H Firth and R S Rait, eds., *Acts and ordinances of the Interregnum* (3 vols.; London, 1911), I, 1133-6 and Florida, 'British Law and Socinianism', 206-7.

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wide range of heresies, including atheism, the denial that the Bible is the word of God, annihilationism and anti-Trinitarianism. It is notable that the Ordinance was directed against those who maintained these heresies ‘by Preaching, Teaching, Printing, or Writing’. There seems to have been no provision for what we might call – to use an Orwellian term – ‘thought-crime’.²³ A second set of lesser heresies, including the mortalist belief in soul-death (thnetopsychism) and soul-sleep (psychopannychism),²⁴ was to bring imprisonment until the accused agreed not to ‘publish or maintain the said error or errors any more’. Best did manage to publish while in prison, including an anti-Trinitarian pamphlet in the summer of 1647.²⁵ This was condemned to be burned by the hangman. In the end, Best was released late in 1647, dying a decade later as a free man.²⁶

Biddle was less fortunate. A schoolmaster from Gloucestershire, Biddle suffered almost ten years of imprisonment between 1645 and his death – in gaol – on 22 September 1662.²⁷ Although he was not put to death as in the case of Wightman, it can nevertheless still be said that Biddle died for his Unitarian faith. From the year Newton turned six until the year he turned eighteen, the Blasphemy Ordinance was in effect. On the day of Biddle’s death, Newton was about to begin his second year as an undergraduate at Cambridge. Although he would one day come to know who Biddle was, his death likely passed without Newton’s knowledge at that time. In any case, there is no evidence that Newton was anything but a Trinitarian in his youth. Heretics dying in gaol and laws directed against

²³ The reader will I hope excuse this anachronism. On the other hand, it could be argued that seventeenth-century conceptions of religious ‘conscience’ show that a person’s private beliefs were a recognised category.

²⁴ Thnetopsychism and psychopannychism differ from annihilationism in that they assume bodily resurrection at the return of Christ and the possibility of immortality for the righteous. On mortalism in the early modern period, see N T Burns, *Christian mortalism from Tyndale to Milton* (Cambridge, Mass., 1972) and Ball, *The soul sleepers*.

²⁵ Best, *Mysteries discovered* ([London], 1647).

²⁶ On Best, see McLachlan, *Socinianism and seventeenth-century England*, 149-62 and Snobelen, ‘Best, Paul (1590–1657)’, *ODNB*.

²⁷ On Biddle, see McLachlan, *Socinianism and seventeenth-century England*, 163-217 and Snobelen, ‘Biddle, John (1615/16–1662)’, *ODNB*. On Best and Biddle, see also Nigel Smith, ‘“And if God was one of us”: Paul Best, John Biddle and anti-Trinitarian heresy in seventeenth-century England’, in *Heresy, literature and politics in early modern England*, 160-84.

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heresy were presumably not yet matters of great concern for Newton. Its threatening language notwithstanding, it seems that no-one was successfully prosecuted under the Ordinance, which lapsed with the Restoration in 1660. On 9 August 1650, at the instigation of the Independents, the Blasphemy Act was also passed.²⁸ But the Act of 1650 was much less severe than the Ordinance of 1648, proscribing atheism and blasphemy along with moral sins and religious delusions, but mostly steering clear of doctrinal issues. The first offence brought six months' imprisonment, while the second offence brought banishment from the realm.²⁹ Although the crime of anti-Trinitarianism is not specifically mentioned, one imagines that it could have been considered blasphemy had the authorities wanted to use this Act against an anti-Trinitarian.

This is not to say that the authorities and heresy watchdogs were asleep.³⁰ During the Interregnum concerns over the explosion of sectarianism and the spread of heresy were also concerns of the state both in the person of Cromwell and the body of Parliament. Yet there were also countervailing concerns on the part of many (including some Independents and Baptists) that harsh persecution would have ill effects on a broader range of society than notable and radical heretics such as Biddle. Throughout much of the 1650s there was an agitated tug of war between these dynamics.³¹ The very pluralisation of religion during this period that helped generate calls for less toleration and more conformity also ironically helped sow the seeds of more tolerant and pragmatic stances towards religious Dissent as competing interests created an uneasy equilibrium. Nevertheless, radical heretics such as the anti-Trinitarians did not feel the full effects of these liberalising forces in the

²⁸ *An act against several atheistical, blasphemous and execrable opinions, derogatory to the honor of God, and destructive to humane society* (London, 1650), reprinted in *Acts and ordinances of the Interregnum*, II, 409-12.

²⁹ For more discussion, see Jordan, *The development of religious toleration in England, 1640-1660*, 134-7, 221, 228 and Florida, 'British Law and Socinianism', 201.

³⁰ For background on this period, see Sarah Mortimer, 'Socinianism in the Interregnum', in *Faustus Socinus and his heritage*, 435-42.

³¹ For an expert account of this complex mix of concerns and worries during the 1650s (including the fear of anti-Trinitarianism), see Blair Worden, 'Toleration and the Cromwellian Protectorate', in *Persecution and toleration*, ed. W J Sheils (Oxford, 1984), 199-233.

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1650s nor, indeed, for many decades afterwards. The Instrument of Government, introduced in December 1653, seemed to allow for at least a certain degree of religious freedom and liberty of conscience. It did not specifically proscribe anti-Trinitarianism, speaking instead in general terms that ‘such as profess faith in God by Jesus Christ ... shall not be restrained from, but shall be protected in, the profession of the faith and exercise of their religion’.³² Still, while Cromwell and others wanted to see provisions made for liberty of conscience, and although there were discussions as to what doctrines were inessential (for which there could be liberty of conscience) and what were essential (denials of which could not be tolerated), the general consensus did not allow for the toleration of Unitarian ideas.

The publication of anti-Trinitarian works was a chief target of the defenders of Trinitarian orthodoxy, whether Presbyterian or not. Thus the appearance of a Latin edition of the Racovian Catechism provoked Parliament to action in November 1651.³³ The printers were hauled before Parliament in February 1652 and charged with being ‘guilty of printing and publishing this blasphemous and scandalous book’.³⁴ All copies of the Catechism were ordered burned by an 2 April 1652 Act after Parliament had resolved that the contents of the work were ‘blasphemous, erroneous, and scandalous’.³⁵ Despite this action, an English translation of the Racovian Catechism, likely translated by Biddle, appeared in the summer of 1652.³⁶ The House on 22 June directed the Committee for Plundered Ministers to investigate the publication and suppress it,

³² Cited in Worden, ‘Toleration and the Cromwellian Protectorate’, 216.

³³ *Catechesis Ecclesiarum* (Racoviæ [i.e., London], 1651). On this edition, see McLachlan, *Socinianism in seventeenth-century England*, 187-90. Although by then redundant, this edition also contains the dedication to James I that appeared in the original 1609 edition. On the possibility that John Milton, at the time a government censor (and also likely himself an anti-Trinitarian), licensed this edition of the Catechism, see Stephen B Dobranski, *Milton, authorship, and the book trade* (Cambridge, 1999), 125-53 and *idem*, ‘Licensing Milton’s heresy’, in *Milton and heresy*, ed. Dobranski and John P Rumrich (Cambridge, 1998), 139-58.

³⁴ Mortimer, ‘Socinianism in the Interregnum’, 438.

³⁵ The text of the printed resolution is given in *The Racovian Catechism*, ed. and trans. by Thomas Rees (London, 1818), sig. A5v.

³⁶ *The Racovian Catechism* (Amsterdam, 1652). Thomason recorded the date ‘8 July’ on the title-page of his copy.

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although in this case no one appears to have been prosecuted.³⁷ Biddle himself was personally at risk when Parliament in December 1654 turned its attention to his case.³⁸ The House directed the Committee for Printing on 12 December to examine Biddle's *The apostolical and true opinion concerning the Holy Trinity* and *A twofold catechism*, both published in February of that year. He was imprisoned in London's Gatehouse and under threat of capital punishment; two of his books were ordered burned by the hangman. Biddle was saved by Cromwell's dissolution of Parliament the following month. But in July 1655 the Presbyterians again pressed their case against Biddle, who found himself imprisoned once more, this time in London's Newgate prison. Biddle's Presbyterian opponents called for him to be tried under the 1648 Ordinance and a contemporary record confirms that Biddle was being 'tried for his life'.³⁹ For his part, Biddle appealed to the Instrument of Government in his defence.⁴⁰ But Cromwell in response both declared that the 1648 Blasphemy Ordinance was still 'in force' and that the Instrument of Government 'was never intended to maintain and protect blasphemers' against its strictures.⁴¹ Biddle also had some support from Independents and Baptists who were evidently alarmed about the possible wider ramifications of Biddle's persecution. Shortly thereafter, Cromwell, beset on the one side by those who wanted Biddle punished and on the other by those who desired leniency, exiled him to the Isles of Scilly.⁴²

The case of John Fry illustrates both that dissension over the Trinity could emerge within Parliament itself and that someone of a higher station in life was by no means immune from prosecution for holding (or for being under suspicion of holding) anti-Trinitarian tenets. Fry was a gentleman from Dorsetshire and an MP who was appointed both to the

³⁷ McLachlan, *Socinianism in seventeenth-century England*, 191.

³⁸ For more details on Biddle during this period, see McLachlan, *Socinianism in seventeenth-century England*, 202-10.

³⁹ William Dugdale to John Langley, 15 September 1655, in *Fifth Report of the Royal Commission on Historical Manuscripts. Part I* (London, 1876), 176.

⁴⁰ *Ibid.*

⁴¹ Cromwell's statements cited in Worden, 'Toleration and the Cromwellian Protectorate', 222.

⁴² Snobelen, 'Biddle'; Worden, 'Toleration and the Cromwellian Protectorate', 219-22.

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Committee for Plundered Ministers and the commission to try Charles I. For the crime of asserting unorthodox ideas on the Trinity, the House of Commons voted on 22 February 1651 to eject Fry from Parliament and ordered his two published works burned.⁴³ Mention should also be made of the persecution by courts of law between 1646 and 1650 of the Unitarian John Knowles, who seems to have been influenced by Biddle. Knowles, who would live to 1677, also suffered imprisonment in 1665 and 1666 under charges of sedition and heresy.⁴⁴ Still, while the cases of Best and Biddle show that the threat of execution had not completely disappeared in the 1640s and 1650s, Edward Wightman was to maintain his dubious distinction as the last to be put to death in England for anti-Trinitarianism.

The trials of the radical Quaker James Nayler provide further evidence of the lengths to which Parliament was willing to go in the 1650s in its efforts to suppress radical religion. Many MPs in Parliament (including those of the Puritan persuasion) wanted to see Nayler put to death for his religious indiscretions. Independents in Parliament were nervous about this threat to what religious toleration there was and those against calling for the death penalty against Nayler prevailed when the matter was put to a vote (although it was close: 96 against and 82 in favour). Still, the House 'took upon itself the unconstitutional power of acting as a judicial body and voted that Nayler be made to stand in the pillory, be whipped though the streets from Westminster to the Old Exchange, have his tongue bored through with a hot iron, and have his forehead branded with the letter 'B' for blasphemer'. After recanting he remained in prison until September 1659.⁴⁵

In addition to the legal restrictions against them, anti-Trinitarians during the Civil Wars and the Protectorate also faced the verbal discipline of published attacks on their theology. The most notorious of the heresy

⁴³ On Fry, see McLachlan, *Socinianism in seventeenth-century England*, 239-49. McLachlan concluded that Fry's writings 'are rather Sabellian in Christology, Socinian in their emphasis upon reason and tolerance' (248).

⁴⁴ Dario Pfanner, 'Knowles, John, c.1625-1677', *ODNB* and McLachlan, *Socinianism in seventeenth-century England*, 263-87.

⁴⁵ Michael R Watts, *The Dissenters: from the Reformation to the French Revolution* (Oxford, 1978), 211.

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watchdogs during this period is Thomas Edwards, whose heresiology *Gangraena* gave voice to a particularly angry form of Calvinist intolerance, attacking Best's writings and a plethora of other heretical works that had come to his attention.⁴⁶ The most notable example from the 1650s came from the pen of the Presbyterian divine John Owen, the inveterate foe of Socinianism. His 700-page *Vindiciae Evangelicae* (1655) was aimed directly at Biddle's *Scripture-catechism* (1654), one of the books Parliament had ordered burned in December 1654.⁴⁷ Biddle and anti-Trinitarianism in general saw many other attacks from other defenders of orthodoxy in this period. The apparent irony and hypocrisy of the once-persecuted Presbyterian party turning into persecutors was not lost on some observers who favoured toleration, including John Milton. His sonnet 'On the new forcers of Conscience under the Long PARLIAMENT', first drafted around 1646 and published in 1673, concludes famously with the words 'New Presbyter is but Old Priest writ Large',⁴⁸ insinuating a dangerous elision of the Presbyterians with the old ways of the established Church.

Anti-Unitarian laws and prosecutions: the Restoration to 1689

The Restoration of the monarchy in 1660 saw the 'Old Priests' return to power as episcopacy was restored and a religious settlement imposed that both discriminated against the Presbyterians and helped create religious Dissent. Large numbers of Presbyterian ministers were ejected from their livings in the Great Ejection. The shoe was once again on the other foot. The Restoration opened a new chapter in the history of persecution and toleration, but it is a chapter that only revealed glimmers of the latter

⁴⁶ Edwards, *Gangraena: or a catalogue and discovery of many of the errors, heresies, blasphemies and pernicious practices of the sectaries of this time, vented and acted in England in these four last years* (London, 1646); Ann Hughes, *Gangraena and the struggle for the English Revolution* (Oxford, 2004).

⁴⁷ Snobelen, 'Biddle'.

⁴⁸ Milton, 'On the new forcers of Conscience under the Long PARLIAMENT', in Milton, *Milton's sonnets*, ed. E A J Honigmann (London, 1966), 27.

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while involving a good deal of the former.⁴⁹ As Mark Goldie reminds us: 'Restoration England was a persecuting society. It was the last period in English history when the ecclesiastical and civil powers endeavoured systematically to secure religious uniformity by coercive means'.⁵⁰ At the beginning of his reign, the reactionary Charles II showed no interest in allowing the flourishing of the sectarianism that the Protectorate had seen. It is true that neither the Worcester House Declaration (1660), the declaration in favour of toleration (1662), nor the Act of Uniformity (1662) specifically mention a requirement to conform to the doctrine of the Trinity.⁵¹ Yet while they do allow a certain amount of latitude in form of worship (giving liberty of conscience to those who could not accept forms of worship that smacked of Romanism), these statements were

⁴⁹ John Marshall, *John Locke, toleration and early Enlightenment culture: religious intolerance and arguments for religious toleration in early modern and 'early Enlightenment' Europe* (Cambridge, 2006), especially 94-137 (chapter 3, 'Protestant religious intolerance in England, c. 1660-c. 1700'); *idem*, 'Defining and redefining heresy up to Locke's *Letters Concerning Toleration*', *Heresy, literature and politics in early modern England*, 254-81; Gordon J Schochet, 'From Persecution to "Toleration"', in *Liberty secured? Britain before and after 1688*, ed. J R Jones (Stanford, 1992), 122-57; Mark Goldie, 'The Theory of Religious Intolerance in Restoration England', in *From persecution to toleration: the Glorious Revolution and religion in England*, ed. O P Grell, J I Israel and N Tyacke (Oxford, 1991), 331-68; Douglas R Lacey, *Dissent and parliamentary politics in England, 1661-1689* (New Brunswick, 1969); Roger Thomas, 'Comprehension and Indulgence', in *From uniformity to unity, 1662-1962*, ed. Geoffrey F Nuttall and Owen Chadwick (London, 1962), 189-253; and Charles F Mullett, 'The Legal Position of English Protestant Dissenters, 1660-1689', *Virginia Law Review*, 22 (1936), 495-526. A convenient list of acts, documents and other information relating to religion in Britain from 1660 to 1779 is provided in Geoffrey Holmes, *The making of a great power: late Stuart and early Georgian Britain, 1660-1722* (London and New York, 1993), 453-62. The studies in *Religion, politics and dissent, 1660-1832: essays in honour of James E. Bradley*, ed. Robert D Cornwall and William Gibson (Aldershot, Hampshire, 2010), appeared too late to be incorporated into this paper.

⁵⁰ Goldie, 'The Theory of Religious Intolerance in Restoration England', in *From persecution to toleration*, 331.

⁵¹ George Gould, ed., *Documents relating to the settlement of the Church of England by the Act of Uniformity of 1662* (London, 1862), 63-78, 386-404, 460-8. Abbreviated forms of these statements can be found in *English Historical Documents, 1660-1714*, 365-74, 377-82.

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intended to secure the position of the Church of England, including its instruments the Book of Common Prayer and the Thirty-Nine Articles. The Act of Uniformity stated ‘that every dean, canon and prebendary of every cathedral or collegiate church, and all masters and other heads, fellows, chaplains and tutors of or in any college, hall, house of learning or hospital, and every public professor and reader in either of the universities and in every college elsewhere, and every parson, vicar, curate, lecturer and every other person in Holy Orders, and every schoolmaster keeping any public or private school, and every person instructing or teaching any youth in any house or private family as a tutor or schoolmaster’ take an oath that included a repudiation of taking up arms against the king and that he would ‘conform to the liturgy of the Church of England’.⁵² Furthermore, heads of colleges or halls were to subscribe to the Thirty-Nine Articles of religion.⁵³ Of course, not all to whom the Act applied were willing to give it their assent.

As the beginning of the Restoration was also when he matriculated at Cambridge, these documents (and in particular the Act of Uniformity) form a backdrop to Newton receiving his degrees, becoming a college fellow and being appointed to the Lucasian Chair of Mathematics.⁵⁴ Thus, when Newton took his BA in 1665 and his MA in 1668, he subscribed to both the Book of Common Prayer and the Thirty-Nine Articles.⁵⁵ When elected as a minor Fellow at Trinity College in 1667, he took the aforementioned oath from the Act of Uniformity.⁵⁶ Then, when elected a major Fellow of his college in 1668, he swore an oath ‘to embrace the true religion of Christ with all his soul’.⁵⁷ Newton subscribed to the Act of Uniformity a third time when elected as Lucasian Professor in 1669.⁵⁸

⁵² Act of Uniformity, in *English Historical Documents, 1660–1714*, 379.

⁵³ Act of Uniformity, in *English Historical Documents, 1660–1714*, 381.

⁵⁴ In this paragraph I outline material first presented in Snobelen, ‘Isaac Newton, heretic’, 394.

⁵⁵ Cambridge University Library Subscriptiones ii, ff. 163, 243; Subscr.Add.3.

⁵⁶ Cambridge University Library Subscr.Add.2, f.16.

⁵⁷ Richard S Westfall, *Never at rest: a biography of Isaac Newton* (Cambridge, 1980), 331.

⁵⁸ Cambridge University Library Subscr.Add.2, f. 25.

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Moreover, the statutes for the Lucasian Professorship also prohibited a series of crimes and misdemeanours, including heresy and schism.⁵⁹ On top of all this, the 1570 Elizabethan Statutes of the University of Cambridge mandated permanent banishment from the University for anyone teaching against the established Church.⁶⁰ Still, Newton was not yet an anti-Trinitarian and there are no indications that Newton balked at any of these religious strictures when he was asked to conform to them in the 1660s.

Not long afterwards, however, Newton apparently did face a test of conscience. If Richard Westfall is correct and Newton became an anti-Trinitarian by the early 1670s⁶¹ and if, as seems likely, the looming 1675 ordination deadline imposed on him as a fellow of Trinity posed a problem of conscience for the secret heretic, it is easy to see why Newton at the beginning of 1675 had thought that he would have to resign his fellowship.⁶² As Westfall notes, this was a tricky moment for Newton. If he was happy to continue at Cambridge and remain celibate as required by the terms of his fellowship, what reason could he give for refusing to be ordained? On the other hand, could he in good conscience be ordained in a Church that he had recently come to see as apostate? Fortunately for Newton, he was saved at the last moment by a royal dispensation that may have been engineered by Isaac Barrow, Master of Trinity College and Newton's predecessor in the Lucasian chair. The dispensation exempted holders of the Lucasian professorship from the requirements of ordination.⁶³ This allowed Newton to remain at Cambridge as an outwardly-conforming inwardly-nonconforming anti-Trinitarian.

⁵⁹ Cambridge University Library O.XIV.254. An English translation of the Lucasian statutes, carried out by Ian Stewart, my colleague at the University of King's College, can be found in Stewart, 'Appendix. The statutes of the Lucasian professorship: a translation', in *From Newton to Hawking: a history of Cambridge University's Lucasian Professors of Mathematics*, ed. Kevin C Knox and Richard Noakes (Cambridge, 2003), 465-70.

⁶⁰ *Statuta Academiae Cantabrigiense* (Cambridge, 1785), 254-5.

⁶¹ Newton's first substantial treatise on the Apocalypse, which appears to have been written in the 1670s, is certainly anti-Trinitarian (Newton, Yahuda MS 1).

⁶² This is not to say that his heresy would have been the only reason for his reluctance to become ordained.

⁶³ Westfall, *Never at rest*, 332-3.

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Newton was to spend more than three decades at Cambridge and this period saw many twists and turns in the persecution and toleration of religious Dissent. First, the Licensing Act, passed in 1662, proscribed the printing of heretical teachings and required books prior to publication to have episcopal authority (to be precise, the authority of the archbishop of Canterbury or the bishop of London).⁶⁴ There would be no repetition of the torrent of radical sectarian tracts seen in the Commonwealth, which had been encouraged by the cessation of the Tudor licensing system in 1641.⁶⁵ Then there are the various repressive and anti-Dissent acts known collectively as the 'Clarendon Code'. These are the Corporation Act (1661), the Quaker Act (1662), the Act of Uniformity (1662), already mentioned, along with the First Conventicles Act (1664), Five Mile Act (1665) and Second Conventicles Act (1670).⁶⁶ Of course, any Act restricting Nonconformist religious gatherings would have applied to Socinian and Unitarian conventicles as well. Mention must also be made of the two Test Acts. The First Test Act (1673) was aimed at popish recusants and required those holding civil office and certain military positions to take the oaths of supremacy and allegiance, repudiate the Catholic teaching of transubstantiation and take sacrament in the Anglican communion within three months of appointment to an office. Members of both the upper and lower houses of Parliament were exempt. The Second Test Act (1678) was intended to keep Catholics out of both houses of Parliament, which it proved effective at doing until 1829. However, as there was no sacramental test, Protestant Dissenters were immune from its strictures.⁶⁷ In fact, neither Test Act prevented Protestant Dissenters from entering Parliament.⁶⁸

⁶⁴ *An act for preventing the frequent abuses in printing seditious, treasonable and unlicensed books and pamphlets, and for regulating of printing and printing-presses*, 14 Car. II, cap. 33 (1662), in *Statutes of the Realm* (London, 1819), V, 428-33.

⁶⁵ Lois G Schworer, 'Liberty of the Press and Public Opinion: 1660-1695', in *Liberty secured?*, 199-230.

⁶⁶ These are summarised in Holmes, *The making of a great power*, 454-5.

⁶⁷ Summaries are provided in Holmes, *The making of a great power*, 457.

⁶⁸ Watts, *The Dissenters*, 251-2.

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So much for the laws. What of their implementation? There were examples of persecution in Cambridge of which Newton could not have failed to take notice. In 1663, shortly after his arrival at the Fenland University, a Fellow of Clare College was indicted for the crime of private preaching. His sentence was ‘to abjure the realm in three months or to suffer death as a felon’. While he was granted a reprieve, he was nevertheless held in prison until 1672. On his release he began preaching once more and was once more locked away, this time in Fleet Prison.⁶⁹ Another notable example came in 1668, the year Newton received his MA and became a Fellow of Trinity, when Daniel Scargill suffered expulsion from Cambridge for ‘asserting impious and atheistic tenets’. His reinstatement came only following his public recantation, which was delivered on Sunday 25 July 1669 at Great St. Mary’s,⁷⁰ the Cambridge church Newton attended on Sundays. With respect to anti-Trinitarianism, William Penn suffered imprisonment in the Tower of London in 1668 for publishing unorthodox (apparently Sabellian) ideas on the Trinity. Lodowick Muggleton rejected the Trinity in published works and after being tried for this sin in 1677 was sentenced to stand in the pillory (where he received a head wound from stones thrown at him) and then afterwards was imprisoned for six months at Newgate.⁷¹

Further afield, the two celebrated cases of the Puritans John Bunyan and Richard Baxter are worth recalling as examples in fact rather than theory of what the laws could bring to active Dissenters. Bunyan was arrested and imprisoned after being caught preaching outdoors in November 1660. The authorities charged him under the authority of the 1593 Elizabethan Act, ‘For Retaining the Queen’s Subjects in their due Obedience’. Sentenced originally to three months, Bunyan’s

⁶⁹ C H Cooper, *Annals of Cambridge* (4 vols., Cambridge, 1842-52), III, 512.

⁷⁰ Cooper, *Annals of Cambridge*, III, 532; Jon Parkin, ‘Hobbism in the later 1660s: Daniel Scargill and Samuel Parker’, *The Historical Journal*, 42 (1999), 85-108; James L Axtell, ‘The mechanics of opposition: Restoration Cambridge v. Daniel Scargill’, *Bulletin of the Institute of Historical Research*, 38 (1965), 102-11; Westfall, *Never at rest*, 318 and Snobelen, ‘Isaac Newton, heretic’, 395; [Daniel Scargill], *The recantation of Daniel Scargill, publickly made before the University of Cambridge, in Great St Maries, July 25. 1669* (Cambridge, 1669).

⁷¹ Marshall, *John Locke, toleration and early Enlightenment culture*, 125-6.

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imprisonment continued for twelve long years due to his failure to conform as required (although he was occasionally let out to attend church meetings). It was also within the magistrates' authority to apply the death penalty. In 1664 this very sentence was brought against a group of twelve General Baptists from Aylesbury who had resisted the call to conform according to the aforementioned 1593 Act. Their lives were spared only by a royal pardon.⁷² As for Baxter, he suffered a brief and mild imprisonment in 1670 for the crime of convening conventicles, but in 1685 and 1686, when in declining health, he was subjected to seventeen months' imprisonment after being charged under the Five Mile Act.⁷³

The legal regime was arguably even more severe north of the River Tweed. The Act against the Crime of Blasphemy passed in 1661 by the Scottish Parliament mandated the death penalty for anyone who 'shall deny GOD, or any of the persons of the blessed Trinity, and obstinately continue therein'.⁷⁴ An Act against Blasphemy passed in 1695 by the Scottish Parliament similarly proscribed those who 'in their Writing or Discourse, Deny, Impugn, or Quarrel, Argue, or Reason against the being of God, or any of the Persons of the Blessed Trinity', stipulating imprisonment for the first offence, imprisonment and a fine for the second offence and death for the third offence.⁷⁵ Neither Act specified the mode of execution. While these Acts targeted atheism and blasphemy and although it is difficult to determine from their wording whether they are meant specifically to proscribe biblicist unorthodoxy on the Trinity, or if they suggest that anti-Trinitarianism was considered as serious as atheism, the laws likely would not have given anti-Trinitarians in the Scottish legal jurisdiction peace of mind.

Despite the restrictions placed on religious Dissenters in the Restoration, there were also indications of the greater toleration that would eventually come. In 1677 the common law heresy statute *de haeretico comburendo*, enacted long before under Henry IV and under

⁷² Watts, *The Dissenters*, 224, 234.

⁷³ Watts, *The Dissenters*, 234-5, 255-7.

⁷⁴ Reprinted in Florida, 'British Law and Socinianism', 207.

⁷⁵ Reprinted in Florida, 'British Law and Socinianism', 208.

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which Legate was burned for anti-Trinitarianism in 1612, was formally repealed by Parliament.⁷⁶ But before it was, Thomas Hobbes had apparently feared – possibly with good reason – that he would be prosecuted, sentenced and burned alive under its harsh dictates. The long-lived Hobbes did, however, get to enjoy two years of peace of mind after its repeal.⁷⁷ The 1677 repeal of this law removed the death penalty, but it did not remove the power of archbishops, bishops and judges of ecclesiastical courts ‘in cases of Atheisme Blasphemy Heresie or Schisme and other damnable Doctrines and Opinions but that they may proceede to punish the same according to his Majestyes Ecclesiasticall Lawes by Excommunication Deprivation Degradation and other Ecclesiasticall Censures not extending to death’.⁷⁸

The repeal of *de haeretico comburendo* stands in contrast to attempts in the 1660s to bring in a Bill against atheism, perhaps motivated in part by the works of Hobbes. A committee appointed by Parliament in October 1666 considered a Bill against atheism that when it was sent to the House of Lords in January 1667 included in its text the firm prohibition against ‘[a]ny person who shall by word, writing or printing deride or deny, scoff at or dispute against the Essence, Persons, or Attributes of God the Father, Son or Holy Ghost given unto them in the Sacred Scriptures’.⁷⁹ When the Bill was again sent to the Lords in October 1667, an additional condemnation had been inserted against those who deny ‘the Immortality of mens soules, and the resurrection of the body and the eternal rewards in Heaven, and eternal torments in Hell’.⁸⁰ After 1668 there was apparently no more discussion of the Bill in Parliament until February

⁷⁶ ‘An Act for takeing away the Writt De Heretico comburendo’, *Statutes of the Realm*, V, 850.

⁷⁷ J A I Champion, ‘An Historical Narration Concerning Heresie: Thomas Hobbes, Thomas Barlow, and the Restoration debate over “heresy”’, in *Heresy, literature and politics in early modern England*, 221-53; Philip Milton, ‘Hobbes, heresy and Lord Arlington’, *History of Political Thought*, 14 (1993), 501-46.

⁷⁸ ‘An Act for takeing away the Writt De Heretico comburendo’, *Statutes of the Realm*, V, 850.

⁷⁹ House of Lords Record Office (HLRO), Parchment Coll., HL, 31 January 1667, cited Milton, ‘Hobbes, heresy and Lord Arlington’, 518.

⁸⁰ HLRO, Main Papers, HL, 14 October 1667, cited Milton, ‘Hobbes, heresy and Lord Arlington’, 519.

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1674 and November 1675 when it was again considered in the Lords, but once more without passing into law. Its provisions certainly would have condemned the author of *Leviathan* as well as Newton himself by the 1680s and 1690s. As Philip Milton puts it: 'Its victims, had it been passed, would have been atheists and Socinians'.⁸¹

Although there were moments of relief for Dissenters and radical heretics in the years from 1660 to 1689, there was nevertheless a great deal of persecution during this period. Thousands of Dissenting Protestants, Quakers and others outside the established Church suffered imprisonment and debilitating fines. Hundreds and perhaps thousands perished in gaol. The persecution of Dissenters reached its peak in the years 1681 to 1685.⁸² Perhaps revealing where his own sympathies had lain all along, on his deathbed in 1685 Charles II converted to Catholicism and received the sacraments according to the Roman rite. Ironically, the ascension to the throne the same year of his brother as James II – who was already a Catholic – signalled an improvement in the lot of Protestant Dissenters. This did not come, however, before a final wave of brutal repression. Always to a lesser or greater degree a dynamic in the persecution of Dissenters, politics loomed large in the reaction to the Duke of Monmouth's June 1685 rebellion against the new king. As many Dissenters offered support to Monmouth, a good number of them were among the roughly 150 rebels put to death as the crown exacted revenge. As Michael Watts records, one poor woman (a Baptist and a chandler) who had taken in one of the rebels was burned at the stake at Tyburn under orders from the notorious Judge Jeffreys.⁸³

Newton would have his own encounter with Jeffreys. A little over a decade after receiving a royal dispensation that allowed him to remain at Cambridge as a heretic, Newton was to play a leading role in defending his university when James II began to use his royal prerogative in his efforts to (re)Catholicize Cambridge.⁸⁴ James had Edward Spence, a

⁸¹ Milton, 'Hobbes, heresy and Lord Arlington', 520.

⁸² Watts, *The Dissenters*, 221-62; Holmes, *The making of a great power*, 147-51.

⁸³ Watts, *The Dissenters*, 256-7.

⁸⁴ Rob Iliffe, 'Those "whose business it is to cavill": Newton's anti-Catholicism', in *Newton and religion: context, nature and influence*, ed. James E Force and Richard H Popkin (Dordrecht, 1999), 97-119. Iliffe deals with the Alban Francis affair on pages 117-19. See also Westfall, *Never at rest*, 474-9 and A Rupert Hall, 'The Francis Affair reconsidered', *Notes and Records of the Royal Society of London*, 49 (1995), 179-84.

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scholar of Jesus College, prosecuted for a November 1686 speech before the university in which he offered a satire of the Catholic Church. The following month, a letter mandate from the king saw Joshua Bassett installed as Master of Sidney Sussex College, a Puritan foundation. Bassett was rumoured to be a secret Romanist and had been the one who had prosecuted Spence.⁸⁵ But a real crisis erupted in February 1687 when James tried to use a letter mandate to force the university to grant an MA to a Benedictine monk named Alban Francis. Had the university accepted the letter mandate, it would have both waived the requirement for the recipient to take religious oaths and given a degree to a Catholic – worse yet, a Catholic *priest*. Newton, whose *magnum opus* the *Principia mathematica* was just then going through the press, was among an eight-man delegation from Cambridge who came before the Ecclesiastical Court four times in April and May of 1687 to answer for its refusal to accede to the royal wishes that Alban Francis be granted a degree. The presiding judge was none other than the infamous Lord Jeffreys. John Peachell, the vice-chancellor, found himself deprived of his office after the third meeting on 7 May. In one draft of a formal reply prepared before the fourth hearing, Newton added a note that reveals serious concerns about the loss of Protestant privileges:

They were influenced also by their religion established & supported by the laws they are commanded to infringe. Men of the Roman Faith have been put into Masterships of Colleges. The entrance into Fellowships is as open. And if forreigners be once incorporated twill be as open to them as others. A mixture of Papist and Protestants in the same University can neither subsist happily nor long together. And if the fountains once be dryed up the streams hitherto diffused thence throughout the Nation must soon fall of. Tis not their preferments for a time but their religion & Church which men of Conscience are concerned for, & if it must fall they implore this mercy that it may fall by the hands of others.⁸⁶

⁸⁵ Westfall, *Never at rest*, 474.

⁸⁶ Newton, Keynes MS 116, f. 2r (normalized text with minor amendments to orthography). Other documents related to the Alban Francis affair among Newton's papers include Newton, Keynes MSS 113, 118, 119, 121, 122, 123 (all available on the Newton Project website).

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In the end, the remaining delegates, including Newton, were successful in resisting the crown's attempt to force its hand in the case, but not before having to endure a tongue-lashing from the fierce judge.⁸⁷ It was the closest Newton ever came to being tried for his faith. On the one hand, in this incident Newton was involved in a mostly successful defence by the university of its liberties along with a rebuff of political interference from the crown. On the other hand, Newton the anti-Trinitarian Nicodemite found himself standing with a delegation from Cambridge consisting mostly of ordained clergymen and, what is more, in effect defending the Church of England – a church he ultimately believed was apostate, although perhaps not quite as wicked as that of Rome.

Realpolitik demanded a change in strategy for James II. And so, after his pro-Catholic policies raised the ire of Anglicans, the king tried another tack. First, in March 1686 he granted a general pardon to Dissenters then imprisoned.⁸⁸ Next, but still as part of his policies aimed at supporting the Roman Catholic cause in Britain, James issued a Declaration of Indulgence on 4 April 1687.⁸⁹ The Declaration removed some legal restrictions on both Catholics and Protestant Dissenters even while it failed to give them full rights. Nevertheless, the Indulgence brought the suspension of both Test Acts as well as the penal laws.⁹⁰ It was a dramatic shift in policy for the monarch.⁹¹ James intended not only to improve the lot of his fellow Catholics but also to create a division between Anglicans and Dissenters, the latter of whom he attempted to win over to support his desire for a new Parliament more favourable to his rule. James issued an enlarged version of the Declaration on 27 April 1688.⁹² As Michael R Watts points out, through this move 'James II thus not only gave the Dissenters freedom of worship for the last two years of his reign, he broke the back of Anglican intolerance and made possible the permanent

⁸⁷ Westfall, *Never at rest*, 478-9.

⁸⁸ Watts, *The Dissenters*, 257.

⁸⁹ The text is printed in *English historical documents, 1660–1714*, 395-7.

⁹⁰ Watts, *The Dissenters*, 257.

⁹¹ For a more sympathetic account of the king's new policy, see Mark Goldie, 'James II and the Dissenters' Revenge: the Commission of Enquiry of 1688', *Historical Research*, 66 (1993), 53-88.

⁹² *English historical documents, 1660–1714*, 399-400.

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toleration of Dissent' that came after he fled the realm.⁹³ Mark Goldie writes that the king also hoped 'to secure the election of a parliament that would give statutory force to religious toleration and to the abolition of the Test Acts by which non-Anglicans were debarred from office'. But the Catholic monarch's stratagem failed. Rather than divide his Protestant subjects, Anglicans and Dissenters united to defend Protestantism against what was increasingly seen as the threat (both in religious and political senses) of resurgent Catholicism. Certainly the Revocation of the Edict of Nantes in 1685 by Louis XIV in France provided an example of what a reactionary Catholic monarch might do, given the will and the means. James began to lose his grip on power, with Protestant feelings further inflamed by news that his wife had given birth to a son. The spectre of a Catholic succession helped precipitate the so-called Glorious Revolution, which saw the Protestant William of Orange and his wife Mary (James's Protestant daughter) come to England. They were offered the throne on 23 February 1689 and crowned monarchs of England on 21 April. Just over a month later, on 24 May 1689, Parliament passed 'An Act for Exempting their Majesties Protestant Subjects, Dissenting from the Church of England, from the Penalties of certain laws'. This important statement has come to be known as the Act of Toleration or the Toleration Act.⁹⁴

⁹³ Watts, *The Dissenters*, 259.

⁹⁴ *An act for exempting their Majesties Protestant subjects, dissenting from the Church of England, from the penalties of certain laws*, in *Anno Regni Gulielmi et Mariae, Regis & Reginae Angliae, Scotiae, Franciae & Hiberniae, primo. On the twenty fourth day of May, Anno Dom. 1689. In the First year of their Majesties reign, this act passed the royal assent* (London, 1689), 303-18. An unabridged version of the Act can be found in *Documents relating to the settlement of the Church of England by the Act of Uniformity of 1662*, 507-16. A slightly abridged version is published in *English historical documents, 1660-1714*, 400-3; two brief excerpts relating to the Trinity are printed in Florida, 'British Law and Socinianism', 208. A full facsimile is published at the end of *From persecution to toleration*. Background on the Act is provided in D L Wykes, 'The Tercentenary of the Toleration Act of 1689: a cause for celebration?', in *Papers from the 1989 International Symposium on Truth and Tolerance*, ed. E J Furcha (Montreal, 1990), 60-82; John Spurr, 'The Church of England, comprehension and the Toleration Act of 1689', *English Historical Review*, 104 (1989): 927-46; and F Kenworthy, 'The Toleration Act of 1689', *Transactions of the Unitarian Historical Society*, 8 (1939), 18-30. Wykes outlines the relative freedom as well as the prosperity Protestant Dissenters enjoyed before and after the Toleration Act despite the legal

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The Act of Toleration is a milestone in the history of religious freedom in England. But it formally extended neither to Roman Catholics nor Unitarians, the first seen as a threat to the state and the second a danger to religion and morality.⁹⁵ Instead, it granted freedom of worship to all Dissenting Protestants – so long as they did not dissent from the doctrine of the Trinity, the tenet singled out as the litmus test for Christian orthodoxy.⁹⁶ Although today called the ‘Toleration Act’ or ‘The Act of Toleration’, it is noteworthy that the Act does not contain the word ‘toleration’. It does, however, contain a number of restrictions. Dissenters were not allowed to meet behind locked doors.⁹⁷ Congregations and religious assemblies were to be registered with the local Bishop, archdeacon or Justice of the Peace.⁹⁸ The Act required Dissenters to swear the oaths outlined in a statute prepared by the Parliament of 1689 and also to subscribe to the declaration given in the Second Test Act (1678), which was aimed at preventing Catholics from taking a seat in either the House of Commons or the House of Lords. Those whose consciences did not allow them to swear oaths (this would apply primarily to Quakers) were required to make a declaration of loyalty to King William and Queen Mary and also to reject the political power of the papacy in the realm of Great Britain. In addition, they were asked to subscribe to a profession of faith as follows:

I, A. B. Profess Faith in God the Father, And in Jesus Christ his Eternal Son, the true God, And in the Holy Spirit, one God blessed for evermore; And do acknowledge the Holy Scriptures of the Old and New Testament to be given by Divine Inspiration.⁹⁹

strictures in Wykes, ‘Religious Dissent and the Penal Laws: An Explanation of Business Success?’, *History*, 75 (1990), 39-62.

⁹⁵ Cf. Westfall, *Never at rest*, 486.

⁹⁶ A litmus test by itself that Catholics of course would have passed.

⁹⁷ *An act for exempting their Majesties Protestant subjects, dissenting from the Church of England, from the penalties of certain laws*, 307-8.

⁹⁸ *An act for exempting their Majesties Protestant subjects, dissenting from the Church of England, from the penalties of certain laws*, 318.

⁹⁹ *An act for exempting their Majesties Protestant subjects, dissenting from the Church of England, from the penalties of certain laws*, 314; Florida, ‘British Law and Socinianism’, 208.

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Later in the Act the Trinity is mentioned again in a statement that prohibits an easing of restrictions for ‘any Papist, or Popish Recusant whatsoever; or any person that shall deny in his Preaching or Writing the Doctrine of the Blessed Trinity, as it is Declared in the aforementioned Articles of Religion’,¹⁰⁰ that is, the Thirty-Nine Articles. A non-Trinitarian, therefore, would not be free to worship openly. And, because the Test Act of 1673 (which mandated that those in public employment receive the sacrament according to Anglican rite) remained in force there was no full equality in the civil sense even for Trinitarian Dissenters whose only scruples were over receiving communion in the Church of England.

What would this Act have meant for Isaac Newton? On the one hand, he was an inveterate opponent of popery in England.¹⁰¹ In addition to the limitations the Act placed on Catholics, Newton surely would also have approved of the legal exclusion of Romanists from the throne of England, another outcome of the Revolution.¹⁰² He was also by this time at least nominally a Whig and the Whigs were generally in favour of greater toleration. Evidence from Newton’s own writings show him to have been a tolerationist.¹⁰³ On the other hand, Newton had strong reservations about oath-taking and it is absolutely clear that he could not have subscribed in good conscience to the Trinitarian clause given in the Act (if he had had scruples about swearing oaths). As it happened, the situation was especially difficult for Newton since he was not only a committed and long-time anti-Trinitarian by 1689, but also had been elected in January of that year as one of two representatives of the University of Cambridge for the convention that was to settle the Revolution. Thus, Newton became a sitting MP in the Convention Parliament.¹⁰⁴ Although by no means an active MP in or outside the House of Commons, Newton was called upon to sit on committees. On 18 April 1689 Newton was added to

¹⁰⁰*An act for exempting their Majesties Protestant subjects, dissenting from the Church of England, from the penalties of certain laws*, 317; Florida, ‘British Law and Socinianism’, 208.

¹⁰¹Iliffe, ‘Those “whose business it is to cavill”’.

¹⁰²Cf. Westfall, *Never at rest*, 484. The restriction of the crown to Protestants was enshrined in the Act of Settlement (1701).

¹⁰³E.g., Newton, ‘Irenicum’, Keynes MS 3, which dates to the early eighteenth century.

¹⁰⁴Westfall, *Never at rest*, 480, 483-7.

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a committee considering relief for French Huguenot ministers who, having escaped persecution in France in the wake of the 1685 Revocation of the Edict of Nantes, had found their way to Britain.¹⁰⁵ Newton almost certainly would have been sympathetic to this cause. And there is more. Three Bills relating to the post-revolutionary religious settlement were debated in Parliament. The first was intended to allow Dissenters public worship, the second would have repealed the 1673 Test Act and the third would have provided for a broad comprehension of Dissent within the state Church. The second and third failed, but the first did succeed and came into being as the aforementioned Act of Toleration.¹⁰⁶ While there is no record of Newton having been involved in these parliamentary debates, he was one of the few Englishmen to have been witness to them.

But this is not all. After the Act was read the second time in the House of Commons on 15 May 1689, it was referred to a committee, which was to meet in the Speaker's Chamber at four o'clock the following day. Among the forty-eight names of the members of this special committee was that of Isaac Newton. The Journals of the House of Commons state: 'all that come to have Voices'.¹⁰⁷ The same account of Parliament records that a spokesman for the committee reported on 17 May with recommended amendments to the Bill. One of these was the introduction of the above-quoted Trinitarian clause for non-oath takers. The Act, as amended, was passed and referred to the House of Lords.¹⁰⁸ We know from the record that Newton was appointed to this committee and that

¹⁰⁵*Journals of the House of Commons. From December the 26th, 1688, to October the 26th, 1693, in the fifth year of the reign of King William and Queen Mary* (London, 1742), X, 93.

¹⁰⁶Westfall, *Never at rest*, 486. William III had himself been in favour of a much broader toleration that would have included Jews, Catholics and Dissenters and, in addition, would have done away with sacramental tests for those appointed to public office. But the Tories were sufficiently strong in Parliament at the time to resist the Calvinist king's wishes, which would have significantly eroded the authority of the Church of England (see W M Spellman, *The Latitudinarians and the Church of England, 1660–1700* [Athens, Georgia, 1993], 134-5).

¹⁰⁷*Journals of the House of Commons*, X, 133.

¹⁰⁸*Journals of the House of Commons*, X, 137. The clause prohibiting preaching and writing against the Trinity referred to above was presumably already in the version of the Act considered by this committee.

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this committee was charged with examining the wording of the Act before its final passage. We also know that the committee met on 16 May as requested and that in their deliberations they agreed to add a Trinitarian clause, thus adding a second restriction to the Act on the religious freedoms of non-Trinitarians. What we do not know is Newton's view of the Act or even if he attended the meeting. Had he attended, it seems reasonable to assume that he would have felt conspicuous and uncomfortable – at the very least. And it *is* possible that he did not attend. In a letter written on 10 May (a Friday) that he sent to John Covel, the vice-chancellor of the University of Cambridge, Newton spoke of being in confinement at his Westminster lodgings due to 'a cold & bastard Pleurisy'.¹⁰⁹ Since this letter refers to his inability to meet Robert Sawyer due to his cold, while a letter dated 15 May (a Wednesday) that Newton also sent to Covel seems to imply that he had by that date been in contact with Sawyer,¹¹⁰ it is possible that Newton had recovered in time to learn that he had been appointed to the committee, to meet with the committee on the Thursday and also to be in the House when the committee made its report on the Friday (a full week after reporting he was ill).¹¹¹ If Newton had in fact missed the meeting, might the wording of the Act have been different? Might it have been the same? If he did attend, would he have suffered a fate similar to MP John Fry in 1651 had he spoken up? We only know that the Act passed with the two Trinitarian clauses and that Newton – MP, Cambridge professor, published natural philosopher with

¹⁰⁹Newton to Covel, [10 May 1689], *The correspondence of Isaac Newton*, ed. H W Turnbull et al. (7 vols., Cambridge, 1959-77), III, 22; see also Newton to Covel, 16 March 1689, *Correspondence of Newton*, III, 18. Since Newton appears to have become ill prior to 15 May, it is likely that his sicknesses was not feigned (unless he had been told about his appointment to the committee prior to the formal announcement on 15 May). Newton's correspondence with Covel at this time suggests that his main preoccupation was with the effect the settlement would have on the university, including the matter of oaths (on this correspondence, see Westfall, *Never at rest*, 483-6).

¹¹⁰Newton to Covel, 15 May 1689, *Correspondence of Newton*, III, 23. Sawyer was the other MP the University of Cambridge elected to Westminster. Sawyer was among the leaders of a group of MPs who met at the Devil Tavern in March to oppose King William's plan to abolish the sacramental test (Lacey, *Dissent and parliamentary politics* in England, 233-4).

¹¹¹Newton's surviving correspondence with Covel shows that he was keen to follow the proceedings in Parliament.

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the beginnings of an international reputation *and* anti-Trinitarian – stood condemned by it.

Another decision made by Parliament around this time appears to have worried Newton and this concerns the oath of allegiance for the new monarchs. Newton evidently had hoped that the new oaths would be imposed only on those taking new university or Church appointments and an early draft of the relevant Bill suggested that this would be the case. However, the House of Lords expanded the scope of the Bill so that it imposed the oaths on those already holding positions. Newton voted against this revised Bill, but his side lost by fifty votes in a 5 March vote. A number of high churchmen refused to renounce their allegiance to the Stuarts and some twenty fellows at St John's College also refused to take the new oath, thus joining other 'non-jurors' in the realm who resisted the oath. Despite his qualms about oath-taking, Newton was not among those who refused.¹¹² Earlier, on 2 March, he reported to Covell: 'To day ye Houses of Lords & Commons took ye new oaths & Test, none in town scrupling them that I have heard of'.¹¹³ None in town including Newton himself.

It has been argued that one of the effects of the restrictions placed on anti-Trinitarians by the Act of Toleration was insincere conformity – that is to say, cases where heterodox thinkers remained in the communion of the Church of England, including biblicist anti-Trinitarians along with anti-scripturalist deists. Notable examples of the former are Stephen Nye and Samuel Clarke.¹¹⁴ Newton himself had been a conformist, anti-

¹¹²Westfall, *Never at rest*, 484-5; Gale E Christianson, *In the presence of the Creator: Isaac Newton and his times* (New York, 1984), 331-2. See also 'An Act for the abrogating of the Oaths of Supremacy and Allegiance, and appointing other Oaths', in *The statutes at large. From the first year of King James the Second, to the tenth year of Queen Anne, inclusive, to which is prefixed, a table of the titles of all the publick and private statutes during that time. Volume the third* (London, 1758), III, 13-15. In a scheme he drafted outlining pedagogical protocols and principles for the University of Cambridge, Newton reveals his distaste for oaths of office: 'No oaths of office to be imposed on the Lecturers. I do not know a greater abuse of religion then that sort of oaths they being harder to be kept then ye Jewish Law' (Newton, Cambridge University Library MS Add. 4005, f. 15v, in Newton, *Unpublished scientific papers of Isaac Newton*, ed. A Rupert Hall and Marie Boas Hall [Cambridge, 1962], 373).

¹¹³Newton to Covell, 6 March 1689, *Correspondence of Newton*, III, 15.

¹¹⁴Cf. Kenworthy, 'The Toleration Act of 1689', 27.

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Trinitarian communicant within the established church since becoming a heretic in the 1670s. So the Act of 1689 did not demand a change in his own practice, although it would have been a reminder of his radical theological Nonconformity and of the need for continued vigilance. The summation of Westfall (who does not mention that Newton had been appointed to the relevant committee) remains apposite:

Newton was well aware that the vast majority of his compatriots detested the views he held – more than detested, looked upon them with revulsion as an excretion that fouled the air breathed by decent persons. He had lived silently with that knowledge for fifteen years. The debate in Parliament, or the virtual lack of debate on a provision accepted without serious question, cannot have failed to bring it home to him once more.¹¹⁵

But just how nervous the Act made Newton is much harder to tell.

In the late seventeenth century two methods (often linked) of dealing with the problem of Nonconformity were considered: the first was comprehension and the second was toleration. During the attempts in 1689 to arrive at a religious settlement after the Glorious Revolution both options were pursued. Very soon after coming to the throne, King William (himself solidly Protestant but of course specifically Calvinist rather than Anglican) had used his influence to see a Comprehension Bill passed by the House of Lords, which was first brought before it on 11 March 1689. This was then sent to the House of Commons, who referred it to the Convocation of Clergy, in whose hands it foundered. The resistance of the Anglican clergy to wider comprehension left the Act of Toleration as the only way forward.¹¹⁶ But even the Act of Toleration was not viewed by all as a permanent opening up of toleration. As W M Spellman notes, ‘many rank and file Anglicans looked upon it as a temporary concession to be withdrawn when circumstances seemed more propitious’.¹¹⁷ It is thus ironic that a kind of *de facto* comprehension emerged after the

¹¹⁵Westfall, *Never at rest*, 486.

¹¹⁶Jonathan I Israel, ‘William III and toleration’, in *From persecution to toleration*, 129-71; Spurr, ‘The Church of England, comprehension and the Toleration Act of 1689’.

¹¹⁷Spellman, *The Latitudinarians and the Church of England*, 136.

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passage of the Act of Toleration. Given that the first was issued by a Catholic king intent on re-Catholicizing England and that the second explicitly excluded anti-Trinitarians, it is also ironic that the 1687 Declaration of Indulgence and the 1689 Act of Toleration after it form the legal backdrop of, and to a certain extent encouragement for, the series of publications now known as the Unitarian Tracts, the first of which was published anonymously by Stephen Nye in 1687.¹¹⁸

Anti-Unitarian laws and prosecutions: 1689 to 1698

At the time of the passage of the Toleration Act the Athanasian Creed was the chief buttress of Trinitarianism in Anglicanism.¹¹⁹ Some churchmen, including John Tillotson, who was consecrated Archbishop of Canterbury in 1691, were in favour of dropping the Creed. While this did not happen, the Ecclesiastical Commission established by King William in September 1689 to amend the liturgy and canons of the Church to allow for greater toleration agreed to qualify the Creed's curses as applying to those who denied the core of Christian religion.¹²⁰ Two literary attempts were made in 1690 to persuade the Church of England to abandon the Creed. The first attempt came in Arthur Bury's *The naked gospel* (1690). Bury was then Rector of Exeter College, Oxford. For his efforts, the university convocation formally condemned the book and had it burned on 19 September 1690. Bury was also fined £500, deprived of his rectorship and excommunicated. Then, in 1695 he was expelled from his college.¹²¹ All this and Bury was himself a Trinitarian! The other attempt came in the form of Stephen Nye's *Brief notes on the creed of St. Athanasius*

¹¹⁸[Nye], *A brief history of the Unitarians called also Socinians* (London, 1687).

¹¹⁹In addition to publications on the Toleration Act already cited above, accounts of persecution and toleration in England around and after the passing of the Toleration Act can be found in R K Webb, 'From Toleration to Religious Liberty', in *Liberty secured?*, 158-98; Hugh Trevor-Roper, 'Toleration and Religion after 1688', in *From persecution to toleration*, 389-408; and Charles F Mullett, 'The Legal Position of English Protestant Dissenters, 1689-1767', *Virginia Law Review*, 23 (1937), 389-418.

¹²⁰Stephen 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), 83.

¹²¹Jim Benedict, 'Bury, Arthur (1623/4-1713)', *ODNB*.

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(1690).¹²² Nye, an Anglican clergyman, had hoped that the elimination of the Athanasian Creed from the liturgy of the Church of England would open the way for the comprehension of Unitarian believers. But Nye may have overplayed his hand, for in addition to attempting to defame the character of Athanasius (who was after all to some a saint), he also argued in this work that the doctrine of the Trinity itself was against both reason and revelation. Far from encouraging the abandonment of the Athanasian Creed in the Church of England, Nye's work elicited replies from William Sherlock and John Wallis, each claiming to represent orthodoxy on the Trinity. One notable outcome of the responses to the Unitarians from the orthodox was a surprising lack of unanimity over the precise contours of Trinitarian dogma.¹²³

Another contributor to the Unitarian controversies of the late 1680s and 1690s was William Freke (1662-1744), a son of Thomas Freke and Cicely Hussey of Hannington Hall in Wiltshire. In his *A vindication of the Unitarians* (1687; 2nd ed., 1690), in which he identified himself as an Arian rather than a Socinian, Freke challenged the Trinity on rational, scriptural and historical grounds. When John Wallis responded to the second edition of this work, Freke issued in reply his *The Arrian's vindication of himself* (1691). More provocative was his *A dialogue by way of question and answer, concerning the Deity* (1693), copies of which he distributed among the members of the House of Lords and the House of Commons. Wanting to bring the book notoriety and greater sales, he hoped that the work would be ordered burnt. He got his wish. But he was also fined £500. Later, in the early eighteenth century, Freke renounced his anti-Trinitarian stance and began to devote himself to prophecy.¹²⁴ In 1695 a clock-maker named John Smith published an anti-Trinitarian work that argued that God is one Person rather than three and that this one Person is the Father alone. Christ is not eternal and the Holy Spirit is the

¹²²Expanded the same year as [Nye], *The acts of great Athanasius with notes, by way of illustration on his creed; and observations on the learned vindication of the Trinity and Incarnation* (London, 1690).

¹²³Trowell, 'Unitarian and/or Anglican', 84-7.

¹²⁴Martin Greig, 'Freke, William (1662-1744)', *ODNB*.

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power of God.¹²⁵ Smith was hauled before the Spiritual Court and forced to recant his anti-Trinitarian views.¹²⁶

Evidence that by the late 1680s the inchoate group of Unitarians had become hopeful (or emboldened) comes in the form of the aforementioned Unitarian Tracts.¹²⁷ There were three formal volumes of Tracts published in 1691, 1693 and 1695. The first volume contained some of Biddle's writings, as well as Nye's 1687 *A brief history of the Unitarians called also Socinians*. It may also be possible to speak of a fourth and a fifth collection published in 1699 and 1701 respectively, but these volumes do not show all the distinguishing formatting and typographical conventions of the first three collections. Also, only the first three collections were underwritten by the Unitarian sympathizer and philanthropist Thomas Firmin, who died on 20 December 1697. Newton's anti-Trinitarian manuscript treatises 'An historical account of two notable corruptions of Scripture, in a Letter to a Friend' and 'Paradoxical Questions concerning the morals & Actions of Athanasius and his followers' date to this period.¹²⁸ And although they emanate in part from projects in which he was engaged prior to the late 1680s (including his study of patristics and church history) and while they bear Newton's own unique stamp of erudition, their tone and aims – in the first case to discredit Athanasius, the champion of orthodoxy, and in the second case to show that of two leading texts used to support the Trinity (1 John 5:7 and 1 Timothy 3:16), one was an interpolation and the other corrupt –

¹²⁵John Smith, *A designed end to the Socinian controversy: or, a rational and plain discourse to prove, that no other person but the Father of Christ is God most High* (London, 1695). On Smith, see Wallace, *Antitrinitarian biography*, I, 289-98.

¹²⁶McLachlan, 'Seventeenth century Unitarian Tracts', 144.

¹²⁷On the Unitarian Tracts, see Trowell, 'Unitarian and/or Anglican'; H McLachlan, 'Seventeenth Century Unitarian Tracts', 138-66 and Wallace, *Antitrinitarian biography*, I, 218-370.

¹²⁸The text of Newton's 'Two notable corruptions' can be found on the Newton Project website; its most authoritative print publication is in Newton, *Correspondence of Newton*, III, 83-149. The 'Paradoxical Questions' exists in two manuscript versions, King's College, Cambridge, Keynes MS 10 and the more elaborate William Andrews Clark Memorial Library (UCLA) MS **N563M3 P222, both also available on the Newton Project website.

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without question overlap with the tone and aims of the Unitarian Tracts.¹²⁹ Had they been published it is likely that many readers would have seen them as being of the same genre of these Tracts. In fact, Newton did originally plan to publish his ‘Two notable corruptions’, albeit anonymously, in translation and on the Continent. He had sent a copy to John Locke for this purpose in 1690, but later had a change of heart and in 1692 asked his friend to suppress the work. The Unitarian controversies that began with Nye’s *A brief history of the Unitarians*, which included many attacks from the orthodox, certainly would have given Newton reason to be nervous about publishing something of his own.¹³⁰ What is more, the many attacks throughout the 1690s against Locke’s *Essay* (1690) and *Reasonableness of Christianity* (1695) for unorthodoxy – including unorthodoxy on the Trinity – would have offered another example to Newton of what he could have faced had he published. All this, and Locke did not directly challenge the Trinity in either publication, the second of which was published anonymously.

The 1690s saw a steady stream of publications directed by the defenders of orthodoxy against the Unitarian Tracts and anti-Trinitarianism in general. On top of this, three additional legal and ecclesiastical documents appeared in Britain during the 1690s that circumscribed non-Trinitarian belief. First, there was the aforementioned Act against Blasphemy issued by the Scottish Parliament on 28 June 1695. Then, in early 1696, motivated in large part by a desire to put a stop to the embarrassing mixture of ideas on the Trinity flowing from defenders of the faith (in

¹²⁹On the ‘Two notable corruptions’, see Rob Iliffe, ‘Friendly Criticism: Richard Simon, John Locke, Isaac Newton and the *Johannine Comma*’, in *Scripture and scholarship in early modern England*, ed. Ariel Hessayon and Nicholas Keene (Aldershot, 2006), 137–57. On the ‘Paradoxical Questions’, see Iliffe, ‘Prosecuting Athanasius: Protestant forensics and the mirrors of persecution’, in *Newton and Newtonianism: new studies*, ed. James E Force and Sarah Hutton (Dordrecht, 2004), 113–54 and Raquel Delgado Moreira’s contribution to this volume.

¹³⁰In addition to a small number of Continental Socinian works, Newton possessed a copy of the first collection of Unitarian Tracts. See John Harrison, *The library of Isaac Newton* (Cambridge, 1978), item 604. For Newton’s engagement with Socinianism, see Snobelen, ‘Isaac Newton, Socinianism and “the one supreme God”’, in *Socinianism and cultural exchange: the European dimension of Antitrinitarian and Arminian Networks, 1650–1720*, ed. Martin Mulso and Jan Rohls (Leiden, 2005), 241–98. A list of anti-Trinitarian works in Newton’s personal library is given on pages 296–8.

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November 1695 the University of Oxford had formally censured William Sherlock for tritheism),¹³¹ Thomas Tenison, the recently-appointed Archbishop of Canterbury, urged king William to bring out a statement on the teaching of Trinitarian doctrine. The king complied.¹³² The published *Directions* stated:

That no Preacher whatsoever, in his Sermon or Lecture, do presume to Deliver any other Doctrine concerning the Blessed Trinity, than what is contained in the Holy Scriptures, and is agreeable to the Three Creeds, and the Thirty nine Articles of Religion.¹³³

Since there was a debate over what the Scriptures said about the Trinity (or if the doctrine was to be found in the Bible at all), the added clarification found in the Creeds and the Thirty-Nine Articles were evidently thought necessary. But the *Directions* not only had men of the cloth in their sight, for the document also states: ‘That the foregoing Directions be also observed by those, who write any thing concerning the said Doctrine’.¹³⁴ Nor was this all.

And whereas We also understand, That divers Persons, who are not of the Clergy, have of late presumed, not only to Talk and to Dispute against the Christian Faith, concerning the Doctrine of the Blessed Trinity, but also to Write and Publish Books and Pamphlets against the same, and industriously spread them through the Kingdom, contrary to Our known Laws Established in this realm; We do therefore strictly Charge and Command You, together with all other Means suitable to Your Holy Profession, to make use of Your Authority according to Law, for the Repressing and Restraining of all such exorbitant Practices.

¹³¹Wallace, *Antitrinitarian biography*, I, 329-31.

¹³²*Directions to our Arch-Bishops and Bishops, for the preserving of unity in the Church, and the purity of the Christian faith, concerning the Holy Trinity. By his Majesties special command* (London, 1696). The date given at the end of this pamphlet is 3 February 1695. But as this date is said to be during the seventh year of William’s reign, it is evidently Old Style. The text is reprinted in *The clergyman’s assistant, being a collection of statutes, ordinances, and forms, with notes and references, relating to the rights, duties, and liabilities of the clergy* (Oxford, 1828), 564-5.

¹³³*Directions for the preserving of unity in the Church*, 5.

¹³⁴*Directions for the preserving of unity in the Church*, 6.

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And for Your Assistance, We will give Charge to Our Judges, and all other Our Civil Officers, to do their Duty herein, in Executing the Laws against all such Persons as shall by these Means give Occasion of Scandal, Discord and Disturbance in Our Church and Kingdom.¹³⁵

Thus the publication of books written against the received doctrine of the Trinity was proscribed (or, proscribed once again). This was just as well from the point of view of the authorities, for 1695 had seen the lapse of the Licensing Act of 1662.

Not long afterwards, on the recommendation of the Bishops (and possibly in part due to an appeal from the Dissenters to the king to halt Socinian publications),¹³⁶ Parliament passed an Act intended to reign in anti-Trinitarianism along with other unorthodox views.¹³⁷ This was the Blasphemy Act of 1698. This Act mandated that any Christian who ‘shall by Writing, Printing, Teaching, or advised Speaking, deny any One of the Persons in the Holy Trinity to be God, or shall assert or maintain there are more Gods than One, or shall deny the Christian Religion to be true, or the Holy Scriptures of the Old and New Testament to be of Divine Authority’, would be barred from holding offices or employment (‘Ecclesiastical, Civil or Military’) or if already holding such offices, would forfeit such. The penalties for a second conviction were even more severe:

he or they shall from thenceforth be disabled to sue, prosecute, plead or use any Action or Information in any Court of Law or Equity, or be Guardian of any Child, or Executor or Administrator or any Person, or capable of any Legacy or Deed of Gift, or to bear any Office, Civil or Military, or Benefice Ecclesiastical for ever within this Realm, and shall also suffer Imprisonment for the Space of Three Years, without Bail or Mainprize, from the Time of such Conviction.¹³⁸

¹³⁵*Directions for the preserving of unity in the Church*, 6-7.

¹³⁶McLachlan, ‘Seventeenth Century Unitarian Tracts’, 143-4.

¹³⁷‘An Act for the more effectual suppressing of Blasphemy and Profaneness’, in *Statutes at large*, III, 275-6. The text is reprinted in Florida, ‘British Law and Socinianism’, 209.

¹³⁸*Statutes at large*, III, 275.

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The Act did, however, require that prosecutions could only come if supported by witnesses under oath. Those renouncing their heresies within four months of their conviction would ‘be discharged from all Penalties and Disabilities incurred by such Conviction’.¹³⁹ This was a heavy stick to wave over the heads of anti-Trinitarians. Had it been enforced and had Newton been prosecuted under its terms for publishing or openly teaching anti-Trinitarian doctrine, he would have lost his position at the Mint and certainly would never have become president of the Royal Society (as he did in 1703). It is also hard to imagine that he would have been knighted (as he was in 1705). Nor could he have stood for Parliament (as he did later in 1705). If he had persisted in public Unitarianism, he could have been imprisoned. It seems unlikely that it would have come to this, but the legal threat was there nonetheless. But the Act only had power where anti-Trinitarians *openly* and *unambiguously* preached their teachings. And this is something Newton never ventured to do.

Once more, we head north to Scotland. There a young twenty-year-old student named Thomas Aikenhead was hung on 8 January 1697 after being convicted under the Scottish Act against the Crime of Blasphemy (1661) and the Scottish Act against Blasphemy (1695). Although he affirmed his orthodoxy (including his belief in the Trinity) before his execution, it seems that Aikenhead had espoused anti-Trinitarian views and may also have expressed himself atheistically.¹⁴⁰ Just how committed he was to these positions is uncertain. One fact cannot be denied: at the end of the seventeenth century a young man in Britain was put to death on charges of heresy, including anti-Trinitarianism. On the day of Aikenhead’s death, Newton was fifty-four years old and had been an anti-Trinitarian heretic for roughly a quarter century. While Aikenhead’s trial

¹³⁹*Statutes at large*, III, 276.

¹⁴⁰Michael Hunter, ‘“Aikenhead the Atheist”: The Context and Consequences of Articulate Irreligion in the Late Seventeenth Century’, in *idem*, *Science and the shape of orthodoxy: intellectual change in late seventeenth-century Britain* (Woodbridge, 1995), 308-32.

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and execution occurred in a different legal jurisdiction than that of Newton, it would have been a reminder of what was possible in his age.¹⁴¹

Anti-Unitarian laws and prosecutions: 1698 to 1726

This brings us to the end of the seventeenth century. In 1696, Newton had left Cambridge for London, where he took up a position as Warden of the Royal Mint. In 1699 he was appointed Master of the Mint. In 1703 Newton was elected president of the Royal Society. Having left the cloisters of Cambridge behind him, Newton became a public figure who associated with nobility, bishops, statesmen, foreign dignitaries and even royalty. Did the arrival of the eighteenth century and Newton's elevation to a prominent state-appointed office along with his status as a distinguished man of natural philosophy bring more security to this Nicodemite anti-Trinitarian, increasingly well known in public but whose private heresies were known only to a few? Yes, and no. It is undoubtedly true that Newton's improved status offered him a certain degree of protection. On the other hand, a series of legal measures and attempted legal measures that intended to curtail religious freedom along with the treatment of two of his most notable followers during the final decades of his life would have demonstrated to Newton the consequences of making his private heresy public. There is more on this below.

Signs of conformity are not hard to find from Newton's London years. A sacramental certificate in the Middlesex County Records attesting that Sir John Stanley (Newton's successor as Warden of the Mint) took Anglican communion at St. James's Church on 5 July 1702 also records that John Garner and Newton took oaths as witnesses. William Wake acted as officiating minister.¹⁴² These sacramental certificates provided a legal record of a person taking communion when or shortly after taking

¹⁴¹While there is no direct evidence that Newton ever became aware of Aikenhead's death, it is likely that he came to know about it. First, the Scottish youth's trial and execution were reported in English newspapers. Second, Newton's friend and fellow advocate of toleration John Locke took an interest in the case and a number of documents relating to the proceedings can be found among the latter's manuscripts (Locke, *The correspondence of John Locke*, ed. E S De Beer [8 vols., Oxford, 1981], VI, 17-19).

¹⁴²*Middlesex County Records*, ed. J C Jeaffreson (London, 1975), IV, 350-1.

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a public office as dictated by the First Test Act (1673). It is a reasonable surmise that Newton had done the same when he was appointed Warden of the Mint in 1696.¹⁴³ Starting in 1700, Newton served for twenty-two years as a trustee of the Golden Square Tabernacle, a new church in his London parish. He was also assigned to the Commission for Building Fifty New Churches in London and Westminster and as well as the Commission for completing St. Paul's Cathedral.¹⁴⁴ But appearances can be deceiving.

Meanwhile, the forces of intolerance remained vigilant. Thomas Emlyn, an English Presbyterian minister who had adopted Arian opinions, was both imprisoned for his heresy in Dublin in 1703 and hit with an enormous £1000 fine (well beyond his ability to pay, it was later reduced).¹⁴⁵ However, as Robert E Florida points out, after his 1705 release he was able to return to England, publish a series of anti-Trinitarian tracts and even preach his Arianism from the pulpit in London.¹⁴⁶ This is not to say that no-one raised objections. A letter dated 19 February 1705 and sent from the clergy of the lower house of Convocation to the bishops of the upper house of Convocation complained about 'the immorality and profaneness of the stage', expressed concerns about a weakening of the Church of England's position and desired that those they perceived as attacking the Church and its teachings be rigorously censured. Among their grievances was the open preaching of a Unitarian in London. They wished 'to inform [their] lordships of the scandal given to all good Christians by an assembly of sectaries, under the name of Unitarians, publicly held in the City of London, the teacher whereof is notoriously known to have been convicted

¹⁴³See also Snobelen, 'Isaac Newton, heretic', 397.

¹⁴⁴Snobelen, 'Isaac Newton, heretic', 397-8.

¹⁴⁵On Emlyn, see Alexander Gordon, rev. H J McLachlan, 'Emlyn, Thomas (1663-1741)', *ODNB*; H J McLachlan, 'The tercentenary of a Unitarian pioneer', *Transactions of the Unitarian Historical Society*, 13 (1963), 19-21; and Wallace, *Antitrinitarian biography*, III, 503-38. As with the example of Aikenhead, it must be stressed that Emlyn's conviction occurred in a different legal jurisdiction than the one in which Newton lived.

¹⁴⁶Florida, 'British Law and Socinianism', 202.

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of denying the divinity of our blessed Saviour'.¹⁴⁷ This presumably was Emlyn, whose preaching activities in the chief city of England had evidently come to the attention of the clergy of the lower house.¹⁴⁸

Having stood and having been elected to Parliament for Cambridge in 1701, Newton chose not to run in the election of 1702. As Westfall points out, the defeated candidate for Cambridge in the 1701 election had in print charged that there had been corruption in that election and had also insinuated that 'radical religious groups might subvert the Anglican church' through such corruption.¹⁴⁹ Even more worrying for Newton was the Jacobite James Drake's pamphlet on the 1702 election, which as Westfall notes 'referred specifically to Cambridge and to Halifax as a patron powerful in the election there, [and] placed the issue of hypocrites, who were destroying the church by pretending to be true Protestants, at the center of attention'.¹⁵⁰ It is possible that Newton himself was a direct target, even though he did not stand in 1702. Despite this possibility, Newton's supporter, Charles Montague the earl of Halifax, persuaded him to run in the election of 1705 and even engineered Queen Anne's knighting of Newton at Cambridge in April to help Newton's chances. Despite Newton's assiduous electioneering, he came last among the four candidates. But losing in the election was apparently not the only indignity Newton had to suffer. Tory sentiment was then raging against the practice of 'Occasional Conformity' whereby Protestant Dissenters were able to be appointed to office by taking sacrament in the Church of England. In fact, a Bill designed to eliminate the practice of Occasional Conformity had passed in the House of Commons in November 1702,

¹⁴⁷ 'A letter of the lower house to the archbishop and bishops about books and writing', in William Gibson, ed., *Religion and society in England and Wales, 1689–1800* (London and Washington, 1998), 70.

¹⁴⁸ The Convocation acted as the parliament of the Anglican Church and like the Parliament at Westminster had both a lower and an upper house, with the clergy in the lower house and the bishops in the upper house. At this time the lower house of clergy was strongly Tory in orientation; the clergy were also keen to see the correction of what they believed to be the loss of the authority of the Church caused by the Toleration Act (Gibson, ed., *Religion and society in England and Wales*, 69).

¹⁴⁹ Westfall, *Never at rest*, 623.

¹⁵⁰ Westfall, *Never at rest*, 623-4.

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but failed when it reached the House of Lords. Other attempts in 1703 and 1704 were also thwarted by the House of Lords.¹⁵¹ It is likely that Newton, who we must remember saw Trinitarianism as a corruption of primitive Christianity, viewed the cries of ‘church in danger’ and efforts to bolster orthodoxy in a way much different than the religious mainstream. In December 1705, Simon Patrick, the Bishop of Ely, complained to the House of Lords about the rough treatment two Cambridge candidates had been subjected to in the election. He said ‘that at the election at Cambridge it was shameful to see a hundred or more young students, encouraged in hollowing like schoolboys and porters, and crying, No Fanatic, No Occasional Conformity, against two worthy gentlemen that stood candidates’.¹⁵² Newton as a Whig candidate would have been one of these ‘worthy gentlemen’ and, although the taunts were not necessarily directed at Newton as an individual, Westfall argues that the attempt to do away with Occasional Conformity ‘struck at the heart of Newton’s security’.¹⁵³

Although Newton never again risked a venture into politics, the decade following the election of 1705 brought other worries for him. While the Whigs had made advances in the election of 1705, the Tories began to grow more powerful by the end of the decade and won a majority in the election of 1710. The Tories and High Church had in part been galvanized by the vociferous attacks on heresy (including anti-Trinitarianism), Dissent, Occasional Conformity, Latitudinarianism and religious toleration by Henry Sacheverell, along with his subsequent impeachment. Additionally, during his trial Sacheverell referred directly to the heretical

¹⁵¹Watts, *The Dissenters*, 265.

¹⁵²William Corbett, *The Parliamentary History of England, from the earliest period to the year 1803* (36 vols.; London, 1806-1820), VI, 496.

¹⁵³Westfall, *Never at rest*, 626. For background on the controversies over Occasional Conformity, see Mark Knights, ‘Occasional Conformity and the Representation of Dissent: Hypocrisy, Sincerity, Moderation and Zeal’, *Parliamentary History*, 24 (2005), 41-57; Martin Greig, ‘Bishop Gilbert Burnet and Latitudinarian Episcopal Opposition to the Occasional Conformity Bills, 1702-1704’, *Canadian Journal of History*, 41 (2006), 247-62; and John Flaningam, ‘The Occasional Conformity Controversy: Ideology and Party Politics, 1697-1711’, *The Journal of British Studies*, 17 (1977), 38-62.

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writings of William Whiston.¹⁵⁴ A period of Tory and High Church ascendancy lasted until the Hanoverian succession of 1715. During this period the Convocation again tried to undo the religious liberties brought by the Toleration Act.¹⁵⁵ The Tory government elected in 1710 passed the Occasional Conformity Act in 1711 in order to eliminate the practice of Occasional Conformity and to strengthen the Anglican Church.¹⁵⁶ Another assault on the Toleration Act came in the Schism Act of 1714, which gave bishops authority over Dissenters' schools. This was also passed by the Tories.¹⁵⁷ Both Acts were repealed by the Whigs in 1718. Finally, at the beginning of the reign of George I, the *Directions* originally issued in the name of William III were reissued in somewhat elaborated form on 11 December 1714 in the name of the new king. These new *Directions*, like those of 1696, were extended to laity who talked, disputed, wrote or published against the Trinity. The document also makes reference to the authority of the Blasphemy Act of 1698.¹⁵⁸

But these developments need not have directly impinged on Newton's heresies, which continued to remain a private affair. However, when two men closely associated with him were prosecuted for anti-Trinitarian heresy, Newton must have felt the pressure. Thus, when William Whiston, Newton's successor in the Lucasian Chair of Mathematics who, partly under Newton's guidance came to adopt anti-Trinitarian views similar to

¹⁵⁴For background, see Geoffrey Holmes, *The trial of Doctor Sacheverell* (London, 1973); Abbie Turner Scudi, *The Sacheverell affair* (New York, 1939); and Snobelen, 'Suffering for Primitive Christianity: William Whiston and Toleration in Eighteenth-Century Britain', in *Scepticisme, clandestinité et libres pensée / Scepticism, clandestinity and free-thinking*, ed. Miguel Benítez, James Dybikowski and Gianni Paganini (Paris, 2002), 269-98.

¹⁵⁵G V Bennett, 'The Convocation of 1710: An Anglican Attempt at Counter-Revolution', in *Studies in Church History*, ed. G J Cumming and G D Baker, vol. 8 (Cambridge, 1971), 311-19.

¹⁵⁶An abridged version of the 1711 Occasional Conformity Act can be found in Gibson, ed., *Religion and society in England and Wales*, 75-6.

¹⁵⁷For an abridged version of this Act, see Gibson, ed., *Religion and society in England and Wales*, 77-9.

¹⁵⁸*Directions to our Arch-Bishops, and Bishops, for the preserving of unity in the Church, and the purity of the Christian faith, concerning the Holy Trinity; and also, for preserving the peace and quiet of the state. By his Majesties special command* (London, 1714). The text is reprinted in *The clergyman's assistant*, 566-7.

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those of his mentor, began to preach openly what Newton had confined to his private writings and conversations, the University of Cambridge acted and expelled him from both his professorship and the University in 1710.¹⁵⁹ Thereafter, Whiston had to make ends meet through publishing ventures and public experimental lecturing courses. That Whiston could be expelled from Cambridge in 1710 for holding views on the Godhead that were for all practical purposes the same as those of Newton gives us an indication of the minimum measures that would have been brought against Newton had he publically declared his anti-Trinitarian faith in the 1670s (when he became a heretic) or the 1690s (when he wrote his 'Paradoxical questions' against the backdrop of the Unitarian controversies). As an ordained priest in the Anglican communion, Whiston faced the discipline of the Convocation of Clergy, then dominated by High Churchmen not inclined to sympathize with Dissenters, let alone an anti-Trinitarian heretic. Throughout the years 1711-1714 he had to endure proceedings directed against him by church courts and delegations. Some of his opponents desired his excommunication and imprisonment. Only with the Hanoverian succession and the return of the Whigs to the political heavens could Whiston breathe easy.¹⁶⁰

Samuel Clarke, who had come to align himself with Newton's highly subordinationistic form of anti-Trinitarianism,¹⁶¹ created a scandal early in the second decade of the eighteenth century with his *Scripture-doctrine of the Trinity* (1712), which, despite its innocuous title, was opposed to Athanasian Trinitology. A clergyman like Whiston, Clarke also faced the discipline of the Convocation of Clergy. However, unlike Whiston, he proved more amenable to moderation and compromise, and agreed to publish no new discussions on the Trinity. He would also not be granted

¹⁵⁹Snobelen, 'Suffering for Primitive Christianity'; Eamon Duffy, "'Whiston's Affair': The Trials of a Primitive Christian, 1709-1714', *Journal of Ecclesiastical History*, 27 (1976), 129-51. See also James E Force, *William Whiston: Honest Newtonian* (Cambridge, 1985) and Maureen Farrell, *William Whiston* (New York, 1981).

¹⁶⁰For further details and supporting documentation, see Snobelen, 'Suffering for Primitive Christianity', 279-84.

¹⁶¹At least in general terms. It is possible that Clarke, while clearly an anti-Athanasian, was closer to orthodoxy than Newton, with whom he nevertheless clearly shared a great deal theologically.

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any further preferment in the church, remaining as rector of St James's, Piccadilly – which for a time was Newton's own parish church.¹⁶²

Given the trials of and outcry against his fellow-heretics Whiston and Clarke, it may seem surprising that the normally-cautious Newton would take the risk of indirectly attacking the Trinity in print immediately after the cases of Whiston and Clarke became notorious. But this is precisely what he did when he appended the General Scholium to the second edition of his *Principia* in 1713.¹⁶³ Nevertheless, although the Calvinist John Edwards (none other than the son of the author of *Gangraena*) exposed Newton's anti-Trinitarian intentions in the General Scholium in a 1714 pamphlet,¹⁶⁴ the oblique language of the text (and perhaps his high station in life) allowed Newton to get away with this theological poke in the eye of Athanasianism. On the other hand, Newton did not go through with the publication of the 'Two notable corruptions' in 1709, which he was apparently contemplating at that time.¹⁶⁵ Whatever the reason for his continued caution (it may have been the Tory and High Church ascendancy at the time, or the beginning of the controversy over Whiston's public Arianism), Newton's anti-Trinitarian 'Two notable corruptions' would remain unpublished during his lifetime.

While the tacit toleration of his fellow anti-Trinitarians Whiston and Clarke from 1715 on may have suggested to Newton that he need no longer be as secretive about his heresy, he maintained his Nicodemite stance until the end of his life. And the truth is, the informal toleration that gradually grew throughout the eighteenth century was a fragile thing often

¹⁶²On Clarke, see John Gascoigne, 'Clarke, Samuel (1675–1729)', *ODNB*; 'Samuel Clarke: Special Issue', *Enlightenment and Dissent*, 16 (1997); Thomas C Pfizenmaier, *The Trinitarian theology of Dr. Samuel Clarke (1675–1729): context, sources, and controversy* (Leiden, 1997); and J P Ferguson, *Dr. Samuel Clarke: an eighteenth century heretic* (Kineton, 1976).

¹⁶³Snobelen, "'God of gods, and Lord of lords": the theology of Isaac Newton's General Scholium to the *Principia*', *Osiris*, 16 (2001), 169–208.

¹⁶⁴Edwards, *Some brief critical remarks on Dr. Clarke's last papers* (London, 1714), 36–40.

¹⁶⁵This is suggested by a Latin translation of the first part on 1 John 5:7 bearing 'Amsterdam. 1709' on the title page. The handwriting is that of Hopton Haynes, Newton's Unitarian colleague at the Mint (Yahuda MS 20). For more on this, see Snobelen, 'Isaac Newton, heretic', 405.

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in danger of reversals. Three examples from the last decade of Newton's life help reveal that the peril had not completely passed. First, in 1719, Whiston, working with a group of Unitarians that included some support from Clarke, drafted a petition in favour of the toleration of anti-Trinitarian Dissent. This petition was sufficiently politically astute to include a statement of opposition to the Roman Church. The petition was even distributed amongst certain select members of the House of Lords. In the end, it came to nought. However, Daniel Finch, the earl of Nottingham and an anti-tolerationist who represented High Church interests, responded vigorously to the publication of an open letter directed to him by Whiston that claimed that the early church had not believed in the eternity of the Son of God. This, obviously, was a frontal attack on a central plank of the Athanasian doctrine of the Trinity. Finch engaged in a literary debate with Whiston and then in 1721 worked in concert with William Wake (then archbishop of Canterbury) to bring a Blasphemy Bill to the Lords that would censure those who denied God's existence, Christ's Godhood, the Trinity and the Bible. Although the Bill failed to pass,¹⁶⁶ this attempt demonstrates that the forces arrayed against radical Dissent were still active and powerful. At the same time, this example suggests that these forces were losing ground to those who favoured toleration. Nevertheless, on 7 May 1721 a completely redrafted set of *Directions* was issued, once again in the name of George I. Like its two predecessors, it extended to both clergy and laity. And like the *Directions* of 1714, it referred to the Blasphemy Act of 1698, this time quoting from it.¹⁶⁷ Finally, near the end of Newton's life there came an attempted prosecution of a Unitarian. Edward Elwall, who had published an anti-Trinitarian work in 1724, was brought to trial on a charge of blasphemy at Stafford in the summer of 1726 at the instigation of some members of the clergy. The relevant law in this case was the Blasphemy Act of 1698. However, the presiding judge appears to have been reluctant

¹⁶⁶For more detail, see Snobelen, 'Suffering for Primitive Christianity', 285-6.

¹⁶⁷'Directions to our Archbishops and Bishops, for the preserving of Unity in the Church, and the Purity of the Christian Faith; particularly in the Doctrine of the Holy Trinity. Anno Dom. 1721.', reprinted in *The clergyman's assistant*, 568-70.

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to convict Elwall (perhaps, as Elwall himself surmised, because it was the clergy who had demanded his prosecution) and he was released.¹⁶⁸

Denial of the doctrine of the Trinity remained illegal in Great Britain until the summer of 1813. The Trinity Act (53 Geo. III, cap. 160) passed by Parliament repealed the anti-Unitarian element of Toleration Act of 1689, the Blasphemy Act of 1698 and the two Scottish Acts, along with their provision of the death penalty.¹⁶⁹ The Trinity Act removed formally *in jure* what had for decades had been confirmed in practice, albeit uneasily. This is not to say that prejudice and low-level persecution against those who dissented from the doctrine of the Trinity disappeared in 1813. While the formal legal hindrances had been abolished, deep prejudices remained and further efforts were needed to bring Unitarians into the mainstream.¹⁷⁰ The ancient universities gradually opened up to Dissenters – including Unitarians – later in the nineteenth century. In 1854 restrictions against Dissenters taking degree courses were lifted at Oxford and Cambridge (although in the seventeenth and eighteenth centuries it had been possible for Dissenters to study at Cambridge without taking the BA, for which subscription was required). All religious tests for degrees and fellowships were removed at Oxford, Cambridge and Durham universities in 1871. Finally, in 1882 headships of colleges along with fellowships were opened up to non-clerical candidates at Oxford and Cambridge.¹⁷¹ It should be noted, however, that a final vestige of Trinitarian orthodoxy remains at Cambridge when degrees are conferred at Senate House. The Latin statement read each time a person receives a degree concludes with the formula ‘in nomine Patris et Filii et Spiritus Sancti’.¹⁷² Although these words come from a New Testament verse (Matthew 28:19) that Unitarians do not believe is Trinitarian (because for them the New Testament is pre-Trinitarian), it is clear the centuries-old tradition of using this formula is Trinitarian in intent.

¹⁶⁸David L Wykes, ‘Elwall, Edward (*bap.* 1676, *d.* 1744)’, *ODNB*.

¹⁶⁹‘A Bill Intituled an Act to Relieve Persons who Impugn the Doctrine of the Holy Trinity from Certain Penalties’ (21 July 1813). The text is given in Frank Schulman, ‘*Blasphemous and wicked*’: *the Unitarian struggle for equality, 1813–1844* (Oxford, 1997), 178.

¹⁷⁰On this, see Schulman, ‘*Blasphemous and wicked*’.

¹⁷¹Schulman, ‘*Blasphemous and wicked*’, 183.

¹⁷²A candidate can, however, ask ahead of time that the formula be omitted.

*Isaac Newton, Heresy Laws and the Persecution of Religious Dissent***Heresy laws and their effect on the heretic**

For Newton the ‘spirit of persecution’ manifested by the Roman Church was an unmistakable sign that it was the Harlot of the Apocalypse. Insofar as persecution and intolerance (and Trinitarian dogma) were indications of apostasy, the Church of England was also indicted. In a treatise on the Apocalypse composed mostly in the reign of Queen Anne, Newton discussed laws enacted in the late fourth and early fifth centuries against those who separated from the Catholic Church, noting that some of the laws made this ‘crime’ punishable by death. After citing a Roman law of 395, Newton writes:

By this Edict it is manifest that all sectaries or Separatists were Hereticks in the sense of the Roman Laws. And therefore by the laws above recited it was made a capital crime in Afric to separate from the Roman Catholick & meet apart for divine worship upon any pretence whatever. The Roman Catholicks by their worshipping dead men, their magical use of the signe of the cross, their spirit of persecution manifested in these & former laws & the great load of heathen superstitions & other humane inventions with which their worship was soiled, gave sufficient cause of separation, & yet by these laws made it death to separate. This is killing men for not being of the Roman Catholick communion. This is that sort of persecution by w^{ch} the Beast made war with the saints & overcame them, that sort of persecution by w^{ch} the Whore of Babylon became drunken wth the blood of Saints & of the martyrs of Iesus.¹⁷³

It is hard to avoid the conclusion that this commentary on the early Roman Church is not also Newton’s gloss on the religious politics of his own times, especially given that this manuscript was written mostly during a period of Tory and High Church ascendancy. This statement gets to the heart of Newton’s own dilemma: the corrupt and false teachings of the established church gave him more than ‘sufficient cause of separation’, but the laws of the land constrained him. As Newton knew better than almost anyone else in his own day, the doctrine of the Trinity

¹⁷³Newton, Keynes MS 5, f. 109r.

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was not only developed with the sharp minds and skilful hands of theologians, but also imposed with the sharp sword and iron fist of the state. In his early treatise on the Apocalypse, Newton writes of the Emperor Theodosius persecuting the true, primitive, Apostolic Church and imposing a new, Trinitarian and apostate Church in its place through force.¹⁷⁴ It was Theodosius who had issued the edict *Nullis haereticis* ('no heretics') that outlawed all forms of Christianity that did not subscribe to the Nicene formulation of the Godhead.¹⁷⁵ The proscriptions against non-Trinitarian belief in Newton's lifetime thus had ancient antecedents. The continued proscription of the worship of the Only True God in his own day likely informed Newton's views on toleration and also confirmed that he was still living in the age of apostasy foretold in the Book of Revelation.

In a document on church history dating from the 1670s in which he compares the Romans unfavourably with the Barbarians (arguing that the former were persecutors and the later tolerant), Newton declared his opposition to religious persecution aided by the state:

The Magistrate may punish or cut off any for their vices or evil actions but not professors of Christianity for erroneous opinions, least they pluck up the Wheat with the Tares. The Church may reprove or excommunicate but she has as little authority to guide the arm of the Magistrate as to handle his sword: for this is to make her self the judge & him but the executioner. Shee may excommunicate but not force into communion. Christ never instituted that a means of her propagation & preservation.¹⁷⁶

Shortly thereafter, Newton labels Christians who persecute 'wolves', contrasting them with the 'sheep' who are peaceable. Then he declares: 'Hence then we have another character of a true Church. For you have already heard how vehement persecutors the Homoüsians were in

¹⁷⁴Newton, Yahuda MS 1.5, ff. 6r-12r. These folios make it clear that in the 1670s Newton saw Athanasianism as a wicked apostasy from primitive Christianity.

¹⁷⁵On the political imposition of the Trinity and the outlawing of Arianism by the Emperor Theodosius, see Richard E Rubenstein, *When Jesus became God: the struggle to define Christianity during the last days of Rome* (Orlando, 1999), 218-26.

¹⁷⁶Newton, Yahuda MS 39, f. 1r.

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Theodosius's reign besides what they did afterwards.¹⁷⁷ Newton knew only too well the persecuting spirit of the homoousians of his own day.

Not long after Newton's death Whiston asserted that the former's belief in 'a long future corrupt state of the Church' was a deterrent to his 'making publick Attempts for the Restoration of Primitive Christianity', adding that in contrast his own prophetic beliefs in 'the near approach of the Conclusion of the corrupt State ... greatly encourage[d] me to labour for its Restoration'.¹⁷⁸ Such eschatological considerations were of great import to Newton, irrespective of whether or not his interpretations were shaped by a reflexive desire to seek biblical sanction (or rationalization) for his Nicodemism. There were in any case many reasons for Newton to keep quiet, not the least of which was the threat of heresy laws. In addition, there can be little doubt that Newton was aware of the religious and political restrictions placed on Unitarianism in his lifetime and he certainly would have known of at least some of the prosecutions of anti-Trinitarians. The trials of his followers Whiston and Clarke would have hit uncomfortably close to home. Newton was never tried for his faith but his faith was tried in the persons of Whiston and Clarke. On top of this, there was the steady stream of condemnations of anti-Trinitarianism that appeared in print throughout Newton's years at Cambridge and London. During his final years, the Lady Moyer Lecturers (among them Daniel Waterland, the champion of Athanasianism, who delivered his sermons in 1719 and 1720) preached the doctrine of the Trinity and denounced its detractors from the pulpit of Saint Paul's Cathedral in London. The Lady Moyer Lecturers attacked the anti-Trinitarianism of Clarke, Whiston and, after his death, alluded even to Newton himself. The posthumous attacks on Newton's heretical theology in the eighteenth century by orthodox churchmen provides a fair indication of the minimum Newton could have expected had he published his views on the Godhead in his own

¹⁷⁷Newton, Yahuda MS 39, f. 1r.

¹⁷⁸Whiston, *Historical memoirs of the life of Dr. Samuel Clarke* (London, 1730), 157. Whiston's insinuation about the prophetic reasons for Newton's reticence to preach primitive Christianity is entirely plausible. It is certainly the case that Newton believed the apostate Church would continue for at least two centuries after his death (see Snobelen, 'Isaac Newton, heretic', 391-3).

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lifetime.¹⁷⁹ Associated with these things, of course, were the strong and violent prejudices against heretics of all sorts, especially radical heretics like the Unitarians. These prejudices were displayed by both the established Church and the mainstream of Dissent. Thus, Newton chose to adopt the strategies of a Nicodemite, perhaps hoping his anti-Trinitarian works would be published after his death, by which time he was beyond the reach of the inquisitorial and persecuting arm of the Church.

Although Priestley and Whiston evidently wished Newton had gone further, given the laws and prosecutions, simply becoming a heretic – even a secret one – was a bold move. In fact, the various anti-heresy laws bought in during Newton’s lifetime would have been deterrents both to becoming *and* remaining an anti-Trinitarian. For those like Newton who continued as secret anti-Trinitarians despite the legal sanctions, they still acted as constraints on religious life and expression. Thus, however uneasy the laws may have made Newton feel, they did restrict the open confession of his faith. While there are certainly other factors, the laws also help explain why he limited himself only to oblique articulations of his heresy in the General Scholium in the *Principia* and Query 31 of the *Opticks*. Anonymous authorship was always an option and this very thing was considered by Newton in the case of the ‘Two Notable Corruptions’, both in the early 1690s and apparently around 1709. But even this Newton in the end dared not to do. As his friend Locke discovered in the case of the *Reasonableness of Christianity*, anonymous authorship was not always a completely protective shield. At the same time, Newton’s almost complete lack of public discourse on religion and his cautious articulations in the few times when he did speak publically about religion help confirm that he recognised that he was a heretic in the eyes of the Church. Ironically, the heresy laws helped to make heretical Nicodemites of men like Newton and Locke who stayed within the Church of England (some heretics, of course, emerged from Puritanism and other Dissenting traditions). Newton’s massive manuscript corpus of two and a half million words or more on theology (not all of it strictly heretical) demonstrates that the laws did not reach effectively into the private lives of heretics.

¹⁷⁹Scott Mandelbrote, ‘Eighteenth-century reactions to Newton’s anti-Trinitarianism’, in *Newton and Newtonianism: new studies*, 93-111.

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They could, however, force heretics to limit their beliefs to their private lives.

The existence of the heresy laws is one thing; their enforcement is another. It is certainly true that some anti-Trinitarians like Newton managed to get away with their heresy. While the less than completely tolerant spirit of the Toleration Act is clear, it spoke specifically ‘any person that shall deny in his Preaching or Writing the Doctrine of the Blessed Trinity’. The Blasphemy Act of 1698 proscribed those who ‘shall by Writing, Printing, Teaching, or advised Speaking, deny any One of the Persons in the Holy Trinity to be God’. Newton did deny the doctrine of the Trinity as commonly understood and also denied that Christ and the Holy Spirit were God in the same sense as the Father.¹⁸⁰ Thus, had his writings been published with his name attached in his lifetime, he would have been open to prosecution. But because Newton continued his policy of self-censorship by leaving his theological treatises unpublished, he arguably remained immune from the full force of the punitive elements of the Act. Furthermore, Newton’s scholarly tone and his tendency to avoid direct statements of his own beliefs along with his excessive quotation of and allusion to the works of others would also have made his writings harder to prosecute. On the other hand, even Clarke’s indirect approach in the *Scripture-doctrine of the Trinity* caused a huge stir when it was published in 1712.¹⁸¹

Although there is no direct evidence from Newton of his opinions or worries about prosecutions of anti-Trinitarians and other heretics in his own day, during the 1690s when Newton was in contact with Locke the latter researched and collected evidence about Legate and Wightman, the last two anti-Trinitarians burned in England, as well as the contemporary case of Thomas Aikenhead in Scotland.¹⁸² What evidence we do have suggests that Newton’s views on religious toleration may have been close

¹⁸⁰E.g., Newton, Yahuda MS 14, f. 25r (c. 1670s) and Keynes MS 8 (c. 1710s).

¹⁸¹The legal constraints against anti-Trinitarianism help explain why Clarke’s anti-Athanasian work was nevertheless called *Scripture-doctrine of the Trinity* (although it is probably fair to say that Clarke appears to have leaned closer to orthodoxy than Newton).

¹⁸²Marshall, ‘Defining and redefining heresy up to Locke’s *Letters*’, 268.

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to those of his friend Locke, for whom we know so much more. It is certainly the case that Newton was strongly opposed to the use of force to coerce people to conform to a particular religious position. We also know that Locke in 1692 asked Newton to comment on a draft of his *Third letter on toleration*.¹⁸³ The available evidence does not allow us to determine just how much of a worry the heresy laws were to Newton through the last two to three decades of his life, during which time he was to a certain extent a public figure. It is possible that he had come to rationalize his continued communion in the Church of England (this communion made easier by the fact that his parish priest for much of his London period was a fellow anti-Trinitarian).

The last two pages of Newton's 'Irenicum', which dates to the early eighteenth century, hint at an aspect of his justification of his continued communion in the Church of England.¹⁸⁴ On these pages, Newton argues that only the *fundamenta* (doctrinal fundamentals) are required for communion in this Church. He also opines that neither the Nicene Creed nor the Athanasian Creed are *fundamenta* and thus Christians should not 'fall out about them'. Is this mere irenicism or is there something more here? With Newton there is always something more. Few orthodox Trinitarians of Newton's age would say that the Trinity was an 'indifferent thing'. This assertion could be seen as a censure of the strictures of the Toleration Act of 1689 and the Blasphemy Act of 1698. But is Newton trying to argue that the Church should not enforce Trinitarianism to allow for the conformity of believers like himself and perhaps even become less Trinitarian? Or is he trying to assuage his own conscience? In other words, is there a reformist agenda here or is he trying to justify his communion in the Church? Newton may have believed that some kind of comprehension within the Church of England was the way forward.¹⁸⁵ This would have allowed him to remain in the Church openly as a biblicist non-Trinitarian. Whatever the case, Newton could not have been happy with the stance of the Anglican Church in his own day. It is difficult to be sure, but it seems likely that there is at least some reflexivity in the concluding statements of the 'Irenicum'.

¹⁸³ Iliffe, 'Friendly Criticism', 152.

¹⁸⁴ Newton, Keynes MS 3, pp. 51-2.

¹⁸⁵ Mandelbrote, "'A duty of the greatest moment'", 289.

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The youthful idealism about primitive Christianity evident in Newton's manuscripts from the 1670s appears to have cooled somewhat by the early eighteenth century. Was he worn out after decades of Nicodemism and the pressures of the ever-present heresy laws? Had he become 'corrupted' by power? Although there is no evidence to suggest that Newton ever returned to the default Trinitarianism of his youth, it is possible that he did soften his animus towards the Trinitarian church in the last couple decades of his life, perhaps content with the belief that God would eventually bring about the Reformation that would restore primitive Christianity. Nevertheless, Newton's continuing belief in the unbiblical nature of the Trinity is seen in his argument at the end of the 'Irenicum' that the Thirty-Nine Articles ultimately only require acceptance of the Creeds and Councils insofar as they agree with the Holy Scriptures. Newton, of course, did not believe that the parts of the Creeds and Councils that promoted Trinitarians passed this test.

Had he lived to witness them, Newton presumably would have been happy to see the Trinity Act and likely the easing of other religious restrictions as well (with the exception of restrictions on Catholicism). Instead, for most of his adult life he lived under the threat of religious sanction, as this study has shown. Heresy laws placed limitations on the heretic and how he could act religiously in public. They have less effect on a person's private faith. Thus, Newton was able to maintain his heresy in private even while he served as mathematics professor at Cambridge, an MP at Westminster, Warden then Master of the Royal Mint and President of the Royal Society. That a radical heretic could operate in such positions of prestige and power demonstrates in a certain sense the limitations of the heresy laws. And so it was that although he contemplated publishing an anti-Trinitarian treatise on textual criticism and while he dared to challenge the Trinity obliquely in his *General Scholium* (coming close to contravening the 1698 Blasphemy Act), and possibly because he eventually reconciled his continued communion in the Church of England, Newton was able to remain both a conformist and a secret anti-Trinitarian to the end of his long life. It can be argued, however, that at the *very* end of his life he broke with the church of his youth and adulthood. One of his last acts was to refuse the sacrament of

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the Anglican Church on his deathbed.¹⁸⁶ Only at the end of his life, it seems, did Newton feel able to make a formal break with the apostate, Trinitarian Church of England. But even this act was done in private.

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¹⁸⁶John Conduitt, Keynes MS 130.7, f. 1r.

**A SHEEP IN THE MIDST OF WOLVES:
REASSESSING NEWTON AND ENGLISH DEISTS***

Jeffrey R Wigelsworth

‘Behold, I send you forth as sheep in the midst of wolves’, Jesus warned his disciples in Matthew 10:16. Like the followers of Christ sent out to preach in hostile lands, Isaac Newton’s natural philosophical and theological writings found an audience among some of England’s notorious deists. Many current accounts of deists support an interpretation in which Newton is metaphorically cast among the carnivorous deists who were eager to tear apart his body of writings extracting the marrow to nourish their subversive agenda. However, as I aim to demonstrate, this sharp dichotomy so often crafted and reinforced by scholars, is insufficient to describe the ways in which deists utilized Newton’s writings in the eighteenth century. So-called wolves may have white wool peaking out from beneath their fur or a seemingly docile sheep may hide a dark stripe of wolf’s fur.

William Whiston, Newtonian disciple and successor to the Lucasian Chair at Cambridge, listed those deists he believed had supported their deism with Newton’s ‘wonderful Discoveries’. Among these men were: John Toland (1670-1722), Anthony Collins (1676-1729), Thomas Morgan (d. 1743), and Thomas Chubb (1679-1747). Wolves all of them, gorging on Newton’s flesh. Edmund Burke repeated the same names in his comments on the French Revolution.¹ Although there were certainly

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¹ William Whiston, *Astronomical principles of religion, natural and reveal’d* (London, 1717), 243, 244; *idem, Memoirs of the life and writings of Mr. William Whiston* (London, 1749), 109; and Edmund Burke, *Reflections on the revolution in France: a critical edition*, ed. J C D Clark (Stanford, 2001), 253. Whiston and Burke also included Matthew Tindal making their list of four deists really a list of five. But Tindal does not mention Newton in his writings and I have not addressed him in any detail in this present article.

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others whom contemporaries and modern historians identify as deists in England (Bolingbroke and Mandeville leap to mind), that both Whiston and Burke identified the same men suggests that these four were particularly important. What is more, they were active from the beginning of England's deist controversy when Toland published *Christianity not mysterious* in 1696 until Morgan released his final book in 1741, when the perceived threat of deism is acknowledged to have declined. Very often when historians address deism and Newton, it is with Toland, and to a lesser extent Collins, that their discussion begins and ends. It is also the case that focus is set squarely on the contents of the *Principia* or *Opticks* rather than Newton's other writings. In this article I endeavour to go beyond traditional anchors in an effort to reveal that even in a well-known list of deists, such as that outlined above, there are nuanced stories to be told and that deist engagement with Newton in the eighteenth century cannot be reduced to the view of Toland alone. Broad categorisations minimize historical complexities. To accomplish my goal I will (1) outline briefly previous accounts of the relationship between deists and Newton including attempts to fashion Newton himself into a deist; (2) consider the manner in which Toland and Collins incorporated Newton into their writings to serve as a baseline; (3) as the least studied members of the list I will use Chubb and Morgan to measure the degree to which Toland and Collins encapsulate deist use of Newton in eighteenth century England; (4) in conclusion I reconsider some of the assessments addressed in section one in light of the material presented in the body of the paper.

Deists and Newton: the Established View

Scholars agree with Whiston's assessment and modern depictions of Newtonianism and the deists are virtually always seen from the perspective of Newton. The underlying question is what did Newton do to encourage deists instead of asking, as I will do in this paper, what did deists do with Newton's work once they read it? It is a matter of altering perspective away from Newton and Newtonians to the deists whose writings I present here. It remains a historiographical truism that Newtonian natural philosophy contributed to the rise of deism in England by offering an image of the world operating according to mathematical laws, a clockwork universe which ran equally well with or without

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reference to God.² This was undoubtedly due to the association of Newton (the apex of the Scientific Revolution) and deism (traditionally defined as the religion of reason in which God created the world and then stepped aside) as the twin pillars of Enlightenment leading to the modern world. The wolves of reason slaughtered the sheep of religion. In one of the most famous formulations of this view Peter Gay suggested that ‘for most of his recorded history man has been a religious animal. After deism, and partly because of it, he was no longer.’ This secular revolt had a scientific basis: ‘The philosophical and the scientific revolutions of the seventeenth century were one and the same, and it was essentially this great revolution, though not led by deists, that gave rise to modern deism.’³ Richard S Westfall agreed that deism was the inevitable outcome of Newtonian philosophy which ‘prepared the ground for the deists of the Enlightenment’. He explained that Newton depicted a ‘mechanical universe run by immutable natural laws’ in which a ‘transcendent God [was] removed and separated from His creation’. Another author suggests that we may draw a straight ‘line of connection from Newton ... through the Enlightenment and the evolution of deism....’ This interpretation continues to find supporters. In her recent synthesis of the Enlightenment Dorinda Outram repeats the position of Gay and even cites him.⁴ Westfall took his study of Newton and deism a step further in his desire to trace the modern world in which he then lived. After studying Newton’s manuscript ‘*Theologiae Gentilis Origines Philosophicae*’, Westfall argued that Newton seemed to grant equal epistemological status to the Bible as to other ancient texts. In Westfall’s view this strategy revealed that the author of the *Principia* downplayed the supernatural elements of the Bible

² See Peter Gay ed. *Deism: an anthology* (Princeton, 1963), 12-13; James A Herrick, *The radical rhetoric of the English deists: the discourse of skepticism, 1680-1750* (Columbia, 1997), 5-6.

³ Cf. S J Barnett, *The Enlightenment and religion: the myths of modernity* (Manchester, 2003).

⁴ Richard S Westfall, *Science and religion in seventeenth-century England* (New Haven, 1958), 219; *idem*, ‘The Scientific Revolution reasserted’, in *Rethinking the Scientific Revolution*, ed. Margaret J Osler (Cambridge, 2000), 51; A B Arons, ‘Newton and the American Political Tradition’, *American Journal of Physics*, 43 (1975), 209; and Dorinda Outram, *The Enlightenment* (2nd edn., Cambridge, 2005), 19-20.

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(for Westfall a key element of deism) making it just another book for scholars to critique and had, as a result, created a worldview in which God was not needed. Thus, perhaps Newton himself was a deist. Newton pulls wolf's fur over his sheep's wool as Westfall described how he supposedly moved 'in harmony with the tides' of mechanism, materialism, and deism, all the markers of modern society, rather than against them.⁵

Reconsiderations of the English Enlightenment, however, cast serious doubt as to its godless character. Any description of the period, Roy Porter, Brian Young, and others argue, must acknowledge that Enlightenment took place with a great deal of piety. J G A Pocock puts it best when he writes that the English 'Enlightenment remained religious even when irreligious.'⁶ This is not to suggest that all examples of eighteenth-century Enlightenment share this trait, France certainly did not. As the climate in which deism emerged continues to undergo scholarly revision, the meaning of deism is similarly being revised. Elsewhere I have attempted to place deists into this emerging historiography and amend the definition of 'deism'. In contrast to the accounts above, 'deism' is best defined as a theological position which denies supernatural involvement in the world in a manner occurring outside of the regular order of things, labelling of many institutionalised religious practices as priestcraft, a Whig political outlook, and other traits.⁷ Changing conceptions of deists merit reconsideration of the interaction between them and Newton specifically. This article serves such a purpose.

⁵ Richard S Westfall, 'Isaac Newton's "Theologiae Gentilis Origines Philosophicae"', in *The secular mind: the transformation of faith in modern Europe*, ed. W Warren Wager (New York, 1982), 31; *idem*, 'Isaac Newton: Theologian', in *The scientific enterprise*, ed. E Ullmann-Margalit (Dordrecht, 1992), 235.

⁶ J G A Pocock, 'Enthusiasm: The Antiself of Enlightenment', *The Huntington Library Quarterly*, 60 (1997), 26.

⁷ Jeffrey R Wigelsworth, *Deism in enlightenment England: theology, politics, and Newtonian public science* (Manchester, 2009), 196-7, 204-8; Roy Porter, *Enlightenment: Britain and the creation of the modern world* (London, 2000); and B W Young, *Religion and enlightenment in eighteenth-century England: theological debates from Locke to Burke* (Oxford, 1998).

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It is worth considering the response given to Westfall's suggestion of Newton's deism as it helps chart the intellectual landscape into which the assessment of deists fits. Betty Jo Teeter Dobbs strongly challenged the characterization of Newton as one who welcomed the secular Enlightenment. Her Newton stands as a lamb surrounded by wolves. She proposed that 'If Newton had succeeded in [his] aim, and had thereby stemmed the tides of mechanism, materialism, deism, and atheism, as he had hoped, we would of course be living in a different world.' This would also be a world very different from that which Westfall claimed emerged out of the eighteenth century. Because we do not live in the godly world, which Newton desired, Dobbs suggested that Newton be viewed not as a winner but rather as a loser in 'a titanic battle between the forces of religion and the forces of irreligion',⁸ although recent characterisations of the English Enlightenment as deeply pious cast doubt as to how strong Newton had to fight.

James E Force also replied to the suggestion that Newton be counted among the deists. Such a reading, he wrote, risks 'distorting the historical Newton'. Seeking anticipations of modern science, with its rational and secular method of study, coloured Westfall's view, Force claimed. Force has argued extensively that all of Newton's intellectual activities followed from a conception of God as Lord God, the God of Genesis and this provides 'the key to understanding the synthetic unity in his thought.' This God was absolutely omnipotent and took an active role in the universe. It was not enough to demonstrate that God could intervene in the Creation; Newton believed that God must act in the world.⁹ No deist in

⁸ B J T Dobbs, 'Newton as Final Cause and First Mover', in *Rethinking the Scientific Revolution*, 38, 39.

⁹ James E Force, 'Biblical Interpretation, Newton, and English Deism', in *Scepticism and irreligion in the seventeenth and eighteenth centuries*, ed. Richard H Popkin and Arjo Vanderjagt (Leiden, 1993), 282-305; *idem*, 'Newton's God of Dominion: The Unity of Newton's Theological, Scientific and Political Thought', in Force and Richard H Popkin, *Essays on the context, nature, and influence of Isaac Newton's theology* (Dordrecht, 1990), 75-102. See also his 'The Newtonians and Deism', in *Essays on Newton's theology*, 43-73; *idem*, 'Samuel Clarke's Four Categories of Deism, Isaac Newton, and the Bible', in *Scepticism in the history of philosophy*, ed. Richard H Popkin (Leiden, 1996), 53-74; and *idem*, 'Science, Deism, and William Whiston's "Third Way"', *Ideas and Production: A Journal in the History of Ideas*, 7 (1987), 18-33.

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England, who viewed God as orderly in His operations and a constant follower of the laws of nature, would have agreed. Further study of Newton's most closely-guarded theological beliefs has settled the issue of his supposed deism. In his examination of the 'General Scholium', Stephen D Snobelen leaves no doubt as to what Newton hoped to convey at the end of the 1713 edition of the *Principia*. Snobelen writes that Newton explicitly desires to 'show that his conception of God is far removed from that of the Deists'.¹⁰ If Newton did not create a godless universe which sat at the centre of a secular Enlightenment, as previous scholars assumed, then are assumptions about deists and Newton similarly in need of revision?

Fashioning a religiously-guided Newton living in a pious nation has changed the image of deists and Newtonian thought as outlined above. Indeed scholarly consensus has swung in the opposite direction. Margaret C Jacob argues that deists were not part of the modernizing forces in England of which Newtonianism led the way. Jacob writes that deists were hostile to the nation's political order which was supported by Latitudinarian Churchmen and Newtonian philosophy. To challenge this system, she suggests that deists constructed alternative schemes of nature to tear apart Newton's philosophy and the society upon which it rested.¹¹ A wolf is still a wolf even if the pasture in which he roams is different. Toland is the key figure in her account as he is in almost all engagement with deism and Newtonianism. Although Justin Champion has shown conclusively that Toland wished to be part of the very establishment that he supposedly sought to destroy, Jacob's thesis has gained such widespread acceptance that it is orthodoxy in many scholarly circles. For example, John H Brooke and Geoffrey Cantor repeat that Toland and Collins used Newton's work in a manner that 'appeared subversive'. Peter N Miller agrees that 'the antagonism between the freethinkers and the

¹⁰ Stephen D Snobelen, "'God of Gods, and Lord of Lords:'" The Theology of Isaac Newton's General Scholium to the *Principia*, *Osiris*, 16 (2001), 176.

¹¹ Margaret C Jacob, *The Newtonians and the English Revolution, 1689-1720* (Ithaca, 1976), 201-50; *idem*, 'John Toland and the Newtonian Ideology', *Journal of the Warburg and Courtauld Institutes*, 32 (1969), 307-31.

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Newtonians stands as one of the main themes in the intellectual history of the early eighteenth century.’ Paul Russell offers the clearest pronouncement of the view in his conclusion that deists ‘were very active and hostile critics of Newtonian philosophy and theology in general....’ Most recently, Jonathan Israel claims that deists in England wished to undermine establishment ideologies, including Newton’s natural philosophy.¹²

But what do the deists themselves offer on these issues? Are they opponents of Newton? In his recent book J B Shank addresses the same types of questions, albeit in a different context. Shank’s study aims to reveal ‘the actual historical linkages that tied Newton to Enlightenment in France’ by challenging the established view of ‘Newton’s solitary genius’ as the beginning of French Enlightenment which was ‘Newton’s natural and unmediated offspring’.¹³ I hope to offer a similar reading of deists and Newton. Despite the rich historiography associated with deists and Newtonians, the voices of deists are mostly silent. Historians often rely on assessments offered by critics of deists and on the writings of accepted Newtonians. Sheep speak for the wolves who are purportedly trying to destroy them. When the deists are permitted to offer their own account, lasting truisms seem on shaky ground.

¹² Justin Champion, *Republican learning: John Toland and the crisis of Christian culture, 1696-1722* (Manchester, 2003); John Hedley Brooke and Geoffrey Cantor, *Reconstructing nature: the engagement of science and religion* (Edinburgh, 1998), 151; Peter N Miller, “Freethinking” and “Freedom of Thought” in Eighteenth Century Britain’, *The Historical Journal*, 36 (1993), 602; Paul Russell, ‘Hume’s Treatise and the Clarke-Collins Controversy’, *Hume Studies*, 21 (1995), 99; Jonathan I Israel, *Radical Enlightenment: philosophy and the making of modernity 1650-1750* (Oxford, 2001); and *idem*, *Enlightenment contested: philosophy modernity, and the emancipation of man 1670-1752* (Oxford, 2006), 38, 43.

¹³ J B Shank, *The Newton wars and the beginning of the French Enlightenment* (Chicago, 2008), 506.

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The Usual Suspects: Toland and Collins

It was during his studies at Edinburgh in 1690 under the instruction of David Gregory that John Toland first learned of Newton's work.¹⁴ But it would be another fourteen years before he displayed his understanding of the *Principia* in *Letters to Serena* (1704). In the final two chapters of the book Toland described his picture of the universe: a material plenum filled with self-moving matter in which no parts were truly separate. Toland's confidence in presenting his view to England's reading public found its roots in Newton's own writings where he 'has spoken of Gravity, Elasticity, Resistance, Impulse, and Attraction' and yet claimed not to know the underlying causes of such forces.¹⁵ Accepting Newton's description of the phenomena of force, but hoping to contribute something of his own to eighteenth-century natural philosophical discourse, Toland wrote that his reason led him to accept the existence of matter with the inherent property of motion. Toland argued that one could not think of matter without also thinking about motion. Motion was simply part of the definition of matter, it was an essential attribute.¹⁶ To draw such a conclusion from Newton was not on its own subversive. Newton himself had to caution Richard Bentley from making a similar association to name only one of the most famous examples.¹⁷ It was however, an interpretation that Newton and his followers sought to curtail. The point to be made is that nowhere in his writings does Toland indicate that he is purposely attempting to undermine a Newtonian view of Newton.¹⁸

¹⁴ Jacob, 'John Toland and the Newtonian Ideology', 310; Philip McGuinness, "'The Hue and Cry of Heresy": John Toland, Isaac Newton and the Social Context of Scientists', *History Ireland*, 4 (1996), 23; and John Friesen, 'Archibald Pitcairne, David Gregory and the Scottish Origins of English Tory Newtonianism, 1688-1715', *History of Science*, 41 (2003), 174.

¹⁵ John Toland, *Letters to Serena* (London, 1704), 233-4.

¹⁶ Toland, *Letters to Serena*, 164, 168.

¹⁷ Isaac Newton to Richard Bentley, 17 January 1693 in Newton, *The correspondence of Isaac Newton*, ed. H W Turnbull et al. (7 vols., Cambridge, 1959-77), III, 240; John Henry, "'Pray Do Not Ascribe That Notion to Me": God and Newton's Gravity', in *The Books of Nature and Scripture*, ed. James E Force and Richard H Popkin (Dordrecht, 1994).

¹⁸ Toland, *Letter to Serena*, 177.

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Where Toland and other readers of Newton did differ greatly was in the acceptance of material space. Despite the seemingly incommensurable difference of Newton's belief in 'Space distinct from matter', Toland nonetheless suggested 'I am convinc'd that [Newton's] words are capable of receiving an Interpretation favourable to my opinion' of a plenum housing self-moving matter.¹⁹ The dense Latin and geometrical proofs of the *Principia*, gave Toland the opportunity to see the book as supporting his worldview. 'Tho Mr. Newton be deemed an Advocate for extended incorporeal Space', Toland wrote, 'yet [Newton] declares that perhaps no one Body is in absolute rest...'.²⁰ Newton could be read as supporting constant motion. Toland explained further that he who 'has seen the farthest of all Men living into the actual State of Matter; and indeed all Physicks ought to be denominated from the Title he has given to the first Book of his Principles, viz. *Of the Motion of Bodies*'. Clearly Newton believed bodies were never truly motionless, or so Toland understood. While Newtonians would have viewed this reading as subversive, Toland gives no indication that this was his intent. With this as support, Toland argued that the force of motion, or gravity, was present in the universal matter, which filled all the Creation. Gravity was the product of the entire universe, which underlay perceived motion. To suppose the opposite that individual pieces of matter had gravity in themselves was the same, Toland wrote, as believing that 'the Wheels, and Springs, and Chains of a Watch can perform all those Motions separately which they do together'. The universal matter as a whole produced the effects that we identify as gravity.²¹

¹⁹ Toland, *Letter to Serena*, 182-3. Certainly Newton and Newtonians disagreed with Toland's assessment and subsequent accounts are told from this perspective. But if Toland is taken at his word (admittedly difficult for a writer who was prone to confabulations) then a different story emerges.

²⁰ Toland, *Letter to Serena*, 201-2.

²¹ Toland, *Letter to Serena*, 184, 185. See also Jeffrey R Wigelsworth, 'Lockean Essences, Political Posturing, and John Toland's Reading of Newton's *Principia*', *Canadian Journal of History*, 38 (2003), 521-35.

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Toland continued to refer to Newton with approval even though he maintained his opposition to the reality of void space, a necessary component of the Newtonian worldview. In *Pantheisticon* (English ed., 1751), which contained Toland's last writings on natural philosophy, he dismissed 'Arguments in Defence of a Void, which have been advanced by Philosophers of no small Repute. Whoever feeds his Fancy with these Notions, let him consult the great *Newton*.'²² Toland here does not criticise Newton, but rather directs readers who are favourable to such notions to consult the writings of a man whom he held in high regard. Newton is presented as a worthy philosophical foil.

Like many others in eighteenth-century England, Anthony Collins tracked Newton's publications. He and close friend John Locke exchanged letters in late 1703 as they anticipated the imminent release of the *Opticks*.²³ What is more, Collins financially supported popularised accounts of Newton's natural philosophy. He is listed among the subscribers for Henry Pemberton's *A view of Sir Isaac Newton's philosophy*, both volumes of John Harris' *Lexicon technicum*, and other similar books.²⁴ Throughout the remaining years of his public life, Collins praised those who propagated Newton's work among the nation, reserving special acclaim for Whiston whom he noted had 'great *designs* for the improvement of philosophy, and for the welfare and trade of his country: as appears by his attempts to explain the philosophy of Sir Isaac Newton....'²⁵ While Collins and Whiston would disagree at length over issues of theology and prophecy, Collins still saw Whiston's efforts at popularizing Newton's mathematics as laudable. Even wolves can admire sheep.

²² John Toland, *Pantheisticon: or, the form of celebrating the Socratic-society* (1751; facsimile reprint: New York, 1976), 20-1.

²³ John Locke to Anthony Collins, 18 November 1703; Locke to Collins, 22 November 1703; Collins to Locke, 16 February 1704 in John Locke, *The correspondence of John Locke*, ed. E S De Beer (8 vols., Oxford, 1976-1989), VIII, 123, 126, 198.

²⁴ Henry Pemberton, *A view of Sir Isaac Newton's philosophy* (London, 1728); John Harris, *Lexicon technicum: or, an universal English dictionary of arts or sciences* (2 vols., London, 1704, 1710); and *Cyclopaedia: or, an universal dictionary of arts and sciences* (2 vols., London, 1728).

²⁵ Anthony Collins, *A discourse of the grounds and reasons of the Christian religion* (London, 1724), 283.

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Collins' own publicly stated admiration for Newton first appeared in his exchange of pamphlets with Samuel Clarke, brought about by Henry Dodwell's writings concerning the soul. Dodwell had argued that the soul was naturally mortal; only God's divine power qualified souls for an eternal afterlife. Clarke feared that such a position would lead some readers to conclude that souls were truly mortal and hence material because material substances could perish whereas Clarke conceived of the soul as an immaterial and immortal entity. Collins, who did not share the position, defended Dodwell's right to publish any view on the soul that Dodwell wished because England ought not to censor intellectual thought. In the lengthy pamphlet war that followed, Collins suggested that what Clarke meant by 'soul' was 'thinking substance'. As evidence Collins invoked Newton's work on gravity to support his argument that a system of matter may have a power of thought or of motion because what powers its individual pieces do have were not known with absolute certainty. Like Toland, Collins referred to the *Principia* where Newton wrote:

That Several Phenomena of Nature may depend on certain Forces, whereby from Causes (or Powers) yet undiscovered, the Particles of Bodies are mutually impelled against each other, and cohere according to regular Figures, or whereby they recede or are driven from one another; which Forces or Powers being yet unknown, the Philosophers hitherto have attempted Nature in Vain.

In citing Newton in this manner, Collins attempted to deflect Clarke's charges that he held improper views on matter and motion by noting that Newton himself claimed not to know the causes of forces. The question between them was, Collins told Clarke, not whether something moves when its support is taken away. The real question was 'whether another Being, or a Being distinct from Matter, does continually impel it, either immediately or mediately'. Matter moved because of the action of something, but whereas Clarke claimed it was an immaterial cause, Collins asserted that one could not make that assumption. Similar to Toland, Collins claimed that all matter was in contact and consequently

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no void existed. As a result, Collins argued that gravity required the continual connection of matter in order to operate. He explained further that surrounding bodies passed gravity to those particles that they encircled in the system of the universe, an example of a power residing in a system of matter when it did not exist in individual pieces. Clarke was not convinced and rebuked Collins strongly for supposing 'that this great Man [Newton] is of your Opinion in the present Question'.²⁶ Clarke's suggestion that he did not understand natural philosophy irritated Collins who expressed his anger in a letter sent during the exchange of pamphlets. Collins wrote that if Clarke believed that he had '*caught me at an advantage now that the dispute turns upon points of Mathematicks and Natural Philosophy*', Clarke would be proven wrong.²⁷

Collins also believed Newton was correct in claiming that proper intellectual inquiry should begin with observation rather than acceptance of tradition. In *A Philosophical inquiry concerning human liberty*, he argued that natural philosophers knew the proper way in which to proceed. Among those whom Collins admired in this regard were Pierre Gassendi, Descartes, Ralph Cudworth and 'Sir ISAAC NEWTON' who treated 'the most profound questions in metaphysicks, mathematicks, and other parts of philosophy; they by handling them as far as their clear and distinct ideas reach'd....'²⁸ That was to say, reason guided the search for truth in nature. Newton, and others, provided the methodological model.

All this is well known to scholars of the period and is used to support entrenched assertions of deist opposition to Newton. But what has actually been said by Toland and Collins? In the case of the former, Newton's name is used to substantiate claims about the universe, as a point of departure, and as a means to introduce Toland's own natural philosophical musings. While he disagreed about vacuous space, Toland did accept Newton's analysis of how matter would move and the

²⁶ Samuel Clarke, *The works of Samuel Clarke* (4 vols., London, 1738), III, 813, 848.

²⁷ Kenneth Spencer Research Library, University of Kansas, MS G23: 14 f. 46r.

²⁸ Anthony Collins, *A philosophical inquiry concerning human liberty*, (London, 2nd ed., 1717), 8-9.

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mathematics used to describe it. Collins too saw in Newton validation for his speculations into the properties of matter. If someone of Newton's stature did not know the true cause of motion (at least he claimed publically not to) or the ontology of forces, then there was no reason not to investigate such things and publish the results. One may misunderstand Newton in the process, but this was almost to be expected. As Henry Pemberton commented, 'The manner, in which Sir Isaac Newton has published his philosophical discoveries, occasions them to lie very much concealed from all, who have not made the mathematics particularly their study.'²⁹ Even Locke famously required assistance with the *Principia's* more mathematically intense passages. While the genius of Newton could not be denied, an appreciation of his work often required a guided tour conducted by authors who attempted to make Newton more accessible. Collins' writings and purchases demonstrate admiration for such efforts.

Is this how all deists engaged with Newton? The supposed subversive political agendas of deists colour how scholars read their engagement with Newton. If deists really did want to remake the English polity and do away with monarchs, then they must also have held devious designs on England's natural philosophy encapsulated in the *Principia*, or so the story goes.³⁰ We are presently ignoring the political aspect of deism because of space constraints, but I hope to have shown, even briefly, that Toland and Collins are not so clear-cut in their reading of Newton.

Casting a Wider Net: Chubb and Morgan

Let us now turn to Thomas Chubb and Thomas Morgan. Both Chubb and Morgan owed much of their public notoriety to direct engagement and association with Newton's closest followers. Each man adopted an Arian Christology because of admiration for the writings of William Whiston and Samuel Clarke. Moreover, Chubb and Morgan saw in Newton's posthumous publications on chronology and prophecy support for their own positions. Wolves and sheep become more difficult to discern further into the eighteenth century.

²⁹ Pemberton, *View of Sir Isaac Newton's philosophy*, 1.

³⁰ Israel, *Radical Enlightenment*; *idem*, *Enlightenment contested*.

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Chubb came from a poor family of Salisbury artisans and by 1705 had found work as a tallow-chandler after diminishing eyesight forced him from his previous job as a glove-maker. Around this time Chubb's enthusiasm for intellectual pursuits led him to establish an informal debating society for some friends. In 1711 the members discussed Whiston's newly-published *Primitive Christianity revived*. The book's Arianism inspired Chubb to pen his own Arian-like arguments. Chubb's resulting manuscript impressed Whiston who saw that his new protégé's book was published in 1715 as *The supremacy of the Father asserted*. In the work Chubb relied upon the Apostle John to advance his case: John 3:16 (For God so loved the world, that he gave his only begotten Son, that whosoever believeth in him should not perish, but have everlasting life) and 5:26 (For as the Father hath life in himself; so hath he given to the Son to have life in himself). From these passages Chubb concluded that 'The Son received his Being and Existence from the Father, as the first Supreme free Cause of that Being and Existence; consequently He is inferior and Subordinate to the Father' and that the 'Son is Inferior and Subordinate to the Father'.³¹ Whiston brought Chubb to London and introduced him to his fellow Newtonian, Clarke. Chubb evidently spent much time with Clarke, commenting on his death in 1729 'I have seen Dr. Clarke often; I lost a very good friend in him'.³²

Whiston also secured space for Chubb with Sir Joseph Jekyll, MP, Master of the Rolls, and Whiston's own patron. Jekyll provided Chubb 'an annual Salary' during the two years in which Chubb resided in London before returning to Salisbury. Once Chubb became more deist-like (denying most examples of providence and suggesting that God was bound by the laws of nature and other similar views), Whiston withdrew from him and advised Jekyll to do the same. Whiston worried that Chubb

³¹ Thomas Chubb, *The supremacy of the Father asserted* (2nd edn., London, 1718), 1, 2, 7, 9, 18; see also T L Bushell, *The sage of Salisbury: Thomas Chubb (1679-1747)* (New York, 1967), 17; and M Pelli, 'The Impact of Deism on the Hebrew Literature in the Enlightenment in Germany', *Eighteenth-Century Studies*, 6 (1972), 39.

³² Joseph Spence, *Observation, anecdotes, and characters of books and men*, ed. James M Osborn (2 vols., Oxford, 1966), I, 379.

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had moved from being ‘one of the most judicious *Christians*, without a learned Education’ to the ‘directly opposite Character of one of the most foolish and injudicious of our modern Unbelievers...’.³³ Nonetheless, it was Whiston who had brought Chubb to prominence and had drawn him into the inner circles of Newtonianism. Are wolves, brought into the homes of sheep, still wolves? T L Bushell, author of the only modern biography of Chubb (1967), claimed that Newton influenced Chubb greatly. Yet, Bushell provides no specific example of how this influence might have worked.³⁴ It is taken for granted that Newtonianism must have led to deism. However, a close reading of Chubb’s works reveals that he never directly referred to Newton’s natural philosophy, although his manuscripts indicate close familiarity with Whiston’s books on the subject. Given his onetime friendship with Whiston, this should not surprise. And yet Newton’s work did inspire Chubb.

In later years Chubb found support for his views in Newton’s writings but not those on which the great man’s lasting reputation would sit. It was the posthumous publications—*The chronology of ancient kingdom’s amended* (1728) and *Observations upon the prophecies of Daniel, and the Apocalypse of St. John* (1733)—which caught Chubb’s attention. His admiration for Newton rested not with achievements in astronomy or mathematics, but rather ‘*superior skill* in history, chronology, &c’. Newton the theologian, not Newton of the Inverse-Square Law, influenced Chubb and, as we will see, Morgan as well.

Newton bequeathed to historians a complicated personal theology. Although certainly not deist, it was far from orthodox and most likely Arian with hints of Socinianism. But the impact of Newton’s theology in the eighteenth century and beyond raises many questions. Partly this is the result of direct concealment on the part of immediate contemporaries.

³³ Thomas Chubb, ‘The author’s account of himself’, *Posthumous works of Mr. Thomas Chubb* (2 vols., London, 1748), I, i-viii. Another account of Chubb’s life is found in the anonymous *A short and faithful account of the life and character of the celebrated Mr. Thomas Chubb* (London, 1747), 1-25. Whiston’s comments are found in *Memoirs of the life and writings of Mr. William Whiston*, 276-7.

³⁴ Bushell, *The sage of Salisbury*, 19-20.

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Larry Stewart has argued that eighteenth-century authors ensured Newton's fame would reside among mathematics and optical experiments even if heterodoxy remained a watchful spectre over the shoulders of those who read the *Principia*. Eulogizers of Newton who tended to his reputation after his death in 1727 presented a picture very different from what modern commentators have crafted. Absent are characterizations of a man determined to trace ecclesiastical history and tease out the meaning of biblical prophecy.³⁵ This is not to suggest that contemporaries were wholly in the dark as to the heretical implications of Newton's theological pursuits. One need only reflect on the objections offered against Newton authored by Daniel Waterland, Arthur Young and Zachery Grey, among others, and the enthusiastic letters sent to Samuel Clarke by the Rector of Rossington, John Jackson, who saw in the General Scholium support for his own Arianism, to see that Newton's theological deviance was an open secret. Nonetheless, deist engagement with Newton's *Chronology of ancient kingdom's* and *Observations upon the prophecies of Daniel* is not well understood. It is true that Scott Mandelbrote and others have shown that Waterland and Grey believed the deist Matthew Tindal bolstered his publications with Newton's posthumous works.³⁶ It is equally true, however, that Tindal's publications contain no mention of Newton's name. The perception of Newton's reputation exceeded his actual impact at least in the case of Tindal. Waterland ought to be forgiven his enthusiasm in seeking precedents for Tindal's writings. He had been long engaged in responding to Tindal and no doubt was sensitive to anything that seemed to support his adversary's claims. However, reliance upon critics means that Chubb and Morgan, deists who did engage with Newton's theological publications, have not received adequate study.

³⁵ Larry Stewart, 'The Trouble with Newton in the Eighteenth Century', in *Newton and Newtonianism: new studies*, ed. James E Force and Sarah Hutton (Dordrecht, 2004), 221-3.

³⁶ Scott Mandelbrote, 'Newton and Eighteenth-Century Christianity', in *The Cambridge companion to Newton*, ed. I Bernard Cohen and George E Smith (Cambridge, 2002), 409-30; Larry Stewart, 'Seeing through the Scholium: Religion and Reading Newton in the Eighteenth Century', *History of Science*, 34 (1996), 123-65.

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Referring to Newton's exegesis of the Book of Daniel, Chubb concluded that 'nothing can *rationally be concluded* from it, in *favour* of Jesus Christ being the ... *Messiah*' and part of the Trinity, which Chubb had rejected decades earlier. Chubb believed that God would never have made such an important revelation regarding both the saviour of humanity and the nature of the divine being to Daniel, '*one man only*', with the rest of humanity left in the dark.³⁷ If it were indeed true, all humanity would know. Chubb also cited Newton as an authority in strategies of prophetic interpretation and as support for his own view that the meaning and intent of prophecy is at best uncertain and perhaps irrelevant to humanity unless it was revealed to a great many people rather than only a chosen few. Embracing Newton's argument that prophecy ought not to be interpreted allegorically, Chubb commented,

For, as Sir *Isaac Newton alone*, through his *superior abilities* and *application*, has *discovered* the meaning of the prophecies, from the events only; so, if he had not *examined* the subject, or if he had not *published* his sentiments upon it to the world, then the *true sense* of the prophecy (supposing Sir *Isaac's sense* to be the true sense) might have been *for ever unknown* to mankind.³⁸

Literal fulfilment was the correct method of interpretation Chubb argued but added the further caveat that any true prophecy must be announced widely.

While he was unsure if a true prophecy had ever been announced, Chubb suggested we find hope for analysing potential prophetic statements in Newton's writings. 'And therefore, Sir *Isaac Newton's* valuable discovery of the *laws of gravitation*, may, perhaps, be *equally* as useful to *Christianity*, as his discovery of the *sense of prophecies*, whilst it remains *indeterminate* what is the Christian revelation.'³⁹ Thomas Morgan agreed that Newton had more to offer eighteenth-century readers than guidance in understanding gravity. Considering Newton's

³⁷ Chubb, *Posthumous works*, II, 147.

³⁸ Chubb, *Posthumous works*, II, 149.

³⁹ Chubb, *Posthumous works*, II, 150.

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interpretations of Revelation, Morgan argued that ‘*Sir Isaac Newton* has proved it to be a genuine Work of *St. John* ... And, however dark and obscure the prophetick Parts of the Book may be, yet the Doctrines contained in it are very clear, and cannot easily be mistaken.’⁴⁰ This was to say, it is reducible to specific principles in the same way that three laws of motion explained the system of the world. Newton was an excellent instructor when one studied prophecy, Morgan believed, because he would bring mathematical certainty to hermeneutics the same way he had brought it to natural philosophy. Chubb likewise suggested that Newton’s erudite reputation should be expanded to include matters of theological scholarship. ‘And tho’ it may be *most evident*’, he wrote, ‘that *Sir Isaac Newton*’s greatly *superior* abilities *better qualified him* to discover and ascertain the *true state* of the *natural world*; yet, that he was thereby better qualified to *discover* and *ascertain* the true sense and meaning of *dark and ambiguous* prophecies, may not, perhaps, be *quite* so apparent.’⁴¹ For Chubb, Newton provided a sounding board, a benchmark against which to judge his own writings about prophecy and the Trinity. If Chubb could substantiate his view with excerpts taken from Newton, then Chubb’s work would carry a much higher status. Morgan’s enthusiasm for things Newtonian was enormous, as we will see, and for him to write approvingly of Newton’s theological musings is to be expected. Of course this was exactly the sort of usage that Waterland and Grey feared and hoped to prevent. Although there is not space to consider this fully, it is worth considering that, as Snobelen has shown, it was an evangelizing Newton who helped set Clarke and Whiston ‘on the path of heresy’.⁴² While Whiston and Clarke were likely pleased initially to have their writings reveal the Arian character of God to Chubb and Morgan, they would have been equally displeased when the latter became deists and used Newton to support theological positions that neither Newton,

⁴⁰ Thomas Morgan, *The moral philosopher* (3 vols., London, 1738-1740), I, 364.

⁴¹ Chubb, *Posthumous works*, II, 149.

⁴² Stephen D Snobelen, ‘Caution, Conscience and the Newtonian Reformation: The Public and Private Heresies of Newton, Clarke and Whiston’, *Enlightenment and Dissent*, 16 (1997), 152.

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nor his closest followers would have accepted. It is certainly well established that Newtonianism did not lead to deism. The point to be made here is that Chubb and Morgan continued to employ Newtonian theology in their writing even long after they had become deists rather than any natural affinity between Newton and deism.

Of the English deists discussed in this study, Morgan is the least known to modern historians. There is no modern biography of him and scholarly engagement with his life and works is very limited (only a few specific articles) and does not amount to much more than three hundred pages. He is a figure in need of more study for what he might reveal about the character of English deism and for how his work illuminates eighteenth-century readings of Newton.⁴³ Morgan was educated at the Dissenting Bridgewater Academy and he became a Presbyterian minister on 6 September 1716. His participation in the 1719 debates at Salter's Hall reveals his affinity for the theology of Samuel Clarke. Using *Scripture doctrine of the Trinity* (1712) as support, Morgan endorsed an Arian position by arguing 'That God is One, or, that there is but One only Living and True God'.⁴⁴ As had Clarke, Morgan urged readers to accept the true biblical doctrine of the Trinity, which is to say deny the Trinity.⁴⁵ Morgan pointed to Deuteronomy 32:39 (See now that I, even I, am he, and there

⁴³ Although not a complete list, see Leslie Stephen, *History of English thought in the eighteenth century* (2 vols., London, 1874), I, 166-9; D Patrick, 'Two English Forerunners of the Tübingen School: Thomas Morgan and John Toland', *The Theological Review*, 14 (1877), 564; J Van den Berg, 'Thomas Morgan versus William Warburton: A Conflict the Other Way Round', *Journal of Ecclesiastical History*, 42 (1991), 82-3; *idem*, 'English Deism and Germany: The Thomas Morgan Controversy', *Journal of Ecclesiastical History*, 59 (2008), 48-61; Robert E Schofield, *Mechanism and materialism: British natural philosophy in an age of reason* (Princeton, 1970), 128 n.28; Anita Guerrini, 'Newtonianism, Medicine and Religion', in *Religio medici: medicine and religion in seventeenth-century England*, ed. O P Grell and Andrew Cunningham (Aldershot, 1996), 305-6; and Anita Guerrini, *Obesity and depression in the Enlightenment: the life and times of George Cheyne* (Norman, 2000), 153-4; see also Peter Harrison's entry in the *Oxford Dictionary of National Biography*.

⁴⁴ Philalethes [Thomas Morgan], *The friendly interposer: or, the true scripture doctrine of the Trinity, stated* (London, 1719), 8. On Morgan's unitarian writings see Van den Berg, 'Thomas Morgan versus William Warburton', 83.

⁴⁵ On Clarke's Arianism see J P Ferguson, *An eighteenth century heretic: Dr. Samuel Clarke* (Kington, 1976), 51, 53-5, 83; Larry Stewart, 'Samuel Clarke, Newtonianism, and the Factions of Post-Revolutionary England', *Journal of the History of Ideas*, 42 (1981), 56, 59.

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is no god with me), Isaiah 43:10 (ye may know and believe me, and understand that I am he: before me there was no God formed, neither shall there be after me) among other passages to support his interpretation. Morgan then stated Scripture reveals that ‘The Supposition of a Duality, or Plurality of Gods, necessarily implies a Repugnancy or Contradiction; for these Two (or more) Gods would be equal or alike in all Perfection.’ For Morgan, God was singular and those who believed otherwise he dismissed as ‘Tritheisticks’.⁴⁶

It was in 1725 that Morgan formally joined the growing ranks of Newtonian enthusiasts when he published *Philosophical principles of medicine*. Morgan opened the book by stating that next ‘to the Knowledge of God ... Knowledge of the Principles and Laws of Motion ... is doubtless the most excellent and useful’.⁴⁷ The similarity of titles was not the only link between Morgan’s book and Newton’s. Morgan too denied that the force of motion referred to anything physical. Rather ‘force’ described ‘Quantity and Direction’ of the ‘Motion generated’ as had been stated by ‘The wonderful and incomparable Author of the *Principia*...’. Those who misunderstood this important concept, argued Morgan, would always misinterpret Newton’s intent. Indeed, this was seen in ‘people pretending’ to be natural philosophers who mistakenly understand gravity as ‘an essential and intrinsick Power’ of matter. Here Morgan explicitly criticises the interpretation of gravity such as that offered by Toland and Collins.⁴⁸ While Morgan shared many theological and political beliefs with his fellow deists, as I have discussed elsewhere, he could not abide what he saw as their faulty reading of Newton.⁴⁹

Morgan then focussed on the heart of the matter discussed in the book. In the same way that large scale alterations in oceans (such as tides) are

⁴⁶ [Morgan], *The friendly interposer*, 8-9; *idem*, *The nature and consequences of enthusiasm consider’d, in some short remarks in the doctrine of the blessed Trinity* (London, 1719), 34.

⁴⁷ Morgan, *Philosophical principles of medicine* (London, 1725), vii.

⁴⁸ Morgan, *Philosophical principles of medicine*, 32.

⁴⁹ Jeffrey R Wigelsworth, ‘The Disputed Root of Salvation in Eighteenth-Century English Deism: Thomas Chubb and Thomas Morgan Debate the Impact of the Fall,’ *Intellectual History Review*, 19 (2009), 29-43; *idem*, *Deism in Enlightenment England*, 133-5, 190-4.

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caused by the sun and moon acting upon the waters through an aetherial medium, Morgan argued that, smaller alterations ‘must necessarily be impress’d upon the Blood and animal Fluids, and produce very sensible and considerable Effects.’⁵⁰ This effect resulted from motion being impressed through the action of a gaseous aether which interacted with fluids, both bodily and oceanic, by means of the pores which all fluids have. Since the human body operated by means of fluids (chiefly blood), Morgan suggested that cures must begin with knowledge of motion because diseases would move throughout our bodies according to Newton’s three laws. Morgan’s dependence on Newton for much of his medical theory is clear. And, it is even more so in the preface which outlined how a proper natural philosopher began his investigations with an appreciation of nature derived from observation tied to skill in mathematics, the method by which Newton made his discoveries. What is more, the book opened with a poem composed by Samuel Bowden, a nonconformist physician and poet, in which Bowden described Morgan’s approach to the problems of medicine: ‘Such was the Path *immortal* NEWTON trod, / He form’d the wondrous Plan, and mark’d the Road’, and a few lines later, ‘Mature *in Thought*, You NEWTON’s Laws reduce / To nobler Ends and more Important Use.’⁵¹

A decade later, Morgan composed *The mechanical practice of physick* (1735). In this latest book he suggested that lack of clarity in medicine (or physick) prevented physicians from accepting the reality of aether and the importance of Newtonian motion in determining cures. This position would find many proponents in the coming years. The search for aether as an explanation for motion became, in the words of R W Home, ‘a feature of eighteenth-century physics’ and increasingly synonymous with Newtonianism.⁵² Morgan blamed ‘*enthusiastick Chymists, such as Paracelsus, Van Helmont, and others*’, who had, ‘*carried the Art of Healing beyond all human Judgement and Comprehension...*’. To remedy this situation Morgan urged his readers to ‘*reduce the Practice of Physick*

⁵⁰ Morgan, *Philosophical principles of medicine*, 80.

⁵¹ Morgan, *Philosophical principles of medicine*, vii, xlv-v.

⁵² R W Home, ‘Mechanic and Experimental Physics’, in *The Cambridge History of Science*, vol. 4, *Eighteenth Century Science*, ed. Roy Porter (Cambridge, 2003), 366.

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to the known *Laws of Motion and Mechanism*'.⁵³ The key task in this quest was determining the movement of diseases inside the body and then finding the corrective motion of a cure. As Newton had demonstrated, matter, motion, and the action of forces described the operation of the world; there was no place for occult properties in a true account of medicine. Morgan advanced his theory by once more mimicking the composition of the *Principia*: listing propositions, their proofs, and finally the proper conclusions to be drawn from them. He also borrowed from the queries to the *Opticks*. Substances which cure disease, he believed, enter the body as fluids but may only act once they had been '*reduced to an exceedingly fine and imperceptible Vapour*'. After ingesting, medicine became rarefied by the heat in the stomach. Chymists and experimental philosophers, noted Morgan, had proven that heat was capable of dissolving and diffusing materials that were formerly solid. This newly-created vapour acted like aether and initiated motion in the body by means of pores in the fluids, such as blood. How these forces operated, Morgan claimed not to know. Indeed, he noted that much of the problem with previous schemes of medicine resulted from fruitless searches for such causes. A true physician ought to be satisfied with observable facts and relate these to known laws of nature. As Newton had claimed 'hypotheses' have no place in 'experimental philosophy'.⁵⁴ Morgan's wolf fur, it would seem, is white and curly.

Following his *Mechanical practice of physick*, Morgan considered the laws of nature in the first volume of his *Moral philosopher* (1737). He stated that all persons held knowledge of these laws, which had been imprinted upon their wisdom and reason. Nonetheless, access to this knowledge required assistance. As the proper guide Morgan chose the *Principia* as containing 'natural Truths', which were 'necessarily founded in the Reason of Things; and yet, I think, none but a Fool or a Madman would say, that he could have informed himself in these Matters as well

⁵³ Morgan, *The mechanical practice of physick: in which the specifick method is examin'd and exploded* (London: 1735), vii, xiv, xvi.

⁵⁴ Morgan, *Mechanical practice of physick*, 6, 8, 21; Isaac Newton, *The principia: mathematical principles of natural philosophy*, trans. I Bernard Cohen, Anne Whitman and Julia Budenz (1726, 3rd edn., Berkeley, 1999), 943.

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without' Newton's masterpiece.⁵⁵ In the third volume of *The moral philosopher* (1740), Morgan noted with approval the widespread acceptance of Newton's natural philosophy: 'There are few thinking inquisitive Persons, now among us, but knowing something of the *Newtonian* Philosophy, and the Laws of Nature demonstrated by that great Philosopher.'⁵⁶ The ideal way to appreciate Newton was through direct engagement with the *Principia*, although Morgan acknowledged this was no easy task. Therefore, most interested persons would come to know Newton through the efforts of others who explained the dense mathematics in a more accessible way. Morgan, like Collins, praised those who promoted Newton's work throughout England.

Morgan continued advancing his theory of medicine and aetherial motion in *Physico-theology* (1741). He began by describing matter as a substance having no intrinsic power except to be acted upon by 'some universal, intelligent, designing Cause'. Motion would be explained by 'some extrinsic active Power or Energy', operating by established laws. First among the properties of motion was gravity, which Morgan identified as being caused by 'no other but the supreme, universal Agent, Author, Governor and Director of all Nature, or God himself'. But how was it that God acted in nature? As he continued his investigation into gravity, Morgan found that light ('the visive Element') was not 'endued with Gravity, Resistance, Pressure, or any other mechanical Power', but it 'actuated and exerted all the mechanical Powers of Bodies...'.⁵⁷ Morgan then posited that light, which pervaded all Creation like a subtle fluid, might be the active aethereal medium responsible for motion, including gravity. He then concluded that gravity, which as he noted was a power not inherent in bodies but affects them with respect to their situation in the Creation and their proximity to other bodies, must be 'continually exerted thro' the whole Creation'. This would, Morgan claimed, seem clear 'if it can be prov'd, that there is actually in Nature a material Substance or

⁵⁵ Morgan, *Moral philosopher*, I, 143-4.

⁵⁶ Morgan, *Moral philosopher*, III, 126.

⁵⁷ Morgan, *Physico-theology: or, a philosophico-moral disquisition concerning human nature, free agency, moral government, and divine providence* (London, 1741), v.

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elementary Fluid, which is not affected with any of these mechanical Properties....⁵⁸

Morgan next revealed the existence of just such a fluid, namely light as he described above. While Morgan believed he followed the lead of Newton, whom he praised as a 'Man of the most elevated and uncommon Genius', he also believed that Newton had not exhausted further study of light. What Newton had proved was that 'Light is corporeal, or a material Substance'. From this premise, Morgan suggested that 'Fire and Light are essentially ... the same, and that Fire is nothing else but condensed Light.'⁵⁹ This conclusion was important because Morgan described fire (along with air) as one of the two 'Counterforces' in nature. Light was an active Newtonian force. To demonstrate this claim, Morgan presented the results of an experiment performed with a magnifying glass. He had focussed light from the Sun into a beam which possessed the power to burn 'Tobacco' and 'dead Oak' or, if sufficiently intense, to melt gold. This proved that fire was 'elementary Light' and 'not subject to the mechanical Laws and Properties of other Bodies, or Material Fluids'.⁶⁰ It moved through space suffering no resistance and operating in 'a purely immechanical' manner. Morgan's understanding of light was influenced by trends in contemporary views of Newton. Consider Henry Pemberton's *View of Sir Isaac Newton's philosophy* (1728), a book to which Morgan had subscribed. Pemberton wrote concerning the power of nature that 'Sir Isaac Newton has in general hinted at his opinion concerning it; that probably it is owing to some very subtle and elastic substance diffused through the universe'. What is more, Pemberton's demonstration of the power of light and fire seen through the use of a magnifying glass is the same as that employed by Morgan himself.⁶¹ While Morgan's claims of a pure Newtonian pedigree for his explorations were in part true, they did not tell the entire story. In his *Hæmasticks* (1733) Stephen Hales also modeled his analysis of the motion of blood on the *Opticks* when he revealed an active immaterial energy in blood as its vitalising agent.

⁵⁸ Morgan, *Physico-theology*, 28.

⁵⁹ Morgan, *Physico-theology*, 29, 30.

⁶⁰ Morgan, *Physico-theology*, 45, 46.

⁶¹ Pemberton, *View of Sir Isaac Newton's Philosophy*, 376, 379.

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Archibald Pitcairne too adopted a Newtonian mathematical account of blood flow. However, an ethereal fire could also be traced to the writings of Herman Boerhaave, a man whom Morgan had at one time admired and then dismissed as using mere words rather than experiment to describe nature.⁶²

Morgan next outlined the sensible properties of light and focused particular attention on the fact that the ‘luminous Rays are in a continual vibrating Motion’. Despite this motion, neither light nor the material with which it interacted were adversely affected. ‘Any one but moderately acquainted with the *Newtonian* Theory of Light’, Morgan confidently claimed, ‘must see the Reason and Necessity of what I have observed and advanced’. This medium was evenly spread through all nature and was composed of ‘extremely subtle and minute, [matter] and, perhaps, [even consisted] of the very smallest and last Divisions of Matter’. From this assertion, Morgan concluded, ‘that all other Bodies or material Substances whatever are immersed in this universal Fluid as the common Medium and Vehicle of all their Actions....’⁶³ Having demonstrated the existence of a medium (active light) that propagated motion throughout the Creation, Morgan followed Newton’s example in claiming that he did not know ‘How this immechanical Fluid acts upon other Bodies...’. Though Morgan refused to speculate, he could, however, articulate the laws that governed its action. This was the correct method in which to proceed because it was the method followed by the ‘great Philosopher, *Newton*’.⁶⁴

After Morgan published *Physico-theology* in 1741, a material aether would receive considerable attention from scholars in the mid-eighteenth century. Thomas Birch’s *History of the Royal Society* (1744) reprinted two letters by Newton: one written in 1676 to Henry Oldenburg and the other composed in 1679 to Robert Boyle. Both letters described Newton’s early researches into aether. Newton told Oldenburg that nature ‘may be nothing but various contextures of some certain aetherial spirits of vapours condensed, as it were, by præcipitation, much after the manner,

⁶² Rina Knoeff, *Herman Boerhaave (1668–1738): Calvinist chemist and physician* (Amsterdam, 2002), 67, 172, 190-1.

⁶³ Morgan, *Physico-theology*, 35, 41; cf. Newton, *Principia*, 940, 943-4.

⁶⁴ Morgan, *Physico-theology*, 298.

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that vapours are condensed.’ Three years later Newton advised Boyle that aether may cause gravity because bodies will ‘get out and give way to the finer parts of aether below, which cannot be without the bodies descending to make room above for it to go out into.’ While these inquiries were decades old at the time of becoming public, nonetheless they served as inspiration for contemporary scholars. Moreover, in 1743 Bryan Robinson published *A dissertation on the aether of Sir Isaac Newton* in which he argued that the phenomena of nature were caused by a spiritual aether, which filled the universe and had both ‘Activity and Power’. This interpretation is very similar to Morgan’s even though Robinson’s aether was immaterial and Morgan utilized the material light of the *Opticks*. Such a difference does not minimize the fact that depictions of Newtonianism were increasingly shaped with references to aethers and material fluids and constructed upon an acceptance of the materiality of light.⁶⁵ Morgan is not standing in opposition to eighteenth-century views of Newton, rather he anticipates them.

Conclusion

Oppositional dichotomies – such as wolves and sheep – make for neat history and easy characterisations. While appealing, such practice does not capture the messy and complicated arena of eighteenth-century intellectual history. Collins, Toland, and Morgan embraced the *Principia* and methodology found within its pages. Chubb accepted Newton’s theological writings while ignoring his natural philosophy. Only Morgan incorporated all of Newton’s writings into his own while at the same time admonishing interpretations of Newton advanced by Toland and hinted at by Collins. Let us briefly return to the characterisations of deists and Newton. Brooke and Cantor argue that Toland and Collins were ‘subversive’ in their use of Newton. However, they addressed only two deists. As we have seen, all four of the deists examined here embraced a

⁶⁵ Isaac Newton, ‘Newton’s Letters to Boyle, 28 February 1679 and to Oldenburg 25 January 1676’, in *Isaac Newton’s papers and letters on natural philosophy and related documents*, ed. I Bernard Cohen (Cambridge, 1958), 253, 254; Bryan Robinson, *A dissertation on the aether of Sir Isaac Newton* (Dublin, 1743), 122; and Rob Iliffe, ‘Philosophy of Science’, in *The Cambridge history of science*, vol. 4 *Eighteenth-century science*, 278.

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variety of Newton's writings. All, except Chubb for whom we have no compelling evidence one way or the other, believed Newton was correct, if somewhat obscure, in his description of the natural world. It was this obscurity that permitted Toland and Collins to read Newton in ways that Newton would not have accepted. Both men believed that offering explanation of Newton's work was a legitimate intellectual pastime. Is any of this an example of subversion? If scholars mean that deists were actively anti-Newtonian or intentionally hostile toward Newton and Newtonians, the evidence presented argues against such a reading. It is clear that the deists discussed here admired Newton and were anxious to attach their work to his. But, as Peter N Miller and others point out, it is equally the case that Clarke and Whiston saw such engagement as extremely subversive because it threatened to link Newton with the deists. The problem is one of point of view. By reading the history of Newton(ians) and deists from the position of the former then subversion is evident, but if scholars reverse their position then things are not so clear. The view of scholars such as Paul Russell and Jonathan Israel, to name only two, needs to be tempered as a more detailed image of English deists begins to emerge: one begins from the perspective of the deists rather than their opponents. Where are the deistical wolves devouring Newton's writings while actively pursuing an anti-Newtonian goal? They are penned up in historical imaginations. Never did they roam in the theological and philosophical fields of eighteenth-century England.

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REVIEW ARTICLE

‘Something odd is happening’: Captain Cook’s last days*Jonathan Lamb*

Glyn Williams, *The death of Captain Cook: a hero made and unmade*, Cambridge MA: Harvard University Press, 2008, pp. 197, ISBN 978-0-674-03194-4

Martin Fitzpatrick, Nicholas Thomas, Jenny Newell, *The death of Captain Cook and other writings by David Samwell*, Cardiff: University of Wales Press, 2007; pp.170, ISBN 978-0-7083-2073-0

Here are two books published a year apart with identical titles. They appeared alongside two others devoted to the same subject, Daniel O’Sullivan’s *In Search of Captain Cook* (2008) and John Gascoigne’s *Captain Cook: Voyager between Worlds* (2007). They were closely preceded by two of the most authoritative recent biographies of Cook that appeared in the same year, Nicholas Thomas’s *Discoveries: The Voyages of Captain Cook* (2003), and Anne Salmond’s *The Trial of the Cannibal Dog* (2003). Nor is it many years since two leading anthropologists joined battle over the ethnographic implications of Cook’s death. In 1992 Gananath Obeyesekere published his *The Apotheosis of Captain Cook* in which he took issue with Marshall Sahlins’s brilliant reading of the sequences of the Hawai’ian Makahiki festival in his *Islands of History* (1985), in which the ritual death of the god Lono (in whose name Cook was greeted and apparently worshipped by the Hawai’ians) was played out, proving fatal for the man who acted Lono’s part. A tired imperial myth, Obeyesekere called it, to have a European identifying himself as a god in front of savages, insulting the practical intelligence of the Hawai’ians in order to indulge his own pride. In his rejoinder, *How Natives Think* (1995), Sahlins pointed out that the identification of seaborne strangers as *atua*, or gods, was not an imperial myth but an active element of Polynesian cosmology and, given the timing and direction of Cook’s arrival, one which fitted perfectly into the scheme of the festival. The debate rumbled on between these two antagonists and

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their various champions. No-one joining it cared much about Cook, but all agreed his death was significant – only by getting to the bottom of it could the last important encounter between Europeans and people who had no knowledge of Europe be understood. The emphasis, to use Greg Denning’s terminology, fell on the landward side of the beach and the systems of belief and exchange that dominated there, not on the motives, ambitions and conflicting interests of the visitors. Both Obeyesekere and Sahlins stuck closely to the Makahiki to make their points, a festival celebrating the four month rule of the fertility god Lono over the land, ending in February when the Ku the god of war resumes his dominion.

With the arrival of Salmond’s and Thomas’s books, the emphasis switched back to the seaward side of things, but now with a strong ethnographic impulse behind the enquiry. Salmond explored the culture and myths of the *Resolution’s* gunroom and Thomas presented us with a Cook fascinated by the ceremonies and cults of the South Seas. Neither made much progress with the problem of Cook’s death. Salmond put it down to the unease accompanying his alienation from his crew, beginning with his refusal to punish Kahura, the Maori chief who killed the men in the *Adventure’s* cutter when they landed at Grass Cove during the previous voyage. His isolation from his men caused him to become passionate and impulsive, culminating in the confused scene at Kealakekua Bay. Thomas thought the fatal outcome was precipitated by Cook’s taking too seriously his role as the representative of George III in the South Seas, prone to excessive agitation when animals were stolen which he had brought from Britain to stock the islands and make them forever rich in milk and meat. At this stage of his career he had an eye on posterity, and he saw in every theft an injury to his fame. Thomas and Salmond were recurring to an issue raised by J C Beaglehole, Cook’s most faithful and learned biographer, when he tried to explain Cook’s bizarre behaviour on his last voyage, which he thought was owing to physical and psychological fatigue. The symptoms took two forms, apparently at odds with each other. The first was the savagery with which Cook punished the thefts committed by Polynesians, cropping their ears, cutting their limbs to the bone and, according to John Rickman, preparing to use actual instruments of torture on the deck of the *Resolution*. At the same time his curiosity about local customs was becoming acute. In Tonga he risked serious retribution when he ignored the *tapu* of the *inasi*

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festival, so intent was he on seeing how it was structured and concluded. In order to be allowed to witness it he let his hair down and stripped himself to the waist, behaviour Lieutenant Williamson thought unbecoming an officer. In Hawai'i he was promoted from a mere observer of ritual to the focus of an elaborate liturgy in which he twice ascended a sort of altar and, flanked by idols, allowed himself to be adored.

Why would someone so impatient of thefts which had occurred every time he landed on Polynesian soil not be able to understand that they arose from ideas of property unique to the South Seas, part and parcel of the cultural difference which otherwise he found so attractive? Alternatively, why would someone so punctual about the preservation of naval equipment be so neglectful of his role as an officer as to appear naked and idolatrous in public? In Douglas's authorized edition of Cook's and King's journals the judgment about his death was that possibly it was owing to a temperamental hastiness which inclined him to take needless risks, like those he ran on the beach at on February 14, 1779 when trying to make a hostage of the paramount chief Kalani'opu'u in order to secure the return of the *Discovery's* cutter, stolen the night before. Several of his men testified that he seemed 'infatuated' during his last days, and James Trevenen wrote a vivid description of how Cook would rage and stamp his feet. On the other hand the character of his commander given by David Samwell is not of a man precipitate or rash, but humane and peaceable; one who died trying to save the lives of Hawai'ians by ordering his men to hold their fire, and who might have survived if he had been properly supported by his officers: Williamson in the launch and Roberts in the pinnace. Anna Seward was Samwell's correspondent and Samwell's Cook is hers, and Hannah More's and Helen Maria Williams's, an officer who never stinted compassion for the distresses of others. 'Thy bless'd philanthropy! thy social hands,/ Had linked dissever'd worlds in brothers' hands', sang More. Was it sympathy then that had led to Cook's active involvement in Polynesian religious rites? William Cowper thought not, and explained Cook's death as Providence's desertion of a man who gave consent to his own idolization: 'Nothing in short but blunder and mistake attended him, 'till he fell breathless into the water, and then, all was smooth again'.

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Cowper was certainly right about the confusion leading up to the death, but the sequel was by no means as smooth as he suggests, principally because there was no coherent account of what had happened. The public had to wait five years before John Douglas's official edition of the voyage appeared, consisting largely of Cook's and King's journals 'clothed', as Douglas put it, 'in better Stile than fell to the usual Share of the Capt.' Whether the clothing was heavier than this is a question now raised in a most intriguing analysis by Glyn Williams, but in any event the just, stern, compassionate Cook given by Douglas, hasty only under the most severe provocations, is what the Admiralty evidently desired the public to recognize and what Cook probably thought himself to be. But before his appearance in Douglas's volumes there had been unauthorized accounts published by John Rickman (1781), John Ledyard (1783) and William Ellis (1782), in which the confusion of the event and the oddities of the captain were more salient. Ellis thought the transactions surrounding his death were unaccountable, 'a chain of events which could no more be foreseen than prevented,' and therefore not really narratable at all, since no necessary connexions subsisted between what led up to it, what actually took place, and its aftermath. George Gilbert, a midshipman, recalled that it all appeared 'like a Dream that we could not reconcile ourselves to.' And Rickman, as we have seen, gives us Cook the torturer.

It was against this background that David Samwell, surgeon on the *Discovery*, produced in 1786 his narrative. His aim was to give an impartial report of the final days of a man for whom he had the highest regard and whom he felt had been unjustly aspersed even in the official publication. On the day of his death Cook was a model of coolness, 'so little did his conduct on the occasion, bear the marks of rashness, or a precipitate self-confidence'; and although what happened was unexpected and unforeseen it had not, in his view, been 'so explicitly related as the importance of it required' and had therefore been 'imperfectly understood'.¹ The way Samwell invited his reader to understand it was as an accident that shattered the continuity of an heroic career. And the accident was the arrival of the news, at the worst possible moment in

¹ Fitzpatrick, Thomas, Newell, *The death of Captain Cook and other writings by David Samwell*, 72, 65.

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Cook's confrontation with an angry Hawai'ian crowd, of the death of a chief, Kaulima, at the other end of the bay, shot by the crew of Rickman's boat who were blockading it. Nick Thomas thinks this is a substantial contribution to the data: 'In all likelihood, the news of Kaulima's death explains the decisive shift in the feeling of the Hawaiian crowd, and that precipitated the outbreak of aggression'.² That accident, compounded by Williamson's cowardice and Roberts's want of presence of mind, explains the fatal attack.

But if the symmetry of Samwell's account depends on an accident subtending a line of glorious naval service, then he has to work hard to make other details fit. In King's own journal there is an account of Cook's imprudent and futile three mile run in search of a pair of tongs and a chisel, ending in idle threats and the mockery of the crowd – a scene illustrating Cook's uncertain temper and in some respects anticipating the extravagant actions of the next day. Samwell glides over this part of the story because he is keen to emphasise two constant elements in his version of it. The first is the persistence of Hawai'ian thefts, as frequent on the first visit to the bay as now, when the *Resolution* returned to fix its mast. The second is the standard practice of Cook with regard to missing property, namely to pursue the thieves vigorously and, if the items were not returned, to destroy goods and take hostages. Even if it were possible to say that a three mile run and bickering with a jeering populace were standard practice, it is authoritatively reported by King that naval property on the first visit was sacrosanct: 'We enjoyd a tranquility about our Dwelling that was the very reverse to other places in these Sea's'.³ But when the British came back to repair their mast it was different. Clerke, now Samwell's own captain, wrote, 'Ever since our arrival here upon this our second visit we have observ'd in the Natives a stronger propensity to theft then we had reason to complain of during our former stay; every day produc'd more numerous and more audacious depredations'.⁴ But here is Samwell quite adamant in stating the contrary: 'There appeared no change in the disposition or behaviour of the inhabitants. I saw

² Fitzpatrick, *Death of Captain Cook ... by David Samwell*, 53.

³ James Cook, *The Voyage of the Resolution and Discovery* (2 vols., J C Beaglehole, ed., Cambridge, 1967), I, 508.

⁴ Cook, *The Voyage of the Resolution and Discovery*, I, 531.

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nothing that could induce me to think, that they were displeased with our return or jealous of the intention of our second visit.’ He added, ‘Thieving, which gave rise to the whole, they were equally guilty of, in our first and second visits’.⁵ He is similarly assertive, against good evidence to the contrary, when he says that Cook’s precautions against sexual contact prevented the spread of venereal disease, a claim even Cook would have disputed, as Thomas points out.⁶

Samwell ends his narrative with an assurance of its authenticity, ‘A strict regard to truth ... compelled me to the insertion of these facts, which I have offered merely as facts’.⁷ That there may be Gulliverian strain to such candour is a suspicion allayed neither by Samwell’s contradictions of what were generally agreed to be the facts, nor by the next part of the sentence: ‘esteeming it the part of a faithful historian, “to extenuate nothing, nor set down ought in malice”’.⁸ If Cook is some kind of Othello, and Samwell the historian Othello calls for just before he kills himself, then what purpose would the facts serve except to dramatise a story of misplaced passion and mistaken conclusions? Samwell was a poet as well as a surgeon, knowledgeable about Welsh bardic poetry and familiar with the strange mythology of Iolo Morganwg concerning the Celtic origins of the Mandan tribe of North American Indians, so it was not unlikely that he believed facts to have no weight without proper rhetorical management. Nevertheless, in talking of the importance of a strictly factual account, he touched on a fundamental element in the business of this kind of voyaging.

When he first set out in the *Endeavour* Cook’s instructions contained this important direction from the Lords Commissioners of the Admiralty: ‘You are, by all opportunities to send to our Secretary, for our information, Accounts of your Proceedings, and Copies of the Surveys and Drawings you shall have made; and upon your arrival in England, you are immediately to repair to this Office in order to lay before us a full Account of your Proceedings in the whole course of your Voyage’.⁹

⁵ Fitzpatrick, *Death of Captain Cook ... by David Samwell*, 68, 78.

⁶ Fitzpatrick, *Death of Captain Cook ... by David Samwell*, 84-5, 57.

⁷ Fitzpatrick, *Death of Captain Cook ... by David Samwell*, 77.

⁸ Fitzpatrick, *Death of Captain Cook ... by David Samwell*, 77.

⁹ James Cook, *The journal of the voyage of the Endeavour* (J C Beaglehole, ed., Cambridge, 1955), ccxxiii-iv.

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This full account included the history of the consumption or loss of every item of property on the ship, money spent in foreign ports, the effect of certain anti-scorbutic supplements, the conduct of astronomical and hydrographical experiments, as well as a daily list of coordinates, winds, soundings, compass variations, and punishments, all set down in the log. Together with the commander's, all other journals kept on the ship were to be collected and rendered up for inspection along with the log. A voyage was a sort of vast experiment, the exactness of whose report was critical to its success: and this report was ultimately a narrative, a digest of the various accounts of what had actually happened far away from home. Having been much embarrassed by the editorial alterations and insertions in Hawkesworth's account of his first voyage, Cook was clearly aware of what was required of him when he set out on his second, describing himself not as an author, 'but a man Zealously employed in the Service of his Country, and obliged to give the best account he is able of his proceedings'. So he starts by describing his vessel, its dimensions, origins and contents: 'It will be necessary to add here some account of its equipment, and of some other matters equally interesting'.¹⁰ From the most spectacular event to the most banal detail there is a bond, for each has a part to play in the 'full Account' of the proceedings.

The failure for fully five years to place such an account of Cook's third voyage before the public was a shameful omission for all concerned, but particularly for the eyewitnesses of Cook's death. In all their attempts to tell the story tragedy rubbed shoulders with comedy, the inevitable with the accidental, benevolence with cruelty, and punctuality with diffidence: none of it made total sense. This is why the event is, as Nick Thomas says, 'perennially contentious', or more dramatically that it has, 'like an incurable wound, broken open from time to time ever since'.¹¹ No matter how contemptible modern anthropologists such as Obeyesekere and Sahlins may find Cook's so-called achievements in these seas, whenever they try to clear the narrative of his death from confusion they join

¹⁰ John Hawkesworth ed., *An account of the voyages and discoveries in the Southern Hemisphere* (3 vols., London, 1773); James Cook, *A voyage towards the South Pole and round the World* (2 vols., London, 1777), vol. 1, xxxvi.

¹¹ Fitzpatrick, *Death of Captain Cook ... by David Samwell*, 49; Glyn Williams, *The death of Captain Cook: a hero made and unmade*, 40.

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everyone else who has failed to give an adequate account of the affair, and thicken a mystery they hoped to dispel. The Lords Commissioners of the Admiralty turned to John Douglas to supply a full account, and the questionable coherence of the story he produced is what concerns Glyn Williams.

His analysis begins with the missing pages of Cook's journal and his log. Cook's holograph journal ends on 6 January 1779 two thirds down the page, while Cook is still at sea off the southern end of Hawai'i, more than a week away from the landing at Kealakekua Bay. His holograph log ends on 17 January, three quarters down the page and mid-way through the first day's events on the beach. That is to say Cook records that he was taken to the *heiau* or 'Morai' of Hikiau, but no more. Assuming that Cook kept a daily log, but wrote up the journal intermittently, when he had time and sufficient hindsight to make the events of his cruise intelligible for the public he knew would eventually read it, then the missing pages of the log are the chief enigma. The place on the page at which it ends suggests that it was a deliberate decision to stop writing on that particular sheet. So we are left to assume either that Cook, neglecting one of the most cardinal rules of the service, stopped keeping a daily log, or that he was keeping it on loose sheets like those that survive, only there must have been more of them. But if there were more they were not continuous with this log, which stops before the end of the page. There are references to two volumes of the log which Douglas was known to have worked from, and would have been included in the three packets that the Admiralty sent to Douglas on 14 November 1780. Soon afterwards at least one of these packets, containing loose MSS, went missing. On one occasion Douglas appears to quote from an entry for 17 January not contained in the extant log, although it may well have been Douglas's own framing of what he imagined Cook might have thought at the time. But it is certain that there are now no traces of Cook's own firsthand impressions, in his own hand, from 18 January until the day of his death, 14 February. Williams is left finally with two alternatives. Either Douglas and the Admiralty between them (for it is unlikely he would have had the temerity to do it on his own) destroyed the missing pages of the log and possibly the journal – an interpretation favoured by Obeyesekere. Salmond points the finger at Clerke who, according to Samwell, got rid of the letters of complaint

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against Williamson and, armed with a precedent for what Williams calls 'a weeding of the record' went on to expunge the last portion of his commander's journal.¹² Or Cook himself was responsible for what is missing, not by destroying it but by never writing it. In which case, what could impel him to neglect his prime duty of giving a full account when half way through the description of an event of which he had perfect knowledge? While favouring the explanation of a conspiracy between Douglas and the Admiralty, Williams has to imagine a reason for their secret censorship of the Cook papers, a reason that might do equally well for Cook's own reticence. And what would it be?

There are three categories into which Cook non-heroic behaviour falls and which Douglas might have wished to airbrush for the official account. These are his passionate and undignified response to thefts; his intemperate and sometimes inhumane treatment of thieves; and the readiness with which he took on the role of a Hawai'ian god. In the matter of theft Cook had reacted far more violently elsewhere, in Tonga and Mo'orea for instance, by torturing the offenders and burning canoes and villages. Besides, in defence of all property belonging to the king, Cook was in his own eyes being faithful to the material of the full account: if he could not explain the disappearance of cutters and tongs, he could not report the voyage in the manner required by his masters. It was notable that Cook treated thefts of personal property much more lightly than that of equipment marked with the broad arrow. As for the punishments he decreed, they were undoubtedly cruel and unjust but his rationale was good: he could not replace what went missing therefore he had to use the only deterrents at his disposal; and his most reliable one was hostage-taking, as Samwell points out. So his attempt to carry Kalani'opu'u on board the *Resolution* in order to force the return of the cutter was certainly not an unusual step for him; and Williams emphasizes how important the cutter was. There is nothing here that is really contentious except the suggestion that Cook was increasingly unable to control his temper, hence the three-mile run. There have been many attempts to explain why this should be, usually concerning his time at sea and the state of his physical and mental health. If one were to look for a local reason, it would lie in the difference between the first visit, when there were no thefts, and the second, when there were many. Perhaps

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Cook found this especially insulting. However, there seems no reason to destroy a log, or to stop one writing one, in order to cover up his methods of retrieving property: these were already in the record.

* * * * *

At first sight the Lono worship seems to be no different. It is not clear for instance whether Cook was being installed as an incarnate divinity, as a representative or idol of the god, or as resurrected scion of Lono’s chiefly line. This may explain why witnesses talked in qualified terms of ‘something of divinity’ and actions ‘approaching adoration’, as if aware of the representational function of what their commander was performing.¹³ Cook’s own account of the *inasi* festival conducted by the chief Paulaho in Tonga is extraordinarily detailed, coinciding with the description of his unbound hair and nakedness, and seems in every respect as strange, or scandalous, as anything that happened in Hawai’i. Besides, if indulging the locals in a few ceremonies ensured a rich and steady stream of food for his people, surely it was prudent to comply. What was more, the *tapu* placed upon their camp and ship guaranteed for the first time in Polynesia the preservation of naval property from theft. But perhaps there was something more. An intriguing possibility seems to lurk under Nick Thomas’s adjective for Cook’s ethnographic curiosity: *rapacious* (‘In Tonga . . . his curiosity was particularly rapacious’).¹⁴ What he seems so eager to seize in the *inasi* is some understanding of things that represent other things—non-facts, such as sticks that stand for yams, baskets of fish and fruit presented as emblems of human bodies—and what he enjoys particularly is participating in a show where everyone is a figure in the drama: ‘Everyone was excluded but . . . those who acted a part’.¹⁵ Regardless of whether such a scene was scandalous, it was not fit for the full account because it consisted of things that were distinctly not facts: emblems, shows, performances.

¹² Williams, *The death of Captain Cook*, 54

¹³ Cook, *The voyage of the Resolution and Discovery*, vol. 2, 1162; Williams, *The death of Captain Cook*, 28.

¹⁴ Fitzpatrick, *Death of Captain Cook ... by David Samwell*, 44.

¹⁵ Cook, *The voyage of the Resolution and Discovery*, vol. 1, 154.

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If one were to search Cook's accounts for an example of excitement resembling this of the *inasi* and, by implication, the Lono installations, it might be found in an entry concerning the discovery of unimportant things that Cook makes in his *Endeavour* journal, when he notes, 'Was it not for the pleasure which natruly results to a Man from being the first discoverer, even it if was nothing more than Sands and Shoals, this service would be insupportable'.¹⁶ Beaglehole distinguishes it from all others: 'There is no more interesting and significant passage in all Cook than this. . . . It is not really a public utterance at all'.¹⁷ Instead it seems to be a private memorandum concerning the property not of the Navy but of Cook himself, something he has found out for himself and made his very own, whose discovery has given him intense pleasure. Now if it were pleasure of this order that the Lono ceremonies afforded him, possibly he thought it pointless to record it in the full account, and stopped writing about it because its significance concerned him alone. But if he did write it up, it could not have escaped the notice of Douglas and the Admiralty that it was, as Beaglehole puts it, a private utterance and not for public consumption. Who knows?

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¹⁶ Cook, *Journal of the Endeavour*, 380.

¹⁷ Cook, *The journal of the voyage of the Endeavour*, clvii.

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Bernadette Bensaude-Vincent and Christine Blondel eds., *Science and spectacle in the European Enlightenment*, Aldershot, Ashgate, 2008, pp. xi + 164; ISBN 978-0-7546-6370-6, £55.00 or £49.50 online.

Among historians of science there has been a growing fascination with the diversity of sites where scientific knowledge has been produced and especially where and how it has been presented to the public. The ten essays that make up this attractive book take us on tour across Europe during the eighteenth century, identifying the many locations where science found audiences as never before. This could be through the agency of learned societies, provincial academies and teaching institutions, but also out on the streets – in the workshops of instrument makers and popular fairs. It is now more than twenty-five years since Simon Schaffer published his seminal article on the public lecturers in eighteenth-century Britain who wooed their audiences with spectacular demonstrations of the forces of nature, offending sensitive souls who saw presumption in their showmanship (*History of Science*, 21 [1983], 1-43). In the intervening period we have learnt more about such itinerant figures as the Englishmen Stephen Demaimbry and Benjamin Martin, the Italians Laura Bassi and Giacomo Bianchi, and the Frenchman Francois Bienvenu, together with others who crossed national boundaries in their proselytising for science.

It is science as entertainment that dominates the investigation in *Science and spectacle* as we encounter the flamboyant figures who were masters of sparks, smells and explosions. As the editors note in their introduction, everything from air pumps to electrical machines, from magic mirrors to defecating automata, from mechanical orreries to hot-air balloons were used to impress. From Cistercian monastery to the hall of mirrors at Versailles, Jean Antoine Nollet famously electrified his volunteers with a shock to more than their sensibilities.

The motif of science as theatre, which recurs throughout the volume, is developed by Larry Stewart in a fine opening essay in which the expansion of a laboratory network in Britain is correlated with a broadening experience of manufacturing processes. Science lent itself to

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theatrical display as well as to claims for utility. The theatricality of the French chemist G F Rouelle, who put on an immensely popular chemistry course at the Jardin du Roy between 1742 and 1768, receives a sophisticated commentary from Lissa Roberts who observes, as do other contributors, that in such settings people from almost every rank of society could gather for entertainment, much as they might at a Parisian fair. In a valuable essay on what was meant in France by *physique amusante*, Jessica Riskin shows how amusement came to mean more than a beguiling diversion. For many science popularisers the aim was to educate as well as titillate. This was eminently true of Joseph Priestley, who enlisted the latest scientific resources in his assault on superstition.

For readers of *Enlightenment and Dissent* the chapter on Priestley by Jan Golinski will be of particular interest because it traces the manner in which the great champion of democratic experiment turned his pneumatic chemistry into theatre – a theatre of the ‘sublime’. By contrast with Edmund Burke’s treatment, Priestley divested the sublime of any experience of pain or apprehension. It was a wholly positive experience, caused by sentiments that related to great objects and requiring great effort of mind. To excite curiosity and surprise in one’s audience transcended the aim merely to please or to terrify. Science was a serious matter, its progress under the jurisdiction of Providence. Priestley’s enthusiasm for his gases and their beneficent properties was infectious, persuading such popular science lecturers as Adam Walker and John Warltire to repeat his experiments in their public performances.

The two editors of this collection have independently done excellent work on the popularisation and vulgarisation of science. In bringing this particular project to fruition, they have materially enhanced our understanding of how science was promoted in different countries (England, France, Italy and Germany) and in different Enlightenment contexts. The emphasis on experimental demonstrations in so many public performances, and the innovative instruments that made them possible, served to reinforce an epistemology in which sense experience gained the ascendancy over other routes to knowledge. With respect to religious authority the consequences could be ambivalent. Bensaude-Vincent and Blondel note that ‘the multiple cultures of sciences favoured rational world-views that competed with religious belief and traditional

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notions of political order.’ On the other hand, as they also recognise, clergymen scientists such as Nollet, Priestley and the crystallographer R-J Hauy saw their public demonstrations as a way of displaying God’s majesty and power.

One of the reasons why *Science and spectacle* is so revealing is that it exposes a large number of performances and practices, once integral components of science, that were to be de-legitimised in the nineteenth century. As the editors insist, it is no use bringing to the scientific cultures of the Enlightenment expectations based on the sharp boundaries between academic institutions and the market place, between professionals and amateurs, between research and teaching, between cognition and commerce. These distinctions were blurred in so many eighteenth-century manipulators of nature. We are therefore invited to consider the historical processes that enabled later and more austere scientific authorities to condemn popular, entertaining and lucrative activities as non-scientific. The contrast can perhaps be pressed *too* hard. In undertaking for the nineteenth century what has been undertaken here for the eighteenth, Aileen Fyfe and Bernard Lightman have recently explored the many sites where markets for popular science continued to proliferate. Their *Science in the marketplace: nineteenth-century sites and experiences* (University of Chicago Press, 2007) makes a perfect partner to the essays presented here.

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Christopher Leslie Brown, *Moral capital: foundations of British abolitionism*, Chapel Hill, University of North Carolina Press, 2006, pp. xvi + 480; ISBN 978-0-8078-5698-7, £20.50.

A vast scholarship exists on the nature of Britain’s abolition of the slave trade in 1807. Down to the early twentieth century the story was usually told in terms of Quaker and Evangelical ‘Saints’ such as William Wilberforce having led a crusade against a great national sin. Abolition became well established as a symbol of the enlightened nature of British civilisation and thus helped justify Victorian imperialism. In his 1944 *Capitalism and slavery* the West Indian Marxist Eric Williams launched

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a frontal assault on this orthodox interpretation, arguing that the West India planters started to experience economic decline during the American War of Independence and that changing economic interests caused abolition of the slave trade in 1807 – while planters were struggling, pioneers of the industrial revolution promoted free trade. The Williams thesis provoked an enormous amount of statistical research and debate that is still ongoing. Few scholars now accept the ‘decline thesis’, however, with many studies showing that the West India interest remained robust and wealthy up to the eve of abolition. The Williams thesis has nevertheless had a broad and lasting influence on interpretations of the character of British abolitionism. In short, it is widely assumed that class and capitalism must, in Howard Temperly’s words, have had ‘something to do with it’ (cited in Brown, *Moral capital*, 20). While historians such as Roger Anstey continued to stress the impulse of Evangelical Christianity, others such as David Brion Davis focused on probing connections between British capitalism and antislavery. Seymour Drescher has produced an impressive body of scholarship that points to how a spreading culture of ‘improvement’ through clubs and associations underpinned the rapid rise of abolitionism, with the northern manufacturing towns providing much of the energy.

In *Moral capital* Christopher Brown convincingly shows that abolitionism was not the inevitable result of a march of mind or economic determinism. While the various sources of antislavery thought such as evangelicalism, natural rights and free trade have been scrutinised, Brown notes that such studies cannot explain how antislavery sentiment translated into abolitionist action. Pursuing a detailed examination of abolitionist individuals and their contexts, Brown’s guiding question is: ‘when men and women in late-eighteenth century Britain tried to organise opposition to some aspect of the Atlantic slave system, what were they trying to do?’ (25). The result is a very detailed study of how a conjunction of individuals, interests and impulses sparked abolitionism: ‘viewed historically, antislavery organizing was odd rather than inevitable, a peculiar institution rather than the inevitable outcome of moral and cultural progress’ (30).

There are four parts to this book that discuss in turn the four key themes in Brown’s account of the foundations of British abolitionism. Part I

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outlines the development of 'antislavery without abolitionism' down to the Somerset Case in 1772, which provoked widespread discussion of the nature of slavery and the status of slaves in Britain. The outcome was seen by most to be a vindication of 'British Liberty', but colonial slavery remained untouched and no campaign for abolition of the slave trade developed. Granville Sharp continued to work at undermining slavery in the British Empire, but 'the man was not a movement' (100). Part II discusses the impact of the American Revolution. Brown thinks that while Eric Williams's stress on economics led a generation of historians down a blind alley, he was right to see the American Revolution as a turning point in the history of British slavery. Widespread debate over liberty and rights and the growing number of slaves liberating themselves by running to the British army turned slavery into a political issue and powerful symbol. British criticism of American slaveholders like Jefferson justifying their rebellion in the name of liberty and natural rights in turn prompted reflection upon the compatibility of British liberty and West Indian slavery. Part III discusses the development of various alternatives to abolition. Before and during the American War a number of proposals were drawn up with an eye to having the imperial state improve the condition of slaves through better regulation, and in some cases gradual emancipation. In doing so figures such as Granville Sharp and Edmund Burke (who drafted a 'Negro Code' in 1780) grappled with a tension between their commitment to the rights of colonial assemblies and their desire to see the imperial state impose regulations that would improve the lives of slaves. Defeat by the American revolutionaries undermined confidence in the capacity of the imperial state to exert control over its Atlantic colonies and fostered anxiety about the moral fibre of the British Empire. In the years following the war attention turned toward schemes for promoting more enlightened forms of commerce with Africa, which included establishing the Sierra Leone colony for free Black loyalists. Abolition of the slave trade emerged as a practical step toward undermining Atlantic slavery and one that was politically possible. Part IV examines how the campaign against the slave trade began because certain groups and individuals decided to organise and devote a considerable amount of energy to the task. Here Brown to some extent returns to the traditional story of the 'Saints', but depicts them in a more

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realistic and nuanced manner. In doing so he shows how abolitionism was to a large extent embraced as an aid to achieving other ends. Evangelicals saw it as ‘an opening salvo in a wider campaign against nominal Christianity’ (302) and Quakers found organising against the slave trade as a way to revitalise their piety. Influenced by new proto-romantic conceptions of the self, the young Thomas Clarkson found in abolitionism a great cause through which he could make a heroic name for himself. Privately complaining about the cautiousness of the Quakers, Clarkson provided their organisational structure with a ‘moral steam-engine’ (in Coleridge’s words). Abolitionism spread quickly through Britain’s seedbed of associations and latent antislavery sentiment. Brown sees the timing as fortuitous:

The opening that arose in the 1780s easily could have been missed. An antislavery movement that coalesced in May 1791, instead of May 1787, soon would have been associated with revolution in France and insurrection in Saint Domingue rather than patriotism and Christianity, an association that would have hindered the prospects for a successful appeal to Parliament and the public for decades to come. What would have been the fate of antislavery impulses in and around the Atlantic world during the nineteenth century without the ideological support provided by a well-established antislavery movement in the British Isles, without its reputation for moral excellence, and without its evidence of success? (461)

Nobody interested in slavery and abolition can ignore this detailed and elegantly written monograph. As Brown’s book stops at May 1787 readers of *Enlightenment and Dissent* will find only passing references to some Rational Dissenting reformers. While Rational Dissenters played an important role spreading and sustaining abolitionism, they provide only scattered expressions of antislavery sentiment during the American War. Preoccupied with religious and political reform, their most important contribution was to help pioneer the tactics and organisational structure of extra-parliamentary reform that abolitionism adopted and successfully expanded. *Moral capital* will, unfortunately, to some extent reinforce the traditional emphasis on Quaker and Evangelical ‘Saints’, and perpetuate neglect of the role of ‘rational Christians’. Richard Price is depicted as little interested in the plight of slaves, something I have tried to discuss

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in more detail in a forthcoming article in the journal *Slavery and Abolition*. Brown does not note that Thomas Clarkson's friends suspected he 'inclined to Unitarian opinions' [Katherine Plymley's diary cited in E Wilson, *Thomas Clarkson: a biography* (1989), 108]. At Cambridge Peter Peckard, a heterodox friend of Edmund Law and John Jebb who wrote in defence of religious and civil liberty, preached a sermon against the slave trade and set the essay question that inspired Clarkson's interest in the issue, but he receives only two passing mentions in this book. While *Moral capital* provides a nuanced account that greatly enhances our understanding of the foundations of British abolitionism, work remains to be done on the role of rational Christians.

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Joyce Chumbley and Leo Zonneveld, eds., *Thomas Paine: in search of the common good*. Nottingham, Spokesman Books, 2009, pp. 144; ISBN 978-085-124-762-5, £12.

This is a curious book. Published on behalf of the University of Peace, founded in 1980 in Costa Rica under the auspices of the United Nations, it includes essays that were presented at a conference held at the U.N. more than 20 years ago under the auspices of its Peace Studies Unit. With the passage of time, they are now badly dated and even quaint in that their authors – described by the co-editors as Paine 'enthusiasts' – have not revised them since they read them to commemorate what was at the time the 250th anniversary of the birth of Thomas Paine. Nor have they taken into consideration the Paine scholarship that has developed since 1987. In fact, it appears the essays were not necessarily meant for publication in that one of the co-editors, Joyce Chumbley, actually transcribed them from the audiotapes that recorded the presentations. The editors tell us that they are publishing these essays now to memorialise the 200th anniversary of Paine's death.

Included in the collection are essays by both well-known and respected historians such as Eric Foner, Sean Wilentz, the late Ian Dyck, and Bernard Vincent, mixed in with contributions by non-historians, members of the Thomas Paine Society such as Michael Foot (leader of the U.K.

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Labour Party in the early 1980s), U.N. employees, and others. Co-editor Chumbley is described in the notes as remarkably versatile. To grasp the full breadth of her background, the description reads as follows: ‘Employment Specialist for Older Workers, Independent Researcher and Writer, Climate and Environmental Campaigner, Arts Council Director, Educational Consultant, College Instructor and Dean ... idea composer ... co-learner ... wholistic networker... impresaria of celebrations... globalist.’ This is an exhausting list of accomplishments for any one person. Her co-editor, Leo Zonneveld, founder and a director of the United Teilhard Trust, which co-sponsored the 1987 colloquium, designed the event to focus on world peace. It was the second in a series held by the Trust to commemorate the life and achievements of Pierre Teilhard de Chardin, the controversial French philosopher and theologian who had difficulties with the Vatican over his views of evolution and phenomenology.

The contributions by the historians named above have basically appeared elsewhere in their publications: Foner explicitly tells us, for example, that his essay is based on his 1976 work *Tom Paine and revolutionary America*, and Dyck’s piece reads like his contribution in his collection *Citizen of the world: essays on Thomas Paine*. The opening address by Foot contains some ideas he included in his edition of Paine’s works that he produced with Isaac Kramnick, but also his immediate thoughts about the beginning of the fledgling policy of *perestroika* (openness) that Mikhail Gorbachev was bringing into being in the Soviet Union just before its collapse four years later. Reminiscing about *perestroika*, Gorbachev, the Soviet Union, Margaret Thatcher, and Ronald Reagan seems so very long ago in an age of Barack Obama and Gordon Brown. Vincent is widely known as a Paine scholar with the publication of his 1987 biography and later essay collections. Wilentz has included the most original piece, giving us a brief glimpse of Paine’s legacy in England and America. Perhaps the Paine legacy deserves a full-scale, book-length treatment along the lines undertaken for Alexander Hamilton in 2002 by Stephen Knott and for Thomas Jefferson in 2006 by Francis Cogliano. In this way, Wilentz’s piece is the most tantalizing of the twelve essays.

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The remaining ones are thin on providing readers with new information on Paine unless this book is the only one a person would ever read about his life and times. More valuable are books published since 1987 by Gregory Claeys, Jack Fruchtman, John Keane, Edward Larson, Craig Nelson, and Harvey Kaye. As it stands, this collection commemorating an event from almost twenty-five years ago is a curiosity, though it does represent a testament to the enthusiasm that Thomas Paine continues to elicit among his worldwide followers two hundred years after his death.

Jack Fruchtman
Towson University

G M Ditchfield ed., *The letters of Theophilus Lindsey (1723-1808), volume 1, 1747-1788*, Woodbridge, Suffolk, Boydell Press for the Church of England Record Society, vol. 15, 2007, pp. ci + 570; ISBN 978-1-84383-344-4, £90.

Theophilus Lindsey is an important figure in the eighteenth century, his resignation in 1773 as rector of Catterick on the rejection of the Feathers Tavern Petition by the House of Commons was a defining moment in the religious history of the age. Before Lindsey, anti-Trinitarians were dangerous and secretive Arians and Socinians; after Lindsey they were Unitarians who were clearly focused on the objective of wider toleration. Lindsey was one of those Latitudinarian Anglicans who came to inhabit the theological spectrum beyond Benjamin Hoadly and Samuel Clarke. Undoubtedly influenced by Francis Blackburne, he staked his career in the Church on the goal of relaxing the strictures of clerical subscription to the Thirty Nine Articles of the Church of England. His aim was clearly to change the Church from within and to make it broad enough theologically to embrace Arians and Socinians. Having failed to do so, Lindsey suffered poverty and privation because he admitted that he had become a Unitarian. He was rescued from destitution by the generosity of friends who built the Essex Street chapel for him in 1778. Lindsey published his *Apology*, explaining why he had abandoned orthodoxy for Unitarianism, in 1774, and within a year it had run through four editions. His arguments were sufficiently compelling for other Latitudinarians, like John Disney, to follow him in seceding from the Church. To Anglicans,

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Lindsey became a *bête noir*, a traitor and enemy; for Dissenters, like Joseph Priestley, he became a welcome recruit from Anglicanism.

All of this points to the importance of the project to publish Lindsey's letters. Providing a window onto Lindsey's thought is an incredibly useful role for this collection. There can be few historians as well equipped to undertake this study as Grayson Ditchfield. Professor Ditchfield has been working on late eighteenth century heterodoxy and Unitarianism for more than forty years. He has written widely on Lindsey and Unitarianism, and has already edited Lindsey's letters to Christopher Wyvill.

This first, of two volumes, covers the period from 1747 to 1788, and includes 380 letters. These letters divide naturally into three groups: the first 69 are to aristocratic friends and patrons, including Frances, Duchess of Somerset, Selina, Countess of Huntingdon and John, Lord Rawdon. The second group is to sympathetic clergy and others such as John Jebb, William Tayleur and William Turner. The third group of letters are, usually individual, or small numbers of letters to a wide range of correspondents, including Richard Price, Henry Toulmin and Bishop Markham of Chester. The collection includes all the instruments for scholarly use (except an index which is promised for volume 2), including: a seventy page introduction to Lindsey's life and career to 1788; a discussion of the nature of Lindsey's correspondence (including, very helpfully, how the collection fits with earlier publications of Lindsey's letters); short biographies of the recipients of Lindsey's letters; a description of the editorial method, and extensive notes following each letter. In other words, when complete with volume 2, this collection will take an important place in the scholarly resources of the period.

Lindsey emerges from Ditchfield's introductory essay as a controversialist who probably would have expanded the bounds of the Church of England to enable him to remain within it, if he could. One influence on Lindsey that has previously been a source of uncertainty is Lindsey's evangelicalism, which was not shared with many other Latitudinarians. Ditchfield explores this issue well, showing how Lindsey's network of patronage and family connections drew him to the evangelical party. Lindsey's peregrinations of conscience are ably traced by Ditchfield, as are Lindsey's commitment to his pastoral role as a clergyman. For Ditchfield, Lindsey was a man motivated by conscience

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and theological scruple. He clearly wanted to bring other like-minded Anglicans with him when he left the Church in 1773. Once separate from the Church, Lindsey had the headache of how to sustain a single-chapel denomination. But he had fewer problems than most in this situation as his chapel appealed to the middle and affluent classes. Tantalisingly, Ditchfield ends his first volume before the French Revolution, so we have to look to the second volume for a full exposition of Lindsey's *Reply to Paine's 'Age of Reason'* and his reaction to the Revolution.

Paradoxically, in the letters themselves, as Ditchfield points out – and in contrast to some of his published work - Lindsey was more dogmatic and adamant than in his books. While this might seem surprising, the answer is clearly because, in most cases, Lindsey was writing to friends and supporters and therefore he was able to reveal his true thoughts. Whereas in most of his published works he was seeking to persuade the open-minded to adopt his viewpoint. Lindsey was also capable of changing his register of language, writing in very different and deferential tones to his noble friends and patrons, than those in which he wrote to closer friends and fellow travellers.

Reviewing half a work, especially like this which lacks an index, is always likely to produce a provisional opinion. However it is clear from this first volume that Grayson Ditchfield has made a remarkable addition to our knowledge of this crucial period, and of a central figure within it. If the second volume reaches up to the high standards of scholarship of the first, the *Letters of Theophilus Lindsey* will be an indispensable tool for historians for generations to come.

William Gibson,
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Mary Hilton and Jill Shefrin eds., *Educating the child in Enlightenment Britain: beliefs, cultures, practices*, Farnham, Ashgate, 2009, pp. ix + 243; ISBN 978-0-7546-6460-4, £55.00, online £49.50.

An arresting collection which succeeds in its goal of posing a challenge to more traditional approaches to the history of education and, instead, understanding it as an aspect of the process by which culture was

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transmitted to young people. Based on a conference, 'Education and Culture in the Long Eighteenth Century', held at Cambridge in 2005, this book begins with a methodological introduction which draws attention to flaws in conventional work, notably the gender bias arising from the extent to which more boys at every level of society attended large educational institutions. Unlike all too many introductions, this is both substantive and successfully links the contributions.

Sophia Woodley considers the debate between private and public education in Britain from 1760 to 1800. She shows that both radical and religious theories of home education reached their fullest development in the late eighteenth century, and that these theories relate to a vibrant philosophical debate that had consequences beyond the merely educational. Considering the educational agenda of Hannah More, her biographer Anne Stott, indicates that More believed that education was a necessary step on the road to virtue. Along with her fellow Clapham Evangelicals, More was within a Christian Enlightenment tradition of rational and humane education, designed to produce a piety that was sober as well as heartfelt. Assessing female educators and Methodist culture, Mary Clare Martin suggests that the vision of Christian communities, which included the young as a means to regenerate society, provided a much more powerful and pro-active vision of the potential of childhood than Rousseau's emphasis on the need to protect the young from the flawed adult world. Carol Percy discusses grammar and girls' schools, while Michèle Cohen probes sociability and conversation in education. Conversation is presented as a structural element of polite culture. Written familiar conversations became a very successful mode of teaching. Jennifer Mori brings in the relationship between diplomats and education through the Grand Tour. Maurice Whitehead considers English Jesuit education, while Deirdre Raftery discusses English education of the Irish poor as a form of cultural colonisation. Jill Shefrin uses the publishing market to throw light on educational practice, and M O Grenby probes children's use of educational books, not least highlighting the extra-textual marks scribbled into children's books. A first-rate volume that is of considerable value, both for content and for methodology.

Jeremy Black
University of Exeter

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Stephen Johnson, *The invention of air: a story of science, faith revolution, and the birth of America*, New York, Riverhead Books, pp. xvi + 254. ISBN: 1594488525, \$25.95.

This is a work in the popularisation of science and its history. It offers the general reader an account of Joseph Priestley's 'invention of air'. Steven Johnson's attempt to bridge the gap between specialist scholarship about the past and present-oriented public interest results in a text that sacrifices thematic coherence for a schematic and eclectic survey of disparate issues and interpretations. It also juxtaposes in an incoherent manner traditional historiographical concerns with biographical context and a 'long zoom' model of interpretation based on 'ecosystem theory'. This model links historical events that 'unfold on the scale of years or decades' with 'transformations in the flow of energy' that 'take thousands (or millions) of years to play out' (47). Though the primary focus of his analysis is Priestley's science, Johnson uses it to show how 'Priestley and his peers' engineered 'revolutions in multiple fields: in politics, chemistry, physics, education, and religion'. Interested in the central role Priestley played in 'the great minds of ... the fledgling United States' – Ben Franklin, John Adams, and Thomas Jefferson – Johnson offers an account of 'the Enlightenment and the American Revolution' that considers, among other things, 'the carbon cycle of the planet', the coffeehouse culture of Europe, and 'the emotional dynamics of two friends [Adams and Jefferson] compelled by history to betray each other' (xv-xvi).

Johnson's multifaceted perspective brings together inputs and considerations from 'chemistry, social history, media theory, ecosystem science, [and] geology' in a brief narrative of a little over 200 pages, designed to capture the fleeting attention of modern readers wired into the internet and blogosphere, in which he is a major player (xvi). Presentism, especially in a sensationalist form, comes in handy in such a context and is not far below the surface of Johnson's breathless narrative. It is evident, for example, in the claim that Priestley was the 'Salman Rushdie of Georgian England' and the strained analogy between the coffee-house culture of The Club of Honest Whigs and the 'late-night bender at an industry conference', wherein 'the sharing of essential, potentially lucrative information' is 'stimulated by the chemical cocktail

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of caffeine, alcohol, and nicotine' (8 and 17-18). Johnson also communicates an ambiguous picture of Priestley's science, recycling the hackneyed view of his methodological shortcomings and theoretical inadequacies, while proclaiming him the 'closest thing to a hero in this book' (xiv).

Priestley's heroic status is immediately evident in the 'Prologue', which depicts the old man calmly recording and precisely measuring ocean temperatures and currents on the deck of the *Samson*, while lesser mortals cowered below in the turbulent wake of pestilence, violence, sickness, and meteorological extremes associated with the transatlantic journey from England to America in the eighteenth century. Johnson sees Priestley retracing Franklin's 1775 journey: like his illustrious mentor, Priestley performed scientific experiments and pursued rational inquiry while he sought refuge in the New World from a 'bull's eye' planted on his back by the English political and ecclesiastical establishment. The struggle of the *Samson* to make port in the teeth of 'the immense forces of energy' associated with 'the tight spiral of the waterspout' and the Gulf Stream provides a core metaphor for Priestley's intellectual life and journey. According to Johnson, Priestley's 'great scientific discoveries' in pneumatic chemistry 'involved the cycle of energy flowing through all life on earth'. They were also conducted according to 'the ideal of Enlightenment science', of the triumph of reason over fanaticism, shared by Priestley and Franklin, but now threatened with extinction by the 'vortex' of reaction (11-12).

The bulk of Johnson's text provides a condensed version of the familiar story of the long and tumultuous journey that took Priestley from the provincial periphery, through the industrial and metropolitan centre, of English society to the rural isolation of Pennsylvania. Chapter One outlines Priestley's early electrical experiments and work in the history of science at Warrington and Leeds. It emphasizes the mentoring role of the Club of Honest Whigs in Priestley's scientific career, the influence of Franklin on the formation of his ideas in electricity (and, later, in chemistry), and the role of the *History of electricity* as an important source of the progressive optimism that shaped 'the worldview of the American founders' (35). Chapter Two deals with the 'invention of air' at Leeds and Calne, focusing on 'two great discoveries': the discovery of oxygen gas

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and the role of vegetation in maintaining the balance of nature through the restoration of air vitiated by combustion and animal respiration. Johnson appeals to psychological causes (a 'life-long hunch') and sociological factors ('networks of communication') to explain Priestley's 'hot hand' in the discovery stakes, which he also relates to the machinations of more global, geological forces. Thus, Chapter Three deploys the 'long zoom' model to argue that Priestley was positioned to make the discoveries he made because of his proximity to 'the ancient biomass trapped in those Carboniferous-era coal deposits' that provided England with the 'stockpile of energy' needed for the Industrial Revolution and Priestley with the resultant leisure time and wealth necessary for the life of the mind. Priestley's 'mountain of scientific understanding grew higher in part because it was sitting on an island of coal' (116-117). Chapters Four and Five return to the world of politics and culture, charting the political turmoil that shattered the peace and quiet of Priestley's scientific laboratory in Birmingham, hounded him into exile in America, harassed him under the Alien and Sedition Acts, only to abate when Jefferson assumed the presidency and Priestley came to enjoy the benefits of a form of government he found relatively tolerable.

Johnson's analysis succumbs to what Herbert Butterfield called the 'historian's pathetic fallacy', or the tendency to adopt a retrospective view of the past when addressing a general audience. This tendency shapes Johnson's image of Priestley's science in both a negative and a positive way. The negative image surfaces in Johnson's claim that in the discovery of oxygen, 'Priestley blundered spectacularly in interpreting his findings' because his 'chaotic methodology and his general aversion for theorizing' resulted in an obstinate commitment to the phlogiston theory, 'one of the all-time classics in the history of human error' (55 and 91-92). Contrasting with this long since discredited image of Priestley's role in the Chemical Revolution is the positive, but equally retrospective, characterization of Priestley's 'sprig of mint' experiment, which linked plant respiration to animal life, as the inauguration of a 'new science', which took two centuries to yield the 'word "ecosystem" ... a name for the complex interactions between organisms and their physical environments' (96).

Johnson's use of the ecosystem model of interpretation is not only vague and, at times, vacuous; it is also less innovative than first

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appearances might suggest. Focusing mainly on the rate of growth and direction of Priestley's science, rather than on its cognitive content, Johnson's analysis conforms more to the traditional (Mertonian) problematic of the sociology of science than to the recent innovations engineered by the sociology of scientific knowledge and science studies. When it does approximate to a science studies perspective, it lapses into a form of technological determinism, according to which it was the development of new technologies and techniques, like the air-pump and precision thermometry, that 'shed light on that most invisible of substances' (70). The problem with this analysis is that such innovative techniques played an insignificant role in the development of British pneumatic chemistry, which relied mainly on readily available objects, such as earthen troughs, gun barrels, and clay pipe stems, to reach its observational and conceptual goals. The real *innovation* was conceptual, not technical, and was first made public by William Brownrigg in 1741, when he denied the elementary nature of Air and used the term 'air' to refer to a third state of matter.

If Samuel Johnson judged Priestley an 'evil man', whose support of the colonial uprising 'unsettles everything', Steven Johnson celebrates the American spirit of progress and optimism that 'arrives aboard the *Samson* in 1794', and which sustained Franklin, Adams, and Jefferson in their moments of doubt and darkness (129 and 212). Anachronistic though it may be, it is refreshing to see Priestley reflected positively in the mirror of the New World, rather than as the villain of the political peace and scientific order of the old one.

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Christa Knellwolf and Jane Goodall, eds., *Frankenstein's science: experimentation and discovery in romantic culture, 1780-1830*, Aldershot, Ashgate, 2008, pp. 240; ISBN 978-0-7546-5447-6 £55, online £49.50.

Frankenstein, with seemingly interminable derivations, and even tales of Martian technological conquest, have proved an endless fascination from nineteenth-century novels to current film. In the many versions of these

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legends, technical potential and paranoia merge. Even the version by Percy Bysshe Shelley of *Prometheus unbound*, in which ‘The good want power, but to weep barren tears. The powerful goodness want...,’ held a romantic mirror up to the Enlightenment project, although much less effectively and certainly less lasting than Mary Shelley’s *Frankenstein* which had appeared in 1818. Her monster has been the stuff of fixations since. The latest result is a book of scholarly essays that link the obsession with the beast to the apparent tragedy of scientific ambition. The objective is to place Mary’s monster amidst an apparent popular, and romantic, unease about early modern science and the technical conquest of nature.

There are some remarkable essays here, notably on the expanding boundaries of nineteenth-century science and social reform, by Patricia Fara, Judith Barbour, Christa Knellwolf, Anita Guerrini and Melinda Cooper. Fara attacks the issue of women writers more generally, where insecurities of experimenters reflected the insecurity of assistants, wives and sisters of those philosophers more well known. It is no doubt true that women writers were subject to a general subordination to their male counterparts. However, Mary’s mother, Mary Wollstonecraft, was a person of much renown and, like the Edgeworths, a promoter of female education. This issue was, given the time, a matter of much contention both socially and politically. Even given social and gender privilege, it is also the case that there were many assistants, male and female, who might usefully attract more attention—such as Josiah Wedgwood’s assistant Alexander Chisholm, James Keir’s daughter for whom he wrote a chemical text, and Caroline Herschel whose skill was essential to her brother William’s discoveries. Much of the veil can perhaps be lifted, as Judith Barbour suggests, once we excavate the pedagogical boundary of reading and skill which was fundamental to the late eighteenth century. Likewise, Christa Knellwolf explores the explosion of geographic limits by explorers, both real and imaginative, which undoubtedly raised serious questions about the reach and the limit of scientific progress. Interestingly, both Anita Guerrini and Melinda Cooper address similar boundaries of experimentation and anatomy which would have been available to Mary Shelley’s reading, with much attendant social and political consequence. From the controversy surrounding Francois

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Magendie's challenge to the monopoly of the surgeons and William Lawrence's exploration of comparative anatomy, the creation of Frankenstein as monster and circus freak raised fundamental doubts about the nature of rights attached to humans—a matter obviously of great import that had arisen from the French Revolution.

The exploration of new realms for nature's powers was essential to an emergent Romantic vision. Joan Kirkby searches the link between animal magnetism, promoted by Mesmerists, and the spiritualism of the Swedenborgians. Frankenstein thus is an abject failure, unable to control the spirit world through the laboratory. Similarly, Jane Goodall examines the rise of an 'electrical romanticism', almost as a reaction to the evangelism of Enlightenment electricians like chemist Joseph Priestley. Goodall is immensely provocative, seeing the backlash against Priestley as the background to the ultimate novelistic hostility to Dr. Frankenstein. The Promethean attack on aristocratic privilege was the essential agenda of Priestley, Thomas Beddoes, and many of those who adopted Galvanic and Voltaic experimental practise in a wide range of medical, chemical and electrical therapies. These were the weapons that were to be used against the enemy of a rising barbarism, predicted by Dr. Beddoes, but which also exposed the very trap in which the monstrous lurked. Edmund Burke had raised the alarm in his *Reflections on the revolution in France*. It is obvious from a reading of essays by Allan Hunter on evolution and Erasmus Darwin, and the counterattack by Burke against an age of calculators, that science could be simultaneously socially redemptive or politically disruptive. Ian Jackson provides a brief survey of the spectacle of science, tracing audience to the ill-fated efforts of the electrical instrument maker, Benjamin Martin, and his many successors such as George Adams, Priestley, and Percy Shelley's long enthusiasm for experimental philosophy. This the kind of public passion that Christine Cheater reveals in her study of the vast natural collections of Ashton Lever and John Gould. In the end, however, Robert Markley traces the 'nightmare of evolution' to the fascination with the natural and mechanistic, to the fears of evolutionary implications that caused doubts even for Alfred Russell Wallace and ultimately to H G Wells' challenge to the bourgeois complacency by the Martian intellect. Evolution, even beyond earth, was replete with materialist baggage. But as Frankenstein

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reflected, much lay at the feet of the apparent arrogance of a science that would change the world and of calculators who would unseat a king.

Larry Stewart
University of Saskatchewan

F P Lock, *Edmund Burke: Volume II, 1784-1797*, Oxford University Press, pp. xiv + 605, £110 (2006, hardback ISBN: 978-0-19-820679-8); £35 (2009, paperback ISBN: 978-0-19-954153-9).

The appearance of this volume marks the completion of the most scholarly, detailed and useful biography of that great parliamentarian and political writer, Edmund Burke, that has appeared so far. It is doubtful whether another biography of this particular kind will ever again be needed. Professor Lock is a distinguished professor of English literature, based in Canada, who has written a great deal on the politics and the literary style of major eighteenth-century writers such as Jonathan Swift. In his two-volume biography of Burke he has examined all the printed primary and secondary sources that are available to him, as well as many manuscript sources. He has had to read a vast amount on the politics of the period and a huge number of works interpreting Burke's thought. I did not notice a single relevant modern work on Burke or his context that he has ignored and he has subjected all the voluminous speeches and writings of Burke to the closest scrutiny. He has himself discovered sixty Burke letters to add to the ten volumes of Burke's correspondence previously available to us (and he has published them in three issues of *The English Historical Review* in 1997, 1999 and 2003). He has also previously published a valuable monograph on Burke's *Reflections on the Revolution in France*. His biography follows Burke through his life, week-by-week and almost day-by-day. His political life is naturally to the fore and we have never been provided with so much detail in chronological order about his political activities. Not a single speech by Burke in parliament, not a single work he wrote, and not an intervention he made in the impeachment of Warren Hastings escapes notice or comment. Nor is his personal and private life ignored as we learn a great deal about Burke's health, his at home life, his relations with family members, acquaintances and visitors, and his interest in his small estate.

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This second volume of Lock's biography is dominated by Burke's views on India and his long and intense involvement in the impeachment of Warren Hastings, by his writings on the French Revolution and the war with Revolutionary France, and by his opinions on the Catholic question in Ireland. There is not a speech, pamphlet or major letter of Burke on these subjects that is not brought to the attention of the reader. Burke was enormously well informed in these issues and so is Professor Lock. All readers will be impressed with the breadth of Burke's knowledge and the number of well-judged and well-expressed words he spoke or wrote. Burke's charges against Hastings alone ran to 135,000 words and years later he delivered a speech against Hastings that lasted for almost exactly twenty-seven hours over nine days. He was still writing furiously and at length in his last years, even after his retirement from parliament. Interspersed with the many pages on these major preoccupations of Burke are interesting and valuable discussions of Burke's attitude to other issues that received less of his attention, but that were important to his contemporaries and modern students of his age. The most important of these is Burke's response to the Regency crisis of the late 1780s, but there is also useful discussions on Burke's views on such issues as crime and punishment, the advisability of parliamentary reform, the toleration of Dissenters, the abolition of the slave trade, the persistence of poverty, and the education of young men.

As befits a literary scholar, Professor Lock is excellent on Burke's prose style (I particularly admired his discussion of the merits of Burke's *A letter to a Noble Lord*) and on his abilities as a speaker in parliament. He is also persuasive in his analysis of Burke's arguments and in revealing why Burke's speeches and writings are still read with profit today by many who have no particular interest in the actual issues that provoked Burke into making his comments. Burke is shown repeatedly combining the particular with the general, the immediate with the universal, always embellished with a vast range of supporting evidence and delivered with energy, power and passion. Professor Lock demonstrates why Burke's speeches and writings had such a powerful impact on many of those who heard or read his words and also why these words still resonate with anyone today who is still interested in such general issues as morality, justice, prescription, and human rights. Although Professor Lock does not

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subject Burke's arguments to the depth of analysis he would employ if he had been writing a monograph on Burke's thought, I found his judgments on his writings very persuasive. Much has been written, for example, on Burke as a utilitarian and on Burke on natural law. Lock, rightly in my view, maintains; 'In the contention between those who have interpreted Burke's ideas as emanating from his belief in natural law, and those who have counted him as a utilitarian, both sides have a persuasive case. Being a politician and a rhetorician, not a theorist, when these and other ideas and principles came into conflict, he sought to reconcile them according to circumstances, appealing to history rather than theory' (331). Burke is rightly praised by Professor Lock for the power and profundity of his speeches and writings and Lock amply displays his enormous energy, his commitment, his need to be actively involved in great issues, and his readiness to sacrifice his personal advancement to those principles he undoubtedly held most dearly. He was undoubtedly shaped by his moral principles and his deep sense of natural justice. I would fully endorse Professor Lock's conclusions that Burke was probably the most talented British politician never to reach cabinet rank and that he is more read today than any of his political contemporaries, famous and admired though some of them still are. What helps to make Lock's favourable opinions of Burke so persuasive is his clear recognition of his subject's undoubted weaknesses. On quite a number of occasions he admits that Burke failed to convince his contemporaries with his spoken or written arguments and that he frequently betrayed failings that irritated and alienated those whom he wished to persuade to accept his opinions. He could be 'an irritating know-all' (54), 'incorrigibly self-righteous' (97), 'inflexible and obsessive' (545), and 'his animosity to Pitt [was] so visceral that his usual wit and invention deserted him' (195). His rhetoric could become 'self-indulgent as well as intolerably long-winded' (469) and 'even Burke's friends and associates sometimes found him tiresome and even impossible as a colleague' (546). Burke was never temperate in his antagonisms, was insensitive to the feelings of others, and almost always refused to compromise: 'his sense of rectitude prevented his seeing an opponent's point of view or accepting that different opinions might equally result from honestly held principles or values' (584).

The main strengths of this volume are the depth of Lock's scholarship,

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his decision to write a chronological study in great detail, and the soundness and persuasiveness of his judgments of the merits of Burke's great and numerous speeches and writings. His prose style is also attractive and his book is embellished with some excellent illustrations, especially some of the many caricatures that Burke's career inspired. There are some weaknesses that are the inevitable consequences of Lock's strengths. Because he has decided to write a chronological narrative this means that his comments on such long-running issues as the impeachment of Hastings and Burke's views on the French Revolution and the Revolutionary War keep appearing, disappearing and then re-appearing throughout hundreds of pages of text. Each time these subjects appear they are given quite detailed treatment, but the author then moves on to other subjects before returning to these important issues at a later date in Burke's life. At times this reader at least would have liked a sustained and continuous discussion on these issues until they had been fully covered. Lock's decision to write at such depth on Burke means that he often has no space to set his account in context. Thus, readers will learn much about Burke's views on the impeachment of Hastings, but will discover little about Hastings' views or what modern historians would make of the issues in dispute. Readers will also learn a vast amount about Burke's views on the French Revolution and the need to defeat Jacobinism, but will learn little about the views of Pitt or Fox on these questions, for example, or whether Jacobinism posed the kind of threat that Burke claimed. To profit fully from Lock's labours, a reader needs to possess a considerable amount of prior knowledge. Professor Lock's publisher has not asked or allowed him to provide his readers with a bibliography, and the index is inadequate, although Lock himself has provided the reader with numerous helpful footnotes. I detected a very small number of errors in his book (for example, it should be lodestone not loadstone on page 13, the Duke of Argyll not Argyle on page 53, and Queen Anne did not employ the royal veto in 1709 and the Septennial Act was not passed in 1717, both on page 67) and also a tiny number of typos (on pages 310, 326, 404, 421 and 533). I also do not agree with Professor Lock's views on the elections and the electorate as expressed on pages 16, 201, and 280. It would be unfair, however, to end on a carping note. Given the approach that Professor Lock has chosen to adopt, this is as definitive a biography of Burke as we are ever likely to get. Professor

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Lock has put all students of Burke and of later eighteenth-century Britain in his debt with this wonderfully detailed and enormously persuasive chronological study of Burke's life, political career, and achievements in the spoken and written word. It has been both instructive and pleasurable to read, long though it is. It simply has no competitors as a richly detailed account of Burke's life in chronological format. Despite its price, even in paperback, it should be in every academic library and on the shelves of anyone with a serious interest in a great political speaker and writer.

H T Dickinson
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Michael North, *Material delight and the joy of living: cultural consumption in the age of Enlightenment in Germany*, Aldershot, Ashgate, 2008, pp. 288; ISBN 978-0754658429, £55, online £49.95.

Histories of eighteenth-century cultural consumption have become well-established in recent years, with works by John Brewer, Maxine Berg and others taking us well beyond the confines both of traditional economic histories of goods and production, and of specific studies of particular trades and crafts. In the present volume (first published in German in 2003, now expertly translated by Pamela Selwyn), Michael North sets out to describe the entire range of cultural consumerism in the German-speaking lands during the Enlightenment, indicating the extent to which even smaller university towns and centres of local government acquired leisure industries similar to those that had already existed for some time in thriving cities such as Hamburg. This cultural diversification naturally provided the basis for a growing market in books, newspapers, journals, plays, art and secular music, with the potential of reinforcing the spread of Enlightenment ideas; but North is at pains to explain how diverse this market was, reaching far beyond intellectual or literary interests towards something much more akin to pleasure and sociability for its own sake. This is clear from the range of topics covered: not just print, theatre and opera, but also fashion, luxury and interior decoration, gardens, tea and coffee-shops, concerts and travel (and of course the proliferating journals which explained all this to their readers).

For such a broad agenda, a short book (171 pages of text) naturally will not be able to dig very deep, but North packs a considerable amount of

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information into each chapter, and there is more in the detailed and thorough notes (although, in the regrettable manner of some publishers, these are hidden at the back of the volume, without even a running head to help the reader). Most of the chapters take the form of a short introduction, followed by thematic sections describing key aspects of the market. For example, the chapter on fashion and luxury provides an informative discussion of the way journals and newspapers encouraged demand and expectations, followed by sections outlining significant changes in style brought about by French, English and other trends, attempts from the 1780s to propagate particular German styles without upsetting particular guild interests, and rounding off with some examples from inventories to indicate what is called 'wardrobe realities'. Here, as elsewhere, the emphasis is predominantly (and understandably) on the elite: although North is aware of the need to try to identify the social status and interests of different groups of consumers, this book does not explore the nature of the source material (or the scope for quantification) in sufficient detail to supersede what we already know from more detailed studies of some segments of the market, such as the book trade, fine art and music.

North stresses the breadth and diversity of the cultural market, and its increasing accessibility in urban Germany (both north and south) even for those of only fairly modest disposable income. The coffee-house and the theatre undoubtedly broadened sociability and social interaction, without of course levelling hierarchical or deferential distinctions. The impact of the cultural market on identity-formation is clear also from his examples of cultural transfer: 'German' plays, for example, were more often than not translations or popularised derivatives from French or other European models. How far and in what respects this altered concepts of self and society – raised questions about religious, social, gendered or even political issues, or indeed about the nature of the European Enlightenment itself – is touched only in passing. But anyone interested in the commercial potential of creativity, or in eighteenth-century German material culture, will find this volume both broad in scope and helpful in mapping out the scale of change.

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Karen O'Brien, *Women and Enlightenment in eighteenth-century Britain*, Cambridge, Cambridge University Press, 2009, pp. 318; ISBN-13: 978-0521773492, £50 (hdbk.); ISBN-13: 978-0521774277, £17.99 (pbk.),

'What does history disclose but marks of inferiority', Mary Wollstonecraft bitterly complained in her 1792 *Vindication of the rights of woman*. '[A]nd how few women have emancipated themselves from the galling yoke of sovereign man?' (Mary Wollstonecraft, *A vindication of the rights of woman* London, Penguin edition, 1985 [1792], 119). Such claims could easily lead one to believe that Wollstonecraft held feminism and history to be fundamentally incompatible. Yet as Karen O'Brien insists in her stimulating intellectual history, even this 'gallic philosophess' was unable to resist the eighteenth-century historicist turn. In O'Brien's formulation, in fact, Wollstonecraft was engaged in nothing short of 'a radical rethinking of history and politics', a rethinking that led Wollstonecraft to the unpopular conclusion that, when it came to the treatment of women, hers was but a 'partial' civilization (189-90).

This is just one of the many astute readings that O'Brien introduces in *Women and Enlightenment*, a rigorous exploration of the gendered implications of what O'Brien posits as 'the great discovery of the British Enlightenment', namely 'that there is such a thing as society, that humans are principally intelligible as social beings, and that society itself is subject to change' (1). If the consequences for women of the discovery of society and of human sociability occupy some of O'Brien's attention here, however, it is really the last of these findings – that 'society itself is subject to change' – that is the focus of her book. As O'Brien's analysis of Wollstonecraft makes clear, she is chiefly interested in how enlightened conceptions of history, and especially of the history of women, impacted the way that writers, male and female alike, understood femininity.

Given this thrust, it is perhaps not surprising that O'Brien hones in quite quickly on the Scottish Enlightenment. After a first chapter that traces the emergence, beginning in the early eighteenth century, of a 'Whig Anglican Enlightenment' that was both hospitable to female learning and cognizant of women's potential contributions to the church and state, O'Brien settles in to an absorbing account of those Scottish figures of the

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mid-eighteenth century onwards who launched ‘the most extensive sociological and historical enquiry into the lives of women ever undertaken in Western intellectual history’ (82). Why were Adam Smith and David Hume, as well as their various followers – John Millar, William Alexander, William Robertson – so interested in the history of women? As O’Brien explains, Smith et. al. identified women not only as pivotal players in the transition of societies from barbarism to civility, but also as invaluable gages of the level of civilization already attained. For those men keen to explain the historical development of and interrelationships between manners, morals, laws, and economics, then, women offered a privileged window into the ‘progress of society.’

While much of this is familiar terrain for O’Brien – her previous book, *Narratives of enlightenment*, explored the cosmopolitan dimensions of eighteenth-century historiography – O’Brien takes her interest in conjectural history in new and provocative directions. In her second chapter, she offers detailed analysis of the challenges that Scottish writers encountered in integrating women into their historical narratives. Although most of these men purported to be writing histories of progress, their attention to women necessarily complicated their projects. They wanted to associate ‘the sexual and political subjection of women with early, barbarous phases of development, and good treatment of them with advancement of civilization,’ but struggled to contain women within this linear, improving framework (88). As a result, their accounts of women were frequently marked by ‘paradoxes,’ ‘ambivalences’ and ‘incoherencies.’ These same challenges persisted in the ethnically-specific histories that emerged as an outgrowth of and gentle rebuttal to the universalism of Scottish conjecturalism, the subject of O’Brien’s third and most innovative chapter. In these more avowedly nationalist histories, women were again assigned a prominent role, though not as ‘barometers’ of civility but rather as a means of ‘defin[ing] what was specific and superior about European culture’ and as ‘a point of connection to the best aspects of the past, whether barbarian, medieval or Roman’ (112).

What were the implications of this historicist turn for British women? Clearly, the histories themselves, with their often ambiguous and contradictory treatments of women, do not lend themselves to

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straightforward analysis. That the Scottish philosophers remained largely silent on the question of women's civil and political rights only further frustrates attempts to assess the liberatory potential of stadial history. Yet in Chapters Four through Six, O'Brien convincingly demonstrates that the 'historicising of women' established the necessary preconditions for the elaboration of feminism in the nineteenth century. Catharine Macaulay and Mary Wollstonecraft, O'Brien argues, may have found much to disagree with in Scottish Enlightenment narratives of progress, but their own emancipatory projects depended on the discovery that women evolved (189). The first female historians of the nineteenth century, meanwhile, were equally indebted to the Scottish philosophers, even as they used history as a tool for 'exploring women's relationship to public culture and of articulating their aspirations for greater female prestige, education and rights' (203). The value of the eighteenth-century 'historicising of women', then, lay more in form than in content. The Scottish Enlightenment gave women a history, and thus the ability to revisit and revise that history in the hope of creating better future conditions.

Women and enlightenment eminently succeeds as a nuanced assessment of the Scottish Enlightenment's historiographical impulses, and the significant implications of these impulses for British women, both as agents and imagined subjects. O'Brien is less convincing, though, when she attempts to situate this rich discussion within a broader conversation about what she terms the 'Latitudinarian Enlightenment,' by which she means a broad church tradition that provided Anglican Whigs and Rational Dissenters alike with a common language and interest in promoting 'benevolence, rational moral autonomy and female education as the means of integrating women into a reformed social order' (153). (In this respect, it is telling that O'Brien's 'Introduction' is the least coherent section of her book, and that the work lacks a formal 'Conclusion'). At times, O'Brien suggests that the Scottish conjectural theorists and their interlocutors were working within this Latitudinarian tradition. Yet at other times, she describes Latitudinarianism as a separate, though interrelated strand of Enlightenment thinking. Because O'Brien privileges her treatment of history to such an extent in her narrative, however, the Latitudinarian Enlightenment often gets lost, and does little

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to animate her analysis of women and historiography. Whether 'Latitudinarian' is even the right label to apply to such a diverse cast of characters, working in a wide range of religious, political and intellectual traditions, will itself, no doubt, inspire much debate and discussion.

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Richard B Sher, *The Enlightenment and the book: Scottish authors and their publishers in eighteenth-century Britain, Ireland, and America*, Chicago, University of Chicago Press, 2006, pp. xxvi + 815; ISBN 0 226 75252 6, £25.50.

This is a very fine book that makes an important, wholly original and thoroughly readable contribution to the book history of the Enlightenment. As such, it will be required reading not simply for specialist Enlightenment scholars and book historians but also for readers with a more general interest in the history of ideas and literature in the long eighteenth century. Although some may be put off by its size and occasional complexity, it is eminently navigable, benefiting from a comprehensive 58 page index and thorough cross-referencing to the author's database of Scottish Enlightenment books.

The database is crucial to Sher's whole enterprise, comprising 115 authors and 350 books Sher considers to have been central components of what scholars now term the Scottish Enlightenment. Based on the author's ground-breaking and exhaustive analysis of the *English short-title catalogue*, the database underpins 7 tables of data that will form one of his most enduring achievements. Sher provides researchers in the field with an unprecedented array of data on the publication and reprinting of the books which interest him, complete with information on price and print runs derived from his painstaking analysis of surviving book trade records from the period. Any attempt to identify the precise constituents of a publishing phenomenon such as this are, of course, fraught with difficulty, and every specialist in the field will be able to name at least one book that Sher might have chosen to include. For the present reviewer, Sher's neglect of the regional historiography of the Scottish Enlightenment (books such as David Ure's *History of Rutherglen and*

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East Kilbride (1793), George Ridpath's *Border history* (1776) and Lachlan Shaw's *History of the Province of Moray* (1775), which actually features in an advertisement reproduced from the *London Chronicle* on page 364) represents a particularly unfortunate omission. These books were all written by men associated with the Enlightenment literati; they reflected the intellectual agenda of Sir John Sinclair's collaborative *Statistical account of Scotland* and in their self-consciously provincial character might have allowed Sher to break free from his overwhelming focus on Edinburgh. Entirely more contentious will be Sher's decision to limit his enquiry to books published between the years 1746 and 1800. Such artificial cut-offs are rarely satisfactory, but especially so in this instance when they require the author to omit a number of works that were of central importance to the emergence of the Scottish Enlightenment as it is usually conceived – not least the principal works of Francis Hutcheson and David Hume's seminal *Treatise of human nature*.

Although some critics have complained that Sher's database reduces the Scottish Enlightenment merely to a subjective selection of books, his narrative in reality illuminates a rather more expansive defence of its distinctiveness. Explicitly targeting the notion (particularly associated with the late Roy Porter) that the Scots were merely part of a broader British Enlightenment (19-21), Sher's Scottish Enlightenment is predicated on the sociability, conviviality, and one might even say collegiality enjoyed by its leading protagonists. In this sense, the present study emerges clearly from Sher's earlier book, the influential *Church and university in the Scottish Enlightenment: the moderate literati of Edinburgh* (1985), which explored in astonishing detail the personal relationships and shared experiences that shaped the distinctive intellectual priorities of the Scottish literati. The same themes pervade *The Enlightenment and the book*, but this time Sher reveals the extent to which the publishers and sellers of the books which interest him were fully integrated into the same sociable and personal networks as their authors. Indeed, it is the recovery of the personal lives of publishers that lies at the heart of this book, and Sher is at his best when recounting their 'stories' (608). Along with a small number of English 'outsiders' (380, notably the Dissenters Charles Dilly, Joseph Johnson and George

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Robinson), they were largely Scottish exiles in London such as Thomas Cadell, William Strahan and Andrew Miller acting in collaboration with a small and select group of Edinburgh booksellers. They were for the most part well educated and enjoyed close personal and sociable relationships with the authors whose works they were publishing. In some cases they were even related to key authors, reflecting the complex kinship networks that helped bind the Scottish Enlightenment together. Taking issue with Robert Darnton's mercenary portrayal of booksellers and publishers, Sher insists that the profit motive was just one factor in convincing them to publish Enlightenment texts alongside powerful personal, intellectual and cultural motivations. He contends that 'the great Scottish publishers were far from neutral in their role as cultural brokers' (360), most convincingly in his dramatic revisionist interpretation of William Creech's career – who committed himself completely to publishing the *Statistical account* even though he was fully aware of the financial risks and practical obstacles inherent in such an ambitious project (ironically, Creech was later blamed by Sinclair for its failure to secure a profit).

Sher's main thesis is that the 'publishing revolution' forged by the authors, publishers, printers and booksellers discussed in *The Enlightenment and the book* ensured the impact of the Scottish Enlightenment was 'extensive and enduring' rather than 'local and fleeting' (609). Collaboration between firms in Edinburgh and London helped important new Scottish books find an English audience, while their subsequent reprinting in cheaper formats and by booksellers abroad meant that they circulated even further afield. Indeed, Sher is to be commended for his unusually whole-hearted commitment to the international scope of book history. Dublin becomes 'the hinge on which the Atlantic dissemination of Enlightenment books turned' (502), with the emphasis on its innovatory trade in superior reprint editions rather than (as is more usual) its importance as a source for cheap pirated copy. More dramatically, in recovering the publishing activities of a small number of Scots and Irish émigré publishers in Philadelphia, Sher makes a genuinely significant contribution to our understanding of the American Enlightenment. These booksellers became 'appropriators of the Scottish Enlightenment in America' (556) by subtly rewriting and rearranging

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certain Scottish texts for an American audience, as well by selecting particular texts to reprint over others – with powerful implications for the contemporary impact of Hume and the Common Sense School of Scottish philosophers.

If publishing and reprinting allowed Scottish books (and thus the ideas which were contained in them) to spread widely, this book offers little on the precise dynamics of their consumption. Sher rarely considers who might have bought the books of the Scottish Enlightenment, refusing to engage with recent scholarship on the rise of institutional reading in the form of commercial circulating libraries, private subscription libraries and pedagogical religious libraries. For readers of this journal, for instance, our understanding of the long-term reception of Scottish Enlightenment books by English Dissenters should be enhanced by a project launched by the Dr Williams' Centre for Dissenting Studies and the Sussex Centre for Intellectual History on 'Dissenting Academy Libraries and their Readers 1720-1860'.

More problematically, Sher is not particularly interested in the seemingly crucial question of how readers responded to the distinctive ideas of the Scots literati – who, as Sher repeatedly makes clear, cared deeply about the impact of their ideas on readers, hoping to improve society, change inherited beliefs and enlighten humanity. At the same time, we await comparative research that might demonstrate more thoroughly how unique the publishing arrangements of the Scottish Enlightenment really were, in both the Anglophone and broader international context – how far, for instance, Godwin, Priestley or Kant (and indeed their books) were treated differently by publishers, printers and booksellers than the Scots literati. But it would be churlish to dwell on such shortcomings. *The Enlightenment and the book* will undoubtedly remain a vital reference tool for generations to come, and if it stimulates scholarship in Enlightenment book history, as seems certain, so much the better.

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Ann Thomson, *Bodies of thought: science, religion, and the soul in the early Enlightenment*, Oxford University Press, 2008, pp. x + 293, ISBN13: 978-0-19-923619-0, £60.00.

Ann Thomson's book is an intellectual history of debates about the soul — 'the crucial question for a materialistic interpretation of humans' — in the late seventeenth and first half of the eighteenth centuries. More particularly, the book's concern is 'how ideas cross frontiers and are transformed by their interaction with the conditions of a different culture' (2). The frontier central to Thomson's book is that between England and France (although Holland also figures prominently), and what she aims to show is that the debate about the soul's immateriality assumes a different complexion on different sides of that frontier. Views challenging the soul's immateriality that in France are strongly anti-religious are frequently embedded in religious belief in England, albeit unorthodox.

Thomson complains that unorthodox expressions of belief in accounts of the English debate have too often been taken as 'mere masks for irreligion' (vii). She endeavours to substitute a more nuanced picture that incorporates a closer look not just at science and philosophy, but the medical and, more specifically, physiological inspiration for material conceptions of the soul from speculations on active matter together with the revival of Christian mortalism. While mortalism came in different guises, it could be and was defended scripturally, with immortality following the resurrection of the dead by God's power at the Last Judgment. Earlier in the seventeenth century, as Thomson observes, Hobbes defended a similar view, tying it, however, to a mechanist view of matter and its behaviour. Some versions were compatible with immaterial conceptions of the soul, but those of special interest to Thomson were not. On immaterial conceptions the soul following death sleeps and is inactive until the Resurrection when immortality is finally achieved. They challenge the inference from the soul's immateriality to personal immortality for which the soul's bare survival was held to be insufficient.

Thomson sketches the implications of her multi-disciplinary approach to these issues for accounts of the Enlightenment in an extended introduction. Following a series of cautions about misleading labels and oversimplifications in the use of 'Enlightenment', 'Radical

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Enlightenment', 'materialism' and the like, she describes her objective as 'a better understanding of how views of human nature have changed by looking at attempts to defend a materialistic conception of humans, the conditions in which these attempts were made, and their implications' (26-27).

When Thomson deals with England, she focuses on a special period, 1695 to 1714, marking the end of the Licensing Act and the Hanoverian accession respectively. She later comments on figures who postdate this period such as David Hartley, although Hartley was self-professedly not a materialist, and Joseph Priestley, who took pride in being one and was determined to repatriate the doctrine for Christianity from French atheism.

She reserves the lion's share of attention, however, for earlier debates when high-Church interests felt threatened by a combination of toleration, the use of reason to undermine the mysteries of religion and a latitudinarian hierarchy, seemingly unresponsive to their concerns. The latitudinarian hierarchy, for its part, responded to these pressures, among other ways, by the establishment of the Boyle Lectures, which made a concerted attempt to show that science and philosophy could stand in alliance with religion by demonstrating the immateriality and immortality of the soul. The claimed passivity of matter played a key role in these demonstrations. For matter, so conceived, could account for neither human thought nor human action. Richard Bentley and Samuel Clarke are notable standard bearers for this view.

For Thomson, orthodoxy drew support from two contrasting philosophical traditions: Aristotelianism, which conceptually connected soul and life, and Cartesianism, which severed that connection, but defended a sharp demarcation between an extension-less immaterial soul from which immortality was inferred and a material body. Cartesianism had trouble with animals, where Aristotelianism did not. Aristotelianism sharply distinguished plant and animal functions from reason for which there was a seeming lack of bodily dependence and for which immortality might plausibly be claimed.

It is in her third chapter that Thomson's account comes into its own. There she presents a particularly useful discussion of how seventeenth-century medical theory challenged Bentley's and Clarke's claims, providing a foundation for the notion that matter must possess not only a

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capacity for action, but also for ‘natural perception’ and life with differences of organization accounting for the variety of living functions, vegetative, animal and sensitive. Whatever their intentions, these physiologists signposted a route for rejecting mind-body dualism and developing a non-mechanistic monism. Thomson’s accounts of Francis Glisson’s view of tissue irritability, and Thomas Willis’ account of brain functioning, as well as the opposition from Henry More, Ralph Cudworth and Robert Boyle (who identified their ancient vintage) are illuminating.

Cudworth argued that such theories inexorably lead to atheism. For thoroughly and comprehensively developed, ‘there will be no need either of an Incorporeal Immortal Soul in Men, or a Deity in the Universe’ (quoted by Thomson, 76). For him, the soul’s incorporeal nature and God’s existence march in lock step. Thomson concludes this chapter with remarks on parallel medical discussion in France by Guillaume Lamy and Claude Perrault, critical of Descartes, which later contributed to the French discussion as Glisson and Willis did to the English.

Thomson’s fourth chapter on ‘Mortalists and Materialists’ takes us from the scientific, medical and religious background to the period central to her book. She sketches the views not only of better known figures such as John Toland and Henry Dodwell who occasioned a celebrated debate between Samuel Clarke and Anthony Collins, but also others such as Henry Layton and William Coward. She devotes the lion’s share of attention to these last and to Coward especially, consistent with her interest in the ‘less visible Republic of Letters’ (22). What distinguishes them is not only that they rely on the medical tradition where Toland and Collins, notwithstanding their rejection of the passivity of matter, do not, but also that they belong to the Christian mortalist tradition. When Thomson later turns her attention to Hartley and Priestley, it is to show that they, unlike their French contemporaries, fall within that tradition.

For Thomson, the scholarly attention lavished on Toland and Collins, whom she sees as ‘irreligious “English deists”’, has skewed the picture of controversies about the soul in this period (138). Thomson draws the contrast most sharply when she compares Coward and Toland. She insists that Coward’s critique of an immaterial soul is not an attack on religion, as many contemporaries claimed, but a critique of priestcraft and superstition (109). For him, mortalism is a doctrine that best fits the

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Reformation unlike immaterialism, which reflects influences alien to primitive Christianity. For him, moreover, the whole man, although not the same numerical matter, is resurrected at the final judgment, the doctrine of the soul's immateriality being 'a plain heathenish invention, and not consonant to the principles of philosophy, reason or religion', to quote from the long title of one of his books (quoted by Thomson, 106).

If there is anything missing from this part of Thomson's story, it is that we do not hear about the issue that worried some who claimed otherwise: personal identity. For crucial to the view that a person is liable to rewards and/or punishments in a future state is the assurance that the person supposedly resurrected and the person who died are identical. Samuel Clarke, in his controversy with Anthony Collins, argued that only immaterialism can successfully explain personal identity, since matter is too flux a substance to support it. No coherent sense can be made of resurrection without it. What foundation is there on such a view as Coward's, accordingly, for personal identity? More generally, philosophical readers will wish more attention were devoted to the arguments that lead Coward to a more thorough going materialism than claimed by the physiologists who inspired him. There is also a missed opportunity from the Clarke-Collins debate to comment on an issue of importance to the book, whether perception and intelligence are molecular properties of living substances or functions of their mode of organization. For Clarke, who hearkened back to objections to Hobbes from Henry More and others, consciousness in particular could not be either. If consciousness were a property of molecular components, there would be as many consciousnesses as material particles rather than a single consciousness. But neither could it be an emergent property of organized matter, as Collins argued, because nothing can be a real property of a material substance that is not also a property of each of its parts, a claim Collins strenuously denied.

Chapter five is the swing chapter that discusses the routes by which English debates came to be known in France and the reasons why they tended to take a more irreligious form in France. While there were French sources to support irreligion such as Montaigne's skepticism, Thomson argues that the English debate, contributions from both sides included, did so as well. She rightly focuses on the contribution of Huguenots such

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as Jean Le Clerc, Pierre Des Maizeaux and Pierre Coste to French language periodicals largely published in Holland, given that many of the works on which they commented were not translated into French. The period in the English debate that particularly interests Thomson is the heyday for reports on English books and intellectual life in those periodicals. In the second edition of his Dictionary, for example, Bayle relied on articles by Coste for his comments on Locke's dispute with Stillingfleet on the soul's immateriality. As Thomson acutely observes, accounts of more orthodox views of the soul in English publications by Des Maizeaux and even Le Clerc, whose personal aim was to publicize English apologetic works by the likes of Cudworth and Clarke, had 'the overall effect . . . to demonstrate the difficulties involved in the doctrine of the soul's immateriality and immortality and the contradictory teachings of the Bible' (147). Thomson details the echoes of these debates in works that circulated in clandestine fashion as well.

Chapter six turns to mid-eighteenth century materialism in France. Thomson argues that the usual interpretation of La Mettrie's *L'homme machine*, unduly influenced by the work's title, has distracted attention from its real preoccupations, which are to be found in seventeenth-century debates over the analysis of living matter, the kinds of debates that informed the work of English thinkers like Coward. Thomson situates La Mettrie, 'the most outspoken and deliberately provocative of the eighteenth-century materialists' (180), in the medical tradition: French, Dutch and, significantly, English, Willis in particular. What Thomson emphasizes is that matter for La Mettrie 'possesses its own inherent life or force which, given the right organization, makes it capable of feeling and thought' and that 'humans are not free but determined by their bodily organization' (189). The first of these issues leads into Thomson's review of the debate over reproduction, which, some argued, atheistic materialism was incapable of explaining, although if matter were allowed to possess self-organizing powers that would be a different story. In her account it is also evident that the English thinkers who are repeatedly mentioned as of interest to those who participated in this and related debates are Toland and Collins. The other key figure is Diderot whose connections to English thought are still more apparent. He likewise belongs in the medical tradition. As Thomson puts it in her later epilogue,

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the attention that has been lavished on Helvétius in accounts of the rise of materialism has ‘led to a distorted picture of eighteenth-century materialism which underestimated its exploration of physiology’ (220).

In her concluding epilogue as well as in Chapter 6, Thomson turns to the upshots of the rise of materialist style thinking about the soul: the issues of determinism and its relation to freedom, morals and politics and views about human diversity, although in most cases the conclusions drawn were quite diverse. At the same time, she looks forward to what followed after the period on which she focuses. Thomson’s book is not intended for beginners just finding their feet in the subject and its issues.

For those reasonably well versed, however, it will be found an illuminating and eye opening account.

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Jose R Torre, ed., *The Enlightenment in America, 1720-1825*, 4 volumes, London, Pickering & Chatto, 2008, pp. lxi + 365; xxi + 270; xxiii + 256; xxiii + 304; ISBN: 9781851969364, £350.

The idea to select and collect together four volumes of primary documents related to the American Enlightenment is a good one, and one that is timely. As Jose R. Torre argues in his ‘General Introduction’, scholarly interest in the Enlightenment has been growing in recent years and that is true not only for the British and European Enlightenments which have been the focus of much scholarly attention in the past, but also for the American Enlightenment. Indeed, the time is ripe for an ambitious project of this sort. But does the collection under review live up to its potential promise in such a way that individuals and libraries would be advised to lay out the funds to cover its hefty price tag?

Torre’s collection is useful for reminding scholars of the vast scope encompassed by the American Enlightenment. In it are reprinted eighty-one selections ranging from *The Balloon Almanac, for the year of our Lord, 1786* (1785) to the *Catalogue of books in the Boston Library* (1800); from DeWitt Clinton’s *An oration, on benevolence* (1795) to Hosea Ballou’s *Divine benevolence further vindicated* (1816); from John Winthrop’s *A lecture on earthquakes* (1755) to Robert Hare’s *Memoir on*

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the supply and application of the plow-pipe (1802). To organize that vast terrain, Torre divides *The Enlightenment in America* into eight sections presented in four volumes. Volume 1 is concerned with the topics of 'Economy and Finance' and 'Politics'; volume 2 with 'Education' and 'Literature and the Fine Arts'; volume 3 with 'Moral Philosophy' and 'Religion'; and volume 4 with 'Science and Technology' and 'Social Sciences.' His effort to expand the American Enlightenment beyond the narrow definition offered by some scholars is commendable, although a number of his section titles will also strike readers of this journal as being rather alien to the eighteenth-century mind. As such, these section titles hint at a tension in Torre's goals for the volumes.

While on one hand Torre aims to restore American Enlightenment writings to their original context — 'to read the ideas of the past in a manner consistent with the context and intentions in which they were expressed' (1:xvii); with the other hand he wants to justify his 'modern nomenclature' (1:xvii), arguing that 'given the goals of the collection to communicate to the present as clearly as possible some idea of the complexity, significance and development of the Enlightenment in America, it seemed pedantic to organize the material in a manner alien to many readers. I have thus followed modern nomenclature in breaking down "knowledge" into fields associated with the modern academy. This reflects both my intentions for the collection and my own daily classroom experience' (1:xviii). If Torre's goal is to present the American Enlightenment in a way that is accessible to modern readers — such as those in his classroom — then the collection has other significant shortcomings.

What editorial apparatus will guide readers of these volumes? Torre has written a short 'General Introduction' for the set — in which he demonstrates his indebtedness to Louis Dupré's *The Enlightenment and the intellectual foundations of modern culture* (2004) — and provides 'Editorial Notes' and a separate 'Introduction' for each volume. What he has not provided, however, is a sufficient explanation of his principles of selection. There is very little to guide the reader about why certain publications have been selected to be reprinted and, perhaps even more importantly as we will see, why others have been left out. One can imagine undergraduates coming to this collection thinking that its content

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'IS' the American Enlightenment and nowhere in these volumes will they be told that they are only reading a handful of texts from possibilities that number in the tens of thousands.

Guidance of that sort is especially important given that the texts selected for some sections are not representative of the wider body of literature to which they belong. For instance, the section on 'Politics' (one of the shortest in the book) is represented by eight sources all of which were published during the short twenty-seven-year span between 1767 and 1794. (Remember, the volumes purport to cover the one-hundred-and-five-year period from 1720 to 1825. The section for 'Moral Philosophy' is even more compact, with all texts falling within only the twenty-year period from 1795 to 1815). The 'Politics' section comprises publications by John Allen, Nathaniel Appleton, the Democratic Society of the City [of] New York, the New York Committee of Safety, and two anonymous authors. Granted, all of these are interesting sources that shed light on the American Enlightenment which they help to expand, undergraduates who come to this volume will go away with a very limited view of American Enlightenment politics. It is difficult to imagine the political thought of the period without a nod to the Declaration of Independence, the *Federalist papers*, the U.S. Constitution, or something written by John Adams, Samuel Adams, Jonathan Dickinson, Benjamin Franklin, Thomas Jefferson, Alexander Hamilton, or James Madison, to name a few of the most obvious choices. Leaving out such core sources runs the risk of making the fringe appear central. And while that dilemma might have been addressed in the section of the volume 'Introduction' devoted to 'Politics' (1:li-lvii), therein one finds no mention of any of the eight sources reprinted under that heading in the volume. The same is true of other section 'Introductions' (and even subsection headnotes) which similarly are strangely unconnected to the reprinted selections.

Surprisingly, there is also absolutely no guidance to the reader about the method of editing. One only finds out for oneself on comparing with the original publications that in most cases (but not all) it is the first edition that has been reprinted; that there has been considerable effort to reset individual title pages in font similar to that of the originals; that first words in the uppercase in the originals are usually (but not always) rendered as lowercase in the reprint; that in the reset text the symbol '/'

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signifies a page break in the original; etc. It is also only by digging around on one's own that one will discover that in some cases texts have been reprinted without their original apparatus, such as the interesting 'Advertisement' and miscellaneous back matter that accompanied the first publication of Isaac Greenwood's *An experimental course of mechanical philosophy* (Boston, 1726). Undergraduates may not always be interested to know editorial details such as these, but scholars certainly are. Laying out these and other textual conventions (the long 's' appears to have been dropped, but original spelling and punctuation appears to have been retained) is standard practice in scholarly editions, even other ones published by Pickering & Chatto.

The volumes are marred by other shortcomings. Torre writes in his 'General Introduction' that 'In the early 1960s ... a cornucopia of studies burst forth and created what Michael Kammen called "a swirling lazy Susan of enlightenments for us to sample, like so many relishes"'. In particular, three full-length studies of the Enlightenment in America stand out from the period — Henry May's *The Enlightenment in America*, Henry Steele Commager's *The empire of reason* and Donald H. Meyer's *The democratic Enlightenment* (1:xv). As scholars familiar with the historiography will immediately realize, none of the three books listed were published in the 'early 1960s' but rather in 1976 (May and Meyer) and 1978 (Commager). Torre knows this, as his endnote references make clear, and perhaps the passage is only poorly written or perhaps 'the early 1960s' was a slip for 'the mid 1970s.' But this is not an isolated slip.

All four volumes are riddled with errors of this sort. To cite some other representative examples from the first volume: Douglass Adair, the well-known scholar of the American Enlightenment, appears in the text and index as 'Douglas' (1:liv [twice]; 4:285); James Delbourgo is identified correctly in the index, but becomes 'John' in the text (1:xvi); Gary Wills's *Inventing America* was first published in 1978, not 1968 as Torre has it (1:lxn41; 1:xliv); the subtitle of J G A Pocock's *The Machiavellian moment* is *Florentine political thought in the Atlantic republican [not Republic] tradition* (1:xxxvii); C Dallett Hemphill becomes D C Hemphill (1:xxx); the co-authors Edmund Berkeley and Dorothy Smith Berkeley become 'Smith Berkeley, E., and D. Smith Berkeley' (1:xxxix); and Benjamin Franklin, who died in 1790, could not have made a

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‘posthumous contribution’ to Mathew Carey’s *American Magazine* in 1787 (1:29). There are various inconsistencies with capitalization and the like. It is usually the ‘American Enlightenment’ but sometimes the ‘American enlightenment’; in the space of one paragraph (at 1: 235) we have ‘Democratic-Republican Societies,’ ‘Democratic Republican Societies,’ and ‘Democratic Republican societies.’ Elsewhere in this volume Torre brings forward evidence to prove the Scottish nature of the ‘*Encyclopaedia Britannica*,’ (when, of course, he ought to refer to the *Encyclopaedia Britannica*, see 1:108; see also 2:xvi; 4:291) without, it seems, appreciating the degree to which that work was a homespun product of the Scottish Enlightenment, being published in Edinburgh in 1771 and written ‘By a SOCIETY of GENTLEMEN in SCOTLAND,’ as it was put on the title page of the first edition. Stacked together these are more than minor slips and irritations, they are errors and shortcomings that detract significantly from the potential value of the volumes under review, regardless of their intended audience.

The twenty-three-paged ‘Bibliography,’ in which some of the errors cited above appear, is also curious in other ways. There is no discussion of its purpose and it does not appear to be a general bibliography of the American Enlightenment. Many of the sources listed are primarily concerned with the British — and especially with the English rather than Scottish version — or European Enlightenments, nineteenth-century Romanticism, John Locke’s thought and influence, and rather idiosyncratic aspects of eighteenth-century economic thought. This, while several important (recent and also classic) sources directly relevant to the American Enlightenment go unlisted, including Douglas Anderson, *The radical Enlightenments of Benjamin Franklin* (1997); Alfred Hoermann, *Cadwalladar Colden: a figure of the American Enlightenment* (2002); Samuel Miller, *A brief retrospect of the eighteenth century* (1804); Douglas Sloan, *The Scottish Enlightenment and the American college ideal* (1971); Paul M Spurlin, *Montesquieu in America* (1940); C Bradley Thompson, *John Adams and the spirit of liberty* (1998); and Whitfield J Bell, Jr., ed., *Patriot-improvers: biographical sketches of members of the American Philosophical Society* (1997-2003); to name a few. Even some of those authors discussed in Torre’s ‘General Introduction’ (Douglass Adair and Daniel Boorstin) are missing from the ‘Bibliography,’ as is

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much of the recent work on the history of the book, such as Hugh Amory and David D Hall, eds., *The Colonial book in the Atlantic world* (2000), volume one in *A history of the books in America*, which is at the forefront of much recent American Enlightenment historiography. All of these volumes might also have been useful to Torre's introductions.

Perhaps the most valuable section of this collection is the first one, that on 'Economy and Finance.' In his introduction to that section — building on his recent book *The political economy of sentiment: paper credit and the Scottish Enlightenment in early republic Boston, 1780-1820* (2007), also published by Pickering and Chatto — Torre writes perceptively that 'Scholars do not often think of political economy, banks, joint-stock corporations, annuities, tontines, funds of various stripes and the paper credit instruments they emitted as part of the Enlightenment' (1:xliv). The selections he reprints in this section are far-ranging and span the period from 1720 to 1825. These selections also introduce readers to often overlooked characters, such as Justus Erich Bollmann and James Swan, thereby expanding our definition of the American Enlightenment in interesting and useful ways. Given the shortcomings of the collection as a whole, however, potential purchasers are advised to be cautious.

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David Hartley's 'Observations on the Progress to Happiness' Discovered

Richard C Allen

On 2 December 1736, David Hartley wrote to his friend John Lister:

I have wrote two small Treatises abt. a year & half ago, but without any design of publishing them in their present form, The Progress of Happiness deduced from Reason—& from Scripture. The first begins with shewing that all our Intellectual Pleasures & Pains are formed either immediately or mediately through Association, . . . It then proceeds to show that Benevolence is the best means of obtaining private Happiness, that this naturally leads us to the love of God, that are Natures are so formed & so adjusted to the System of things that we must by the Law of Association at last become benevolent, & consequently that all must some time or other be happy.¹

Eighteen months earlier, in June 1735, John Byrom wrote in his journal on 13 June that he 'saw Mr. Davis, at Mr. D's chamber, came out and walked into the fields and talked about Dr. Hartley's book.'² Two weeks later, on 26 June, Byrom wrote that 'Mr. Davis sent me . . . Dr. Hartley's paper on benevolence, never to sacrifice a greater pleasure for a less.'³ This 'paper' — 'The Progress of Happiness' deduced from reason — has now come into the light of day.

The manuscript was purchased in March 2009 by Dan Casavant, of Waterville, Maine, a manuscript collector and dealer, on eBay. Dan Casavant contacted me about the possibility that Hartley was the author of the anonymous manuscript. Upon review, I concluded that Hartley was indeed the author.

¹ The Correspondence of David Hartley and John Lister, Calderdale Archives, Calderdale Central Library, Halifax; see also Richard C Allen, *David Hartley on human nature* (Albany: State University of New York Press, 1999), xix-xx, 44–5.

² John Byrom, *The private journal and literary remains of John Byrom*, edited by Richard Parkinson (Manchester: The Chetham Society, 1854–57), vol. 1, sec.2, 622.

³ Byrom, vol.1, sec.2, 634.

Notice

The manuscript is titled ‘Observations on the Progress to Happiness.’ No author is given. The final page carries a date: March 7, 1734/5. The manuscript is 103 pages long. It is in the hand of a professional copyist. The title and date are thus consistent with the first of the two ‘small treatises’ Hartley mentioned to Lister, and with the manuscript Byrom discussed with and received from Davis. And as for its format, the manuscript is divided into twelve ‘Observations,’ which is consistent with the format of Hartley’s *Observations on Man*.

The manuscript’s textual connections with Hartley’s work begin with the first sentence: ‘The whole art of living may be briefly comprehended under this general precept; never to sacrifice a greater pleasure to a less.’ This matches Byrom’s comment, quoted above: ‘Dr. Hartley’s paper on benevolence, never to sacrifice a greater pleasure for a less.’

For one textual connection with the *Observations on Man*, consider the following passage from the end of the Ninth Observation:

Moreover, as our compassion tenderness and love for others is chiefly generated by a reflection upon our own desires and fears in the like situation, and conversely our sensibility for ourselves is much affected by what we think others ought to have for us, . . . it follows that our affections towards ourselves and others will by this reciprocal influence become ultimately equal; we shall at last make every man our friend and son and second self. Thus we seem to be to each other like so many different sets of senses and powers of perception, what A feels is through him felt by B, C, D, E and so on, the mutual communications through which happiness flows are ever multiplying and enlarging, so that at last not a single particle will stagnate but each arrive in its proper season at every part of the great whole, . . .

Compare *Observations on Man*, part 2, prop. 68:

Let us suppose, that the benevolence of *A* is very imperfect; however, . . . that he receives pleasure . . . from the happiness of *B, C, D, &c.* . . . Let us also suppose, that *B, C, D, &c.* . . . are yet happy, upon the whole, and that *A, . . .* has some comfortable general knowledge of it. This . . . gives us a faint conception of *A*’s unbounded happiness, on supposition that he

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considered every man his friend, his son, his neighbor, his second self, and loved him as himself; and that his neighbor was exalted to the same unbounded happiness as himself by the same unlimited benevolence. Thus *A, B, C, D, &c.* would all become . . . new sets of senses, and perceptive powers, to each other, so as to increase each other's happiness without limits; they would all become *members of the mystical body of Christ*; . . . happiness would circulate through this mystical body without end, so as that each particle of it would, in due time, arrive at each individual point, or sentient being, of the great whole, that each would *inherit all things*.⁴

As comparison of these two passages suggests, the 'Observations on the Progress to Happiness' is a work preliminary to Hartley's *Observations on man*. It contains many of the ideas — concerning association, the classes of pleasures and pains, benevolence as a 'primary pursuit,' and universal salvation — that are more fully developed in the *Observations*. A thorough comparison of the two works should yield insights into that development. It is to be hoped that, when sold, Hartley's 'Observations on the Progress to Happiness' will go to a university library or other public institution, so that it will be accessible to scholars.

⁴ The phrase 'new senses and powers of perception to each other, [so as to] give to and receive from each other happiness indefinitely' also appears in the *Observations*, part 1, prop. 35. See also Allen, *David Hartley on human nature*, 354–5.