ENLARGING THE BOUNDS OF MORAL PHILOSOPHY: WHY DID ISAAC NEWTON CONCLUDE THE OPTICKS THE WAY HE DID?

by

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This paper draws attention to the remarkable closing words of Isaac Newton’s Optics (1706) and subsequent editions of the Opticks (1718, 1721), and tries to suggest why Newton chose to conclude his book with a puzzling allusion to his own unpublished conclusions about the history of religion. Newton suggests in this concluding passage that the bounds of moral philosophy will be enlarged as natural philosophy is ‘perfected’. Asking what Newton might have had in mind, the paper first considers the idea that he was foreshadowing the ‘moral Newtonianism’ developed later in the eighteenth century; then it considers the idea that he was perhaps pointing to developments in natural theology. Finally, the paper suggests that Newton wanted to at least signal the importance of attempting to recover the true original religion, and perhaps was hinting at his intention to publish his own extensive research on the history of the Church.

Keywords: Isaac Newton; moral Newtonianism; natural theology; history of religion; science and religion

INTRODUCTION: FAMOUS LAST WORDS?

The closing words of Newton’s second astonishingly influential book, Opticks, are truly remarkable even by the standards of the early eighteenth century. The second English edition of 1718 ends like this:

In this third Book I have only begun the Analysis of what remains to be discover’d about Light and its Effects upon the Frame of Nature, hinting several things about it, and leaving the Hints to be examin’d and improv’d by the farther Experiments and Observations of such as are inquisitive. 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. And no doubt, if the Worship of false Gods had not blinded the Heathen, their

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moral Philosophy would have gone farther than to the four Cardinal Virtues; and instead of teaching the Transmigration of Souls, and to worship the Sun, and Moon, and dead Heroes, they would have taught us to worship our true Author and Benefactor.¹

These are the final words of Query 31, and therefore of the *Opticks* itself, as they appear in the second English edition. Accordingly, this is not to be found at the end of the first edition of 1704, which ends with Query 16.² The remarkable concern with morality and religion is first introduced in the Latin edition of 1706, in the last of seven new queries added to that edition.³ The Latin version, provided by the translator of the *Optice*, Samuel Clarke, was presumably based on an English original provided by Newton. The version quoted here, from the 1718 edition, is very close to the Latin, but was probably written in English by Newton.⁴ Newton made a small, but crucial, addition to the end of this paragraph in the third English edition of 1721. We shall come back later to this addition.

From our perspective, this is a very strange way to wrap up a book of experimental science devoted to optics. Reminding ourselves that this was written long before the secularization of British society, we might suppose that what strikes us as odd would not have seemed so strange to contemporary readers.⁵ But this kind of explicitly religious ending was by no means required, or expected, for works on optics, or for works on natural philosophy more generally.⁶ Even to contemporary readers this would have been seen as excessively pious, and a clear sign that the author was driven by his own highly developed religiosity to introduce religious sentiments into a book which, on the face of it, has no special religious implications and no other obvious connection to theological matters. Given what we now know about Newton and his indefatigable scriptural studies over many decades, we might simply draw the same conclusion ourselves, and see this as nothing more than another sign of Newton’s profound preoccupation with religious matters.⁷

But these closing remarks do not look like all-purpose piety; they are not merely sweeping and non-specific comments about the need to maintain the faith, much less to uphold the teachings of the Church. The claim that a true ‘Moral Philosophy’ can be established by following the method set forth throughout this book—a method which we would call ‘scientific’—is surprising to the reader, not just because it introduces religion into a work of experimental natural philosophy, but also because it claims that the establishment of this true moral philosophy will surely follow the application of this same scientific method. This is the kind of claim that needs some setting up in advance in order to make it sound plausible; and yet Newton just throws it out, without any build-up, in his closing words.⁸

It is worth asking, therefore, why Newton chose to finish his *Opticks* in just this way. Clearly it was not just a religiously inspired whim, and yet he evidently chose not to introduce the claim with any explanatory background.⁹ The result is that these closing words remain surprising and strange, and yet, as far as I know, their strangeness has never been commented upon before. There is no mention of the closing words, for example, in A. Rupert Hall’s otherwise comprehensive commentary on the *Opticks*, *All Was Light*, nor in Westfall’s meticulously detailed biography of Newton, *Never at Rest*.¹⁰ Scott Mandelbrote has pointed out that: ‘Traces of his conclusions about the pure, primitive religion of Noah can also be found in the published and unpublished queries to the *Opticks.*’ Similarly, Stephen Snobelen’s discussion of this aspect of Newton’s religious thinking notes their appearance in the *Opticks*. But neither Mandelbrote nor Snobelen point out that these ideas appear as a parting shot, a culminating point, in a book otherwise concerned with experimental optics, and (in the Queries) with a speculative
matter theory. Likewise, Frank Manuel discusses a hand-written addition to these closing words, which he refers to as a ‘scholium on the Optics’, and even provides a photographic plate of the relevant page, but his interest is in the underlying moral philosophy: he is completely unconcerned about the fact that these words form an unexpected conclusion to the Opticks. Recent scholarship on Newton’s religious interests has revealed the idiosyncratic beliefs underlying Newton’s changing comments at the end of successive editions of the Opticks, but this paper is the first to seek to explain why Newton chose to end his second great contribution to natural philosophy with a religious claim that was not set up in advance in the foregoing text and which remained, for all but a very few contemporary readers, entirely cryptic.

What follows is essentially speculative, because we cannot know for certain why Newton chose to conclude the Opticks in just the way he did. But the exercise remains valuable because it clearly reveals that Newton himself had difficulty in separating what we think of as his ‘scientific’ writings from his religious and historical research. Even when writing what proved to be one of the most influential scientific books of the Enlightenment, Newton evidently felt the need to forge links between his natural philosophy and his developing religious beliefs.

**Enlarging the bounds of moral philosophy through rational morality or natural theology?**

The question as to why Newton chose to end the Opticks the way he did is worth asking because this final paragraph actually proved to be astonishingly influential. The Queries as a whole were hugely influential upon subsequent Western culture, but even against that background, the impact of this final paragraph stands out. The main impact of the Queries was on subsequent physical and chemical, and even medical, thought, but this cryptic paragraph seems to have been sufficient in itself to stimulate what modern scholars have referred to as ‘moral Newtonianism’. George Turnbull (1698–1748), author of the influential Principles of Moral Philosophy (1740), included Newton’s statement that the bounds of moral philosophy might be enlarged by pursuing his method as an epigraph on the title page. Furthermore, the reader did not have to progress far into the Preface before coming across an effusive acknowledgement of Newton’s importance in moral philosophy:

> The great Master, to whose truly marvellous (I had almost said more than human) sagacity and accuracy, we are indebted for all the greater improvements that have been made in Natural Philosophy ... plainly declares, that he looked upon the enlargement Moral Philosophy must needs receive, so soon as Natural Philosophy, in its full extent, being pursued in that only proper method of advancing it, should be brought to any considerable degree of perfection, to be the principal advantage mankind and human society would then reap from such science.

Turnbull went on:

> It was by this important, comprehensive hint, I was led long ago to apply myself to the study of the human mind in the same way as to that of the human body, or any other part of Natural Philosophy: that is, to try whether due enquiry into moral nature would
not soon enable us to account for moral, as the best of Philosophers teaches us to explain natural phenomena.\textsuperscript{15}

Similarly, David Hume declared on the title page that his \textit{Treatise of Human Nature} of 1739 was \textit{An Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects}. The model of the ‘experimental method of reasoning’ that Hume had in mind was undoubtedly Newton’s.\textsuperscript{16} We can see the inspiration of Newton also in Hume’s account of the psychological phenomenon of the ‘association of ideas’, as it was dubbed by John Locke. For Hume this depended upon ‘a kind of attraction, which in the mental world will be found to have as extraordinary effects as in the natural, and to show itself in as many and as various forms’.\textsuperscript{17} Newton’s \textit{Principia} was largely concerned with the attractive force of gravity, and attractions between atoms were a prominent aspect of the Queries.

Similar ideas appeared subsequently in the \textit{Observations on Man}, of 1749, by the English moral philosopher, David Hartley (1705–1757). The opening chapter, for example, begins like this:

My chief design in the following chapter, is, briefly, to explain, establish, and apply the doctrines of vibrations and association. The first of these doctrines is taken from the hints concerning the performance of sensation and motion, which Sir Isaac Newton has given at the end of his \textit{Principia}, and in the questions annexed to his \textit{Optics}; the last from, what Mr. Locke and other ingenious persons since his time have delivered concerning the influence of association over our opinions and affections, and its use in explaining those things in an accurate and precise way, which are commonly referred to the power of habit and custom, in a general and indeterminate one.\textsuperscript{18}

In case anyone finds the focus on Newton puzzling in this context, Hartley insists on the importance of following the Newtonian method:

The proper method of philosophizing seems to be, to discover and establish the general laws of action, affecting the subject under consideration, from certain select, well-defined, and well-attested phenomena, and then to explain and predict the other phaenomena by these laws. This is the method of analysis and synthesis recommended and followed by Sir Isaac Newton.

Hartley has guaranteed the accuracy of this summing-up of Newton’s method by paraphrasing what Newton himself had written in the Preface to the \textit{Principia}.\textsuperscript{19}

Another important figure here, of course, was Adam Smith (1723–1790), who has been called the Newton of economics, while his \textit{Wealth of Nations} (1776) has been called the \textit{Principia} of political economy.\textsuperscript{20} Smith himself admitted that after reading Newton’s \textit{Principia} he was drawn into abandoning his view that philosophical systems were ‘mere inventions of the imagination, to connect together the otherwise disjointed and discordant phaenomena of nature’, almost believing that Newton had succeeded in revealing the ‘real chains which Nature makes use of to bind together her several operations’.\textsuperscript{21} It was undoubtedly Newton’s inspiration that marked the shift in the Enlightenment from politics to political science, and the belief that just as there were laws of nature, so there must be laws of society.\textsuperscript{22}

There can be no denying, then, that the closing words of the \textit{Opticks} had a profound influence on subsequent thinkers, and through them had a major impact on Enlightenment thought. But, was all this what Newton had in mind when he wrote those closing words?
With historical hindsight, we can see that the Enlightenment attempt to introduce the Newtonian method into moral subjects turned out to be a secularizing movement, one which dovetailed closely with contemporary French efforts to take authority on moral questions away from the Church, and to place that authority firmly on what the French called ‘reason’. But there is no evidence which would allow us to infer that this is the kind of thing Newton had in mind when he wrote the final flourish at the end of the *Opticks*. There is no indication in any of his writings that Newton wanted to develop a moral philosophy in the manner of a George Turnbull or a David Hartley. It would seem, then, that proponents of this Enlightenment enterprise might have seen themselves as Newtonians, but, as was so often the case in the eighteenth century, they were re-making Newton in their own image rather than maintaining and promoting his own concerns.

But, if Newton did not have an Enlightenment ‘science of man’ in mind when he wrote of the bounds of moral philosophy being extended by his method, what did he mean? If we go back to Newton’s closing paragraph, it seems pretty clear that for Newton the extending of the bounds of moral philosophy would lead not to a secularizing movement but to a better understanding of the being and attributes of God. Recall that immediately after mentioning the enlarging of moral philosophy he wrote:

> 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.

Perhaps, then, we should consider that Newton’s intention was closer to what we think of as natural theology—perhaps he was merely suggesting that natural philosophy should be used to establish the existence of the ‘first Cause’, and then increased acknowledgement of Christian morality would follow?

Again, there can be no denying that Newton’s work in general led to the burgeoning of natural theology among British natural philosophers throughout the eighteenth and nineteenth centuries, and it is perfectly possible, therefore, that this passage played its part in stimulating devout followers to pursue those ends. But, again, there seems to be something rather different occupying Newton’s mind here. It is easy to see the very significant difference between the end of the *Opticks* and the famous opening statement in his correspondence with Richard Bentley:

> When I wrote my Treatise about our System, I had an Eye upon such Principles as might work with considering Men, for the Belief of a Deity...

The concern here is to combat atheism, and accordingly, the following discussions throughout the correspondence are aimed to that end. The four letters to Bentley are exclusively concerned with the natural theological enterprise of using the clear evidence of order and design in the universe to prove the existence of God.

In the final paragraph of the *Opticks*, by contrast, the existence of God is simply taken for granted—the issue is not one of establishing the reality of a God whose existence might be in doubt, rather, the aim is to learn more about God and to get to know him better. Newton does not write here of belief *in* God, but knowledge *of* God:

> 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 . . .
Natural philosophy is not invoked to tell us whether there is a first cause, but to tell us what that presupposed first cause is. The concern is not with the existence of God, but with the nature of God.

Now, this is not particularly unusual at this stage of Newton’s career. It seems to me that in his natural philosophical writings Newton’s discussions of God can be divided roughly into two categories. On the one hand we have fairly standard natural theology—usually based on the argument from design. We see this in the letters to Bentley, and in the first part of the discussion of God in the General Scholium, and in various other places in his works. But there are also places where the discussions are rather different, and these are perhaps best designated simply as philosophical accounts of the nature of God.

We can see both kinds of discussion in the General Scholium, which Newton added to the end of the second edition of the *Principia* in 1713. Paragraphs 2, 3 and 4 of the General Scholium are straightforwardly natural theological. Paragraph 2 brings natural theology into consideration after discussing the motion of the planets through void space. As Newton writes:

> They will indeed persevere in their orbits by the laws of gravity, but they certainly could not originally have acquired the regular position of the orbits by these laws.

What is required, as we are told in paragraph 4, is an intelligent Creator:

> 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... And so that the system of the fixed stars will not fall upon one another as a result of their gravity, he has placed them at immense distances from one another.

Immediately after this, however, in paragraph 5, Newton switches to a discussion of the nature of God himself. In so far as evidence is brought in to support Newton’s theology here, it is not drawn from the natural world, but from familiar Christian doctrine, from scripture and other ancient writings, or from metaphysical assumptions.

This part of the General Scholium begins by discussing God as Pantokrator, and the nature of his dominion and authority—which is presented as transcendent authority over inferior, secondary beings, not as power by virtue of immanence. It then discusses his superlative nature, including his eternity and infinity. This leads to a discussion of his relations to space and time, but it does so not in physical terms but metaphysical. Then comes a sortie into negative theology, where we are told that we have no idea of how God ‘senses and understands all things’, and we have no idea of the substance of God (‘much less do we have an idea of the substance of God’). We are said to know him only by his properties and attributes, and to think of him through ‘a certain similitude from things human’, but immediately this is said to be only an imperfect way of thinking of him. During the course of this discussion, Newton refers in footnotes to various passages of scripture, and to a number of ancient writers—again this is in contrast with the natural theological part of the discussion, where there is no reference to tradition.

I believe this distinction between natural theology on the one hand, and a more general religious concern with the nature of God himself is a valid one to make with regard to Newton’s theological pronouncements, but it should be acknowledged that Newton does not always see these as distinct approaches—indeed, perhaps he never sees them as distinct. Certainly, it was after three long paragraphs on the nature of God in the General Scholium, which take the reader a long way from the earlier use of the argument from
design, that Newton famously wrote ‘to treat of God from phenomena is certainly a part of experimental philosophy’. Similarly, he moves fairly freely in his early unpublished work, known as De gravitatione, from natural theology to a more metaphysical discussion of God and his actions in the world. It may be, therefore, that we are artificially separating what Newton saw as all one, but I believe the use of this distinction will help us to discern significant nuances in Newton’s own approach to theology.

So, if we return now to the final paragraph of the Opticks, it should be clear that there is no sign here of the argument from design and standard natural theology. Although he writes that ‘our Duty towards him [God], as well as that towards one another, will appear to us by the Light of Nature’, this is not typical of natural theology, which focuses on proving the existence and attributes of God himself, and does not pretend to be able to establish specific moral precepts, such as duties to one another. The focus, as we have already seen, is on the nature of God and the nature of his relationship with humankind, while God’s existence is simply accepted without question. Another important aspect of the final paragraph is with correct teaching and correct focus of worship. The final sentence of the Latin edition, for example, can be translated as ‘they [the heathens] would really have been more likely to have taught the best means by which our true and most beneficent Creator was to be worshipped’ [id sane multo potius docuissent, qua ratione optime colendus esset verus noster & beneficentissimus].

It seems clear, then, that when Newton spoke of extending the bounds of moral philosophy by pursuing the same method which enabled him to perfect natural philosophy, he was not intending to promote the development of a natural, or rational, morality of the kind developed subsequently by Enlightenment thinkers. And nor was he intending to promote the kind of natural theology that was developed subsequently by self-professed Newtonians from Richard Bentley to the authors of the Bridgewater Treatises, and even beyond to Charles Darwin and James Clerk Maxwell. But he was intending to suggest that correct natural philosophy and its methodology could lead, or should lead, to the true religion, its doctrines and its correct practices. For Newton, the true morality was evidently bound up with the true religion, correct religious belief and the correct form of worship.

THE TRUE RELIGION AND THE END OF THE OPTICKS

One of the strongest indications of this belief in an intimate connection between morality and correct religion was provided by Newton in the small addition he made to the final paragraph in the third English edition of the Opticks in 1721. He now introduced new final words to the book, adding after ‘they would have taught us to worship our true Author and Benefactor’, ‘as their Ancestors did under the Government of Noah and his Sons before they corrupted themselves’. Here, again, the addition is remarkable in its oddity. Newton does not take the opportunity to expatiate upon ‘our true Author and Benefactor’; he does not, for example, choose to add a comment about the ubiquity and omnipotence of God. Instead, he chooses to add another historical comment, about the ancestors of the heathens, including a suggestion that these ancestors ‘corrupted themselves’.

Newton scholars now know that this final, newly added, clause alludes to the reconstructed history of religion which Newton had been developing, largely in secret, since the 1680s in his ‘Theologiae gentilis origines philosophicae’ (Philosophical Origins
of Gentile Theology; hereafter referred to as 'Origines'), and subsequently in his ‘Original of Religions’, ‘History of the Church’ and various other associated manuscript papers. Essentially, Newton presented an account of the history of religion in which the true religion was repeatedly corrupted into idolatry. Noah and his sons were entrusted, after the Flood, to restore the true religion originally taught to Adam and Eve. But the Noachian (Newton uses the word ‘Noachide’) version of the true religion was in turn corrupted into idolatry and had to be restored subsequently by Moses. But, as Newton despairingly (or perhaps contemptuously?) pointed out, ‘the world loves to be deceived’, and the true religion was corrupted once again. Whereupon, Jesus Christ was sent to restore once more the true original religion. In a projected Chapter 11 of the ‘Origines’, Newton intended to show:

What the true religion of the Noachides was like before it began to be corrupted by the worship of false Gods. And that the Christian religion turned out to be no more true nor less corrupt.

Effectively, Newton was saying that Christianity, as it had been taught since the Council of Nicaea in 325 AD, was not the true religion, but was yet another corrupt idolatrous religion, which was now long overdue for reform. As a result of the comparatively new scholarly interest in Newton’s religious papers, and their inclusion in the online Newton Project, Newton scholars can now immediately recognize that Newton was alluding at the end of the Opticks to his own ideas on the history of religion. This was definitely not the case, however, for Newton’s contemporaries. Although there are clear signs that Newton at least considered preparing some of these researches for the press, in the end he never went public, and the only aspect of these efforts which did see publication was the associated reform of Biblical chronology, which appeared posthumously in his Chronology of Ancient Kingdoms Amended (1728). Newton’s reference to the ancestors of Noah worshipping their true author and benefactor before they corrupted themselves could not have had any clear and certain meaning for Newton’s contemporaries. All Newton’s readers would have known straight away what he meant by the four cardinal virtues, say, but nobody could have known to what he was referring with this mention of Noah.

Having said that, it is also worth noting, of course, that this comment about the ancestors of Noah eventually becoming corrupt was not so unusual a reading of sacred history that it would leap off the page to the unengaged reader as an unorthodox peculiarity. It would have been perfectly possible to see this as a fairly anodyne comment about the fortunes of the Judaic religion before the advent of Jesus Christ and Christianity. Indeed, that is presumably how readers have taken it until very recently. It is only with the discovery of Newton’s ‘Origines’ and related papers that we now know that Newton had something much more specific in mind in 1721 when he added this comment about the ancestors of Noah corrupting themselves.

So, what was Newton suggesting (albeit in a highly obscure and even opaque way) in his final paragraph of the Opticks? It seems pretty clear from a reading of the ‘Origines’, ‘History of the Church’ and other writings, that Newton believed that the true religion was intimately bound up with correct natural philosophy. Moreover, this intimate association was revealed even in the form of worship, and the places of worship, of the true religion. We can see this, for example, in the heading of Chapter I of the ‘Origines’:
That Pagan Theology was Philosophical, and primarily sought an astronomical and physical understanding of the world system; and that the twelve Gods of the major Nations are the seven Planets together with the four elements and the quintessence Earth.41

As Kenneth Knoespel wrote in 1999:

For Newton ... the question was not accommodation between ancient wisdom and Christian revelation but the extent to which natural philosophy provided the fundamental structure for natural religion to such a degree that in the end all religious practice could be shown to be an expression of natural philosophy.42

Knoespel suggests that the ‘Origines’ may have given way to ‘The Original of Religions’ as the focus of Newton’s scholarly efforts when he came to believe he could reconstruct the temples of the original religion, the prytanea, and see the altar fires and associated rituals as representations of the cosmos:

And lastly [Newton wrote] as the Tabernacle was contrived by Moses to be a symbol of ye Heavens (as St Paul and Josephus teach), so were ye Prytanea amongst the nations. And as the Tabernacle was a symbol of the heavens, so were the Prytanea amongst ye nations. The whole heavens they reconed to be ye true & real temple of God & therefore that a Prytaneum might deserve ye name of his Temple they framed it so in the fullest manner to represent the whole systeme of the heavens. A point of religion then wch nothing can be more rational.43

So, the architecture of the Temple at Jerusalem, for example, reflected the structure of the universe.44 And when adherents of the original religion worshipped, they did so in a prytaneum which was modelled on the structure of the cosmos.45

This in turn, of course, was related to Newton’s scholarly endeavours of the early 1690s, in the so-called ‘Classical Scholia’, to show that the ancients knew the Copernican theory, and even the universal principle of gravitation. It was obviously crucial for Newton’s claims that the prytanea should be modelled on the heliocentric cosmos, not on the corrupt and incorrect Aristotelian/Ptolemaic system.46

It would seem, therefore, that what Newton had in mind when he added this final paragraph to the Opticks, first of all in 1706, was to announce his belief that the perfection of natural philosophy would help us to discover and possibly restore the true religion that had been given to mankind in the earliest ages, but had been repeatedly corrupted and restored, and was at that time, in the early eighteenth century, once again corrupt. For Newton, then, moral philosophy depended upon true religion, and the true religion was intimately intertwined with true natural philosophy. It seems, therefore, that he saw himself as contributing to the revival of the true religion by virtue of his success in natural philosophy.

WHY DID NEWTON INTRUDE THIS INTO THE OPTICKS?

The question remains, why did he choose to make an announcement about this (albeit a highly obscure one) in the Opticks? This question is all the more pertinent given that, on earlier occasions when he intended to allude in print to his religious conclusions, the intention was never carried through to publication.
We have already mentioned the Classical Scholia of the early 1690s: which were intended for a second edition of the *Principia* which never appeared at that time. But even earlier than that, Newton evidently intended to include a brief discussion of his on-going religious research in the first edition of the *Principia* (1687). Newton had already begun to write the ‘Theologiae gentilis origines philosophicae’ when Edmund Halley diverted him into writing the *Principia*. For a while, Newton planned to include as the Third Book of the *Principia* a more discursive account of its cosmological conclusions, intended to be more accessible to readers who were incapable of following the mathematics in the other books. This third book was to open with a discussion of the preliminary results of Newton’s historical research. It appeared in English translation in 1728 as *A Treatise of the System of the World*.

Right at the outset, in the second paragraph of the *Treatise*, Newton linked ancient knowledge of the solar system to ancient places of worship. After describing the heliocentric system, Newton wrote:

> This was the philosophy taught of old by Philolaus, Aristarchus of Samos, Plato in his riper years, and the whole sect of the Pythagoreans. And this was the judgement of Anaximander, more ancient than any of them, and of that wise king of the Romans Numa Pompilius; who as a symbol of the figure of the World with the Sun in the center, erected a temple in honour of Vesta, of a round form, and ordained perpetual fire to be kept in the middle of it.

This research was still in progress (though suspended while Newton worked on the *Principia*), but temples to Vesta were to figure prominently in subsequent writings. The beginning of ‘The Original of Religions’, written in the early 1690s, reads: ‘The religion most ancient and most generally received by the nations in the first ages was that of the Prytanea or Vestal Temples.’

It looks as though Newton recognized straight away the links between his new natural philosophy and what he took to be the original religion, and yet he made no public announcement of this until the *Optice* of 1706, maintaining it in 1718 and finally reinforcing it slightly for the 1721 edition. So, what made him break his silence?

All we can do here is speculate. It seems to me that there are four possibilities—two of which I think we can dismiss fairly quickly. First, he may simply have included it as a clear signal to anyone who had pursued the same research and had come to the same conclusions. Newton is renowned for voyaging on strange seas of thought alone, but he would perhaps have been glad of company if a like-minded thinker responded to his signal. So, although he knew the final sentence would pass by the general reader as nothing more than an odd comment about religious history, he perhaps included it in the hope that somebody out there might have followed the same path and reached the same destination. Such a reader, if he or she existed, would perhaps recognize the reference to Noah and his sons as a hint that Newton had developed a reconstruction of the true religion, and would make contact with this fellow traveller.

Alternatively, he might simply have hoped that one of his readers, or better, a number of them, might have written to him to ask what he meant by saying the bounds of moral philosophy would be enlarged by pursuing the same method that Newton had used in natural philosophy. This would provide him with the opportunity to present his ideas in private correspondence and to sound out reactions.

These may have been considerations in Newton’s mind, but they seem too casual to have been the real reason to make him add this seemingly incongruous paragraph to the end of his
second major work of natural philosophy. Given what seems to modern readers to be such a strange unexpectedness about this ending, surely we need a much more serious reason for Newton to have chosen to end the *Opticks* this way?

There is one possibility, which although it may seem unpersuasive to modern readers, does seem to fit with what we know of Newton’s idiosyncrasies. The clue to this can be seen in Cornelis Schilt’s recent paper on Newton’s working methods. Schilt shows how Newton fully embraced the approach, common among alchemists, that the discoveries of the art of alchemy should only be communicated to adepts. This approach went hand-in-hand with the view that the adept was capable of picking up clues which the non-expert could not possibly fathom. We can see this clearly in Newton’s description of his ‘New Theory of Light and Colours’, which he had sent to the Royal Society in February 1671/72:

> As to ye printng of that letter [the ‘New Theory’] I am satisfied in their [the Fellows’] judgment, or else I should have thought it too straight and narrow for publicke view. I designed it only to those that know how to improve upon hints of things.

Bearing this in mind, we can turn for help also to Scott Mandelbrote’s earlier paper, which like Schilt’s, uses a revealing quotation from Newton in its title: ‘a duty of the greatest moment’. Mandelbrote points out that Newton’s motivation for writing his religious papers may simply have been for his own benefit: ‘His was a voyage of personal discovery.’ And for Newton, whose relationship to God was characterized by a sense of duty, trying to recover the true religion was a matter of duty: ‘Thou seest therefore that this is no idle speculation, no matters of indifferency but a duty of the greatest moment.’ It is possible, therefore, that Newton felt he at least owed a duty to God to point the way to others to recover the true religion. At one point in the same unpublished work, for example, he urges putative readers: ‘But search the scriptures thy self & that by frequent reading & constant meditation upon what thou readest, & earnest prayer to God to enlighten thine understanding if thou desirest to find the truth.’

On this reading, Newton decided it was his duty to God to urge others to embark on their own search for the true religion, and correct moral philosophy, by pursuing the methods demonstrated in the *Opticks*. In doing so, however, he chose to aim his remarks only at ‘those that know how to improve upon hints of things’, and restricted himself to the strange and completely obscure comment at the end of the *Opticks*. Anything is possible, where Newton’s peccadillos are concerned, but there is another reading which seems to me to be more persuasive. The declamation to ‘search the scriptures thyself’ might well have been written with a real readership in mind. After all, the manuscript in which this appears actually begins, just a couple of paragraphs before, with the words:

> Having searched after knowledge in the prophetique scriptures, I have thought my self bound to communicate it for the benefit of others, remembring the judgment of him who hid his talent in a napkin.

The ending of the *Opticks* might well be seen, therefore, to count as evidence that Newton fully intended, at least at the time that the *Optice* and the subsequent English editions of 1718 and 1721 appeared, to publish the fruits of his research on the original religion. This seems to follow from the cryptic nature of the passage. Newton might have been expected to say a bit more, to make his meaning more clear, but if he believed he would be in a position to publish his work on religious history fairly soon, he might well have preferred...
to leave readers of the *Opticks* wanting more. In fact, there is clear evidence that Newton intended to go into more detail at the end of the 1721 edition of the *Opticks*.

In a copy of the 1718 edition (which is now in the Huntington Library in San Marino, California) Newton added in manuscript after the closing printed words, ‘our true Author and Benefactor’:

as their ancestors did before they corrupted themselves. For the seven Precepts of the Noachides were originally the moral law of all nations; & the first of them was to have but one supreme Lord God & not to alienate his worship; the second was not to profane his name; & the rest were to abstain from blood or homicide & from fornication, (that is from incest adultery & all unlawful lusts,) & from theft & all injuries, & to be merciful even to bruited beasts, & to set up magistrates for putting these laws in execution. Whence came the moral Philosophy of the ancient Greeks.58

In the end, as we have seen, Newton simply added, ‘as their Ancestors did under the Government of Noah and his Sons before they corrupted themselves’. After all, the long addition he wrote into his copy of the 1718 edition did nothing to show the links between moral philosophy and natural philosophy. Given what had gone just before, the reader might expect an illustration of how correct natural philosophy, or the correct method of natural philosophy, could *lead* to correct moral philosophy, but Newton’s proposed addition did not fulfil this reasonable expectation. Instead of continuing to show how natural philosophy might reveal moral precepts, ‘by the Light of Nature’, Newton simply slipped into a historical account of the original principles of morality. It seems plausible that Newton realized that what he had written did nothing to advance his claim in the earlier part of the paragraph and therefore did not include it in the 1721 edition.

Before thinking better about this, however, Newton had evidently sent a similar new ending to Pierre Coste to include in his French translation of the *Opticks*, which appeared in 1720:

... ils nous auroient appris à adorer notre suprême Bienfaiteur, le veritable Auteur de notre Etre, comme firent nos premiers Peres avant que d’avoir corrompu leur Esprit & leurs Mœurs: car la Loi Morale qui étoit observée par toutes les Nations, tandis qu’elles vivaient en Chaldée sous la direction de Noé & de ses Enfans, renfermoit le Culte d’un seul Dieu suprême; & la transgression de cet Article fut punissable, longtemps après, devant le Magistrat des Gentils, Job. xxxi. Moyse en ordonna aussi l’observation à tout Estranger qui habitoit parmi les Israélites. Selon les Juifs, c’est une Loi qui est encore imposée à toutes les Nations de la Terre par les sept Préceptes des Enfants de Noé; & selon les Chrétiens, par les deux grands Commandemens, qui nous enjoignent d’aimer Dieu & notre Prochain: & sans cet Article, la Vertu n’est en effet qu’un vain nom.59

The same failure to show how the light of nature might lead to a better moral philosophy is also true, of course, of the brief comment that he actually did add to the 1721 English edition—it does not illustrate how correct natural philosophy leads to correct religion. It does, however, hint at Newton’s beliefs as to where religion went wrong in the past, and thereby succinctly prepares the reader for a following work. The brief comment at the end of the *Opticks* can perhaps be seen, then, as a bridge linking the *Opticks* to ‘Of the Church’, which by about 1710, if Matt Goldish is correct, Newton may well have been preparing for publication.60 Rather than detain his readers at the end of the *Opticks* by giving a fuller account of his historical research, he chose to finish with a provocative and
intriguing gesture—fully intending to expand on this in a following work—a work which in the end, as we know, he never did manage to see through the press.

If this is correct, it would seem that by 1706 Newton felt he was approaching the point where he would be ready to publish the results of research in which he had invested so much labour since the 1680s and that this conviction persisted until 1721, when he evidently still believed a publication on the ‘History of the Church’ might be possible. After a number of false starts, in the aborted accessible Book III of the first edition of the Principia, and in the Classical Scholia of the aborted second edition of the same work, Newton finally chose to allude, albeit cryptically, in the Optica and later editions of the Opticks to his unpublished attempts to reconstruct the true original religion and its subsequent fortunes in the history of religion.

CONCLUSION

It seems clear that by 1706 Newton had come to believe very firmly in what he discerned as the inextricable link between the true natural philosophy and the true religion. His work for the ‘Origines’ and its successors had reached a position by 1706 which convinced Newton of the intimate connection between the true natural philosophy and the true theology. Newton began to write the Opticks in the early 1690s and at that time he could proceed without having to think about anything other than his experimental results and how they should be interpreted. As he delved deeper into the early history of religion, however, he became increasingly convinced that original places of worship were modelled on the universe as God had created it, and that this was just one aspect of an original religion which was ‘Philosophical, and primarily sought an astronomical and physical understanding of the world system’. Having discovered (as he no doubt thought of it—discovery, not invention) the crucial importance of natural philosophy in the constitution of the original religion he could not forbear from mentioning this connection when the 1706 Optica went into print. Perhaps Newton, like Kepler, Robert Boyle and other devout natural philosophers, saw himself as a priest of the Book of Nature, and saw it as his duty to emulate the natural philosopher priests of the original religion. As he wrote in ‘The Original of Religions’: ‘And thence it was yt ye Priests anciently were above other men well skilled in ye knowledge of ye true frame of Nature & accounted it a great part of their Theology.’ Be that as it may, I think the final paragraph of the Opticks is a clear and undeniable indicator of the unity of Newton’s thought, and his belief in the intimate and inextricable connection between sound natural philosophy and the true religion.

It is impossible to reach a clear and certain conclusion as to why Newton concluded the Opticks the way he did, but it seems fair to say that if he did not insert it as a pointer to the theme of his next published book, he must have seen it as a duty to God, and to other believers (of the right sort), to hint at what might be discovered about morality and religion by following the same method which was already beginning to perfect ‘natural Philosophy in all its Parts’. Speculative as this may be, one thing is abundantly clear: Newton really did believe that the true religion was intimately related to the true natural philosophy. Although this belief was sincerely believed (we must assume), there was clearly some element of self deception in it. It is hard to see how Newton could have believed that ‘the seven Precepts of the Noachides’, which he held to be ‘originally the moral law of all nations’, and which he obviously became aware of through scriptural and
historical research, could have been derived from ‘the Light of Nature’, especially if the light of nature was exemplified by the methods Newton used in the main body of the *Opticks*, or those used in the Queries. It is one thing to suppose that the form of worship of a ‘philosophical religion’ would have taken place in temples modelled on the heliocentric world system, but it is quite another to claim to be able to infer, from natural principles, what might have been the moral teachings expounded in those temples. The disconnect between these two stages of thinking would have been made more apparent to English readers if Newton had included the extended passage that he wrote by hand at the end of his copy of the 1718 edition, and that was included in the French translation of 1720.

Newton thought better about mentioning the seven precepts of the Noachides and including specific moral teachings in his final paragraph, and so readers were not able to notice the flaw in Newton’s thinking. But if he had included the more extended closing paragraph, at least his readers would have had a better idea of the way Newton was actually thinking about these matters (ultimately, in spite of what he tried to imply, a way which was based on a reading of the scriptures rather than on the experimental method). As it was, it is hardly surprising that the immediately succeeding generation should completely miss the significance of the reference to Noah and his sons and should assume instead that what Newton had in mind must have been a moral philosophy that could be established on grounds analogous to those developed in the new ‘experimental philosophy’. The Enlightenment development of moral Newtonianism, however, was a far cry from what Newton himself envisaged when he wrote that ‘the Bounds of Moral Philosophy will be also enlarged’.

**ACKNOWLEDGEMENTS**

An earlier version of this paper was read at a conference on Newton at the Huntington Library, San Marino, in October 2014: ‘All in Pieces? New Insights into the Structure of Newton’s Thought’. I am very grateful to the conference organizer, Rob Iliffe, for inviting me to take part. I also wish to thank Mordechai Feingold, Andrew Janiak, Alan Shapiro and especially Scott Mandelbrote and Stephen Snobelen for their helpful comments on my paper. I would like to thank the anonymous referees of the paper, and the Editor, for helping me to improve it.

**NOTES**


2 Newton, *Opticks, or a Treatise of the reflections, refractions, inflections and colours of light* (Sam Smith and Benjamin Watford, London, 1704), p. 137. Query 16 in this edition is the last of the queries and is shorter than in subsequent editions.

3 Newton, *Optice: sive de reflexionibus, refractionibus, inflexionibus & coloribus lucis. Libri tres* (Sam Smith and Benjamin Watford, London, 1706), Query 23, p. 348. This is now easily accessible online, thanks to Rob Iliffe and his team’s wonderful Newton Project: http://www.newtonproject.sussex.ac.uk/.

4 The various drafts of the Queries are now available online at the Newton Project.


8 Religious sentiments are expressed earlier on in Query 31, and in Query 28, but these are concerned with natural theology, or God’s relationship to the Creation. These are more typical of the kind of religious comment routinely appearing in contemporary natural philosophical works. The closing words of the Opticks are not concerned with natural theology, and are significantly different in intention—as we shall see shortly.

9 This kind of lack of explanation has recently been exposed as a common practice in Newton’s writings, and what is said here can be seen as further support for this analysis. See Cornelis J. (Kees-Jan) Schilt, ‘To improve upon hints of things’: illustrating Isaac Newton’, Nuncius 31, 50–77 (2016).

10 A. Rupert Hall, All was light: an introduction to Newton’s Opticks (Clarendon Press, Oxford, 1993). Hall does discuss the earlier, natural theological material (pp. 135–138, 150–152) but remains silent about Newton’s suggestion that the bounds of moral philosophy may be enlarged. The same is true of R. S. Westfall, op. cit. (note 7).


We shall see as the paper proceeds that Newton continually changed the closing words, or thought about changing them, in successive editions. It is perhaps worth adding that A. Rupert Hall mentions that Newton, ‘starting with *Optice* in 1706’, begins ‘to inject into his scientific writings his system of natural theology’, but he makes no mention of the closing words (which, as we will see, are not concerned with natural theology). A. Rupert Hall, *Isaac Newton, adventurer in thought* (Cambridge University Press, 1992), p. 375.


Hume, *Treatise*, op. cit. (note 16), Book I, Part I, Section IV.


Paul Hazard, *European thought in the eighteenth century* (Penguin, Harmondsworth, 1965); Jonathan Israel, *Radical Enlightenment: philosophy and the making of modernity 1650–1750* (Oxford University Press, 2002). I say ‘with historical hindsight’—I do not reject claims that the Enlightenment in England was much less irreligious, or anti-religious, than in France, say; but this kind of rationally based morality did in the long run contribute to secularization.


26 I am referring to the paragraphs in the latest English translation of the *Principia*, which has now established itself as the standard edition, Isaac Newton, *The Principia*, op. cit. (note 19), pp. 939–944.


30 Newton, *Principia*, op. cit. (note 19), pp. 941, 942. The first of these notes, where Newton refers his readers to Edward Pococke (1604–1691) as well as Exodus, Psalms and John, was not added until the 1726 edition; the other note, present in 1713, refers to Cicero, *On the nature of the gods*; Vergil’s *Georgics* and *Aeneid*; Philo, *Allegorical interpretation*; Aratus, *Phenomena*; and numerous Scriptural citations.

31 Newton, *Principia*, op. cit. (note 19), p. 943; ‘experimental’ was changed to ‘natural’ for the third (1726) and subsequent editions.


33 Newton, *Opticks*, op. cit. (note 1), p. 382, emphasis added. In fact, I argue below that there is a flaw in Newton’s reasoning here, since we cannot arrive at an ‘ought’ from an ‘is’, as Hume put it. More specifically, no matter what he thinks, Newton cannot legitimately expect moral precepts to emerge from even a complete and certain understanding of the natural world.


35 Largely, but not entirely; he is known to have discussed some of his ideas on religion with Richard Bentley, David Gregory, Nicholas Fatio de Duillier, John Locke and Samuel Clarke—a handful of people over several decades. A good sense of the uncertainty surrounding Newton’s religious beliefs can be gleaned from Scott Mandelbrote, ‘Newton and eighteenth-century Christianity’, op. cit. (note 11).

37 Newton, ‘Untitled treatise on Revelation’, Section 1.1; Yahuda Ms. 1.1, f. 4r: the Newton Project (note 36).
38 Newton, ‘Theologiae gentilis origines philosophicae’, Yahuda Ms. 16, f. 43Av. This seems to be the heading for an unwritten Chapter 11: ‘Qualis fuit vera Noachidarum religio antequam per cultum falsorum Deorum corrumpi cæpit. Et quod religio Christiana non magis vera nec minus corrupta evasit.’
39 For Newton, worship of Jesus as an aspect of the Godhead was itself idolatrous. He insisted the true religion was strictly monotheistic, and Trinitarianism was a gross and indefensible corruption. On Newton’s anti-Trinitarianism, see Westfall, *Never at rest*, op. cit. (note 7), especially pp. 312–356; and Stephen Snobelen, ‘Isaac Newton, Socinianism and “The one supreme God”’, *Socinianism and cultural exchange: the European dimension of Antitrinitarian and Arminian networks, 1650–1720* (ed. Martin Mulsow and Jan Rohls), pp. 241–298 (Brill, Leiden, 2005). On Newton’s belief that a reform of religion was urgently required, see Snobelen, ‘The true frame of Nature’, *op. cit.* (note 7).
43 Newton, ‘The original of religions’, Yahuda Ms. 41, ff. 5r–6r.
45 On *prytanea* and other aspects of Newton’s research into the original religion, see Westfall, ‘Newton’s *Theologiae gentilis origines philosophicae*, *op. cit.* (note 36); and Snobelen, ‘The true frame of Nature’, *op. cit.* (note 7).
48 Newton, 1728, *op. cit.* (note 47), pp. 1–2.
49 Newton, ‘The original of religions’, Yahuda Ms. 41, f. 1r.
50 I am agreeing here with the claims made by Stephen Snobelen in his ‘The true frame of Nature’, *op. cit.* (note 7). He argues that Newton saw the need for a dual reformation of natural philosophy and religion, and that the correct reformation of both had to reveal the links and synergies between them. Moreover, he argues that this is a feature of Newton’s outlook from very early in his career.
51 Schilt, ‘To improve upon hints of things’, *op. cit.* (note 9).
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52 Schilt, ‘To Improve upon hints of things’, op. cit. (note 9), p. 76.
56 Newton, Yahuda Ms. 1.1, f. 2r.
57 Newton, Yahuda Ms. 1.1, f. 1r.
58 Newton, Opticks, op. cit. (note 1), Huntington Library, Rare Books, Babson Newton 700873. See also Manuel, Isaac Newton, historian, op. cit. (note 7), pp. 112, 284. Manuel even includes a photograph of the annotated page: Plate 10, facing p. 117. I am very grateful to Dr Stephen Snobelen for bringing this annotation, and Manuel’s discussion, to my attention.
59 Isaac Newton, Traité d’Optique, translated by Pierre Coste, pp. 582–583 (Pierre Humbert, Amsterdam, 1720). Unfortunately, we have no details about how this final passage came into Coste’s hands, but it must have been sent to him by Newton. I am grateful to my colleague, Sergio Orozco-Echeverri, for bringing the French edition to my attention.
60 Matt Goldish sees ‘Of the Church’ as ‘the culmination’ of Newton’s researches on religious history, and ‘possibly earmarked by the author for eventual publication’. See his ‘Newton’s Of the Church’, op. cit. (note 36), p. 146.
61 Newton, Theologiae gentilis origines philosophicae, Yahuda Ms. 16.2, f. 1r.
63 Newton, ‘The Original of religions’, Yahuda Ms. 41, f. 7r.