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THEOLOGICAL AND RELIGIOUS STATEMENTS IN ISAAC NEWTON'S QUERIES/QUAESTIONES TO THE OPTICKS/OPTICE, 1704-1730

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Abstract

In this essay, we provide a thematic editorial history of the theological and religious statements in the Queries/Quaestiones to the Opticks/Optice. Based on our editorial history, we document and discuss a number of important changes in Isaac Newton's theological thought.

Keywords: theological, religious, stance, eighteenth-century, thought

1. Introduction

Upon its first appearance, the *Opticks* (1704) contained no theological or religious statements whatsoever [1]. This changed significantly in its first Latin rendition, the *Optice* (1706), translated by Samuel Clarke (1675-1729), and continued to change in later editions of the *Opticks* and *Optice*. The second edition of the *Opticks* was published in 1717 and reprinted in 1718, the third edition in 1721 and the fourth edition in 1730. The second edition of the *Optice* was published in 1719. Whereas the theological contents of the General Scholium, and the manuscripts that were prepared for it, have been extensively scrutinised [2, 3], the Queries/*Quaestiones* to the *Opticks*/*Optice* have received less attention (see however [4-6]).

Although the drafts to the Queries/*Quaestiones* have been studied by Alan E. Shapiro, the focus of his seminal article was on drafts related to methodological issues [7]. Stephen D. Snobelen, in turn, has done an excellent job interpreting some of the theological and religious contents of the Queries/*Quaestiones* against the background of Newton's theological manuscripts [8; 9; S.D. Snobelen, *'The Light of Nature': God and Natural Philosophy in Isaac Newton's Opticks* (unpublished manuscript)]. However, he has not taken into account the myriad of multifarious theological and religious statements in the drafts Newton prepared for the Queries and *Quaestiones*, nor has he attempted to

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analyse their development and the contexts out of which they emerged. In fact, in his work only one draft folio is discussed, namely Cambridge University Library, Cambridge, United Kingdom, Add. Ms. 3970, f. 619r-v (as nearly all manuscript material we discuss is part of this class mark, we only provide the folio numbers in what follows).

In this article, we provide a thematic editorial history of the theological and religious statements in the Queries and *Quaestiones*, taking into account the published versions and their corresponding draft material, and we discuss what this editorial history can teach us about Newton's theological and religious ideas. Our aim here is threefold. First, we want to bring all relevant material, which can be found in the appendix to our article (available online at https://zenodo.org/record/4543563, DOI: 10.5281/zenodo.4543563), at the focus of scholarly attention. The appendix also contains our detailed arguments that support the chronological order of the material and serves as the backbone of our argument. Second, we endeavour to canvas its development by providing a thematic editorial history as a result of which Newton's theological and religious statements are dated relatively. Finally, we explore the contexts out of which they emerged, thereby explaining their role and meaning.

The appendix - and therefore also our research in general - was generated starting from the transcriptions of the draft versions of the Queries/*Quaestiones* available on the website of The Newton Project (http://www.newtonproject.ox.ac.uk/view/texts/diplomatic/NATP00123) which each of us has then checked and corrected against the digital reproductions of CUL, Add. Ms. 3970 provided on the Cambridge Digital Library (https://cudl.lib.cam.ac.uk/view/MS-ADD-03970/1). Here and throughout, we adhere to the following conventions in our transcriptions of Newton's manuscripts: words between arrows pointing downwards were added to the text; words between double arrows contain two subsequent additions or corrections to the original; words that are struck through are words that Newton crossed out; words that are double struck through are words that Newton double crossed out; and letters of words that are illegible are indicated by [illegible].

2. Fragments related to active and passive principles

According to Newton there are, besides inactive matter and the passive principles that regulate it, active principles in nature. These active principles operate non-mechanically, i.e. not in terms of direct contact between lumps of matter, and testify of God's general providence [10]. Elsewhere, we have provided new evidence indicating that it is highly likely that Newton introduced this discussion of active and passive principles as a response to John Toland (1670-1722) who defended the view that motion is essential to matter and thus that matter can move itself, an unacceptable claim to Newton [S. Ducheyne and F. Dhondt, *Isaac Newton Explicating his Natural Philosophical Method: A Thematic Editorial History of the Queries:Quaestiones to the Opticks/Optice, ca. 1704-*

1717 (unpublished manuscript)]. Instead, Newton wanted to show that matter is dependent on God for its motion.

In the earliest fragments we were able to find, Newton did not yet discuss active versus passive principles, but gradually headed in the direction of doing so. In the earliest fragment, he argued that the pores in matter and animal bodies are carefully contrived according to certain uses. "Without these uses", Newton wrote, matter would have been "a dead lump", adding that it is "reasonable to allow that he who contrived all things ↓with wisdome↓, framed matter in such a manner as to fit it best for these uses" (f. 234v). On the same folio, Newton suggested, following the ancients, that an active principle is responsible for gravitational attraction. In the subsequent draft, he drew on material from what are known as the 'Classical Scholia' (f. 291r). Composed in the early 1690s, the 'Classical Scholia' were intended to supplement Propositions 4 to 9 of Book III of the *Principia*, but never appeared in print (for a transcription and translation, see [11]; for discussion, see [12]). Given Newton's belief in the *prisca sapientia*, the 'Classical Scholia' were intended to provide additional support for some of the results he established in the *Principia* by showing that those results correspond to the natural philosophical views upheld by the ancients [12, 13].

In the next draft, Newton for the first time explicitly introduced active and passive principles. He stated that inertia is "a passive principle by w^{ch} bodies persist in their ~~state~~ motion or rest", and that from it alone "there could never have been any motion in the world" (f. 620v). In addition, he remarked that bodies "cannot move themselves" and provided examples of active principles, for instance gravity. Another active principle he discussed is the exertion of our will over our body. The laws involved in the exertion of our will may be of universal extent, if "there be an universal life & all space be the sensorium of a thinking Being" (f. 620v). Of importance here, is that Newton's famous discussion of God's sensorium emerged in these fragments on active and passive principles. As we show in section 3, this tentative draft material later resurfaces in the context of Newton's arguments in favour of God's design.

The next draft is a more polished version of the previous one. Again, Newton reused material from the 'Classical Scholia' to which he added: "The Cartesians make God the author of all motion & its as reasonable to make him the author of the laws of motion. Matter is a passive principle & cannot move it self. […] These are passive laws & to affirm that there are no other is to speak against experience. Ffor we find in o^{e} selves a power of moving our bodies by o^{e} thought ↓Life & ~~thinking~~ ↓will↓ are active Principles by w^{ch} we move our bodies, & thence arise other laws of motion unknown to us.↓" Here Newton endorsed the Cartesian view that God is the cause of motion and the author of the three laws of motion. However, Newton argued that the three known laws of motion are passive laws, and maintained that active laws of motion orchestrated by God are required. In this draft, he also reformulated his argument based on God's sensorium. Finally, he drew once more on material from the 'Classical Scholia' with the intention of showing that the ancients were aware of 'active' laws of motion, as is clear from their mythologized treatments of the cause of gravity (f.

619r). A last remnants of the material taken from the 'Classical Scholia' was Newton's contention that the philosophers of Greece and Phoenicia "tacitly" attributed gravity "to some other cause different from matter" [14].

Thus far, the draft material we have surveyed is distinctly different from the published version. The subsequent draft is much closer to the published version and states: "The Vis inertiæ is a passive principle by w^{ch} bodies persist in their motion or rest, receive motion in proportion to the force impressing it, & resist as much as they are resisted. By this principle alone there could never have been any motion in the world." (f. 254r) This fragment is followed by a discussion of the exertion of the human will as an active principle, God's sensorium, short-range attractive forces and Newton's agnosticism with respect to the cause of gravitation. All these topics were deleted and relocated to different parts of the Queries/*Quaestiones*. What then followed was a fragment that would yet again become part of the published version, which reads: "↓For↓~~F~~↓f|↓rom the various composition of two motions tis very certain that there is not always the same quantity of motion in the world" (f. 254r). Here Newton criticised René Descartes (1596-1650), who argued that the total quantity of motion in the Universe is conserved [15], with the aim to show the contrary. These statements were followed by a number of examples showing why Newton sought to challenge Descartes' claim that quantity of matter is conserved (ff. 255r-256r). It was this draft that was published in the 1706 edition of the *Optice* [14, p. 340-343].

In draft material prepared for the 1717 edition of the *Opticks*, Newton added a final sentence to the latter version stating: "And if it were not for these Principles the bodies of the Earth, Planets, Comets, Sun, & all things in them would grow cold & freeze & become inactive masses, & all putrefaction generation vegetation & life would cease, & ~~the Planets~~ the Planets & Comets would not remain in their Orbs" (f. 282r). With this addition included the fragments on active and passive principles arrived at their final form [16].

3. Fragments related to God's sensorium

The fragments considered in this section have their roots in the fragments on f. 234r-v up to ff. 252v, 254r, 255r and 256r considered in the previous section. We have shown that the topic of active and passive principles was broadened by the accretion of additional material relating to the subject. Newton drew upon the wisdom of the ancients, his methodological orientation, and his aversion of Descartes' conservation of quantity of motion to establish the necessity of active principles in conjunction with passive principles for the constitution of all phenomena. As Newton brought all this material to bear on the discussion of active and passive principles, he increasingly elaborated on it resulting in the emergence of new themes, most notably God's sensorium. From the crossed-out sentences in ff. 252v, 254r, 255r and 256r, we infer that Newton then and there decided to develop these themes further independently from one another. Giving that material a new home also meant that part of its meaning changed.

The earliest fragment that discusses God's sensorium and the aim of natural philosophy in its own right appears on f. 249_{bis}r-v. From a comparison between this fragment and ff. 252v, 254r, 255r and 256r, the textual and thematical differences are immediately apparent. Newton included a statement on the required method in natural philosophy by which one will arrive at the first cause, i.e. God. Although these methodological comments were absent from ff. 252v, 254r, 255r and 256r, Newton most likely repurposed material from an earlier fragment on f. 619r-v as he frequently did while writing these drafts. By this time he settled on "natural Philosophy", while in f. 619r-v we clearly recognize a struggle to find the correct expression. The phrase "Nature does nothing in vain" occurs in nearly all preceding material (i.e. on ff. 620v, 619r-v and ff. 252v, 254r, 255r and 256r), and is here included in a set of rhetorical questions. Through this set of questions Newton arrived at the following conclusion: "[a]nd tho every true step made in this Philosophy brings us not immediately to the ~~first cause~~ knowledge of the first cause yet it brings us nearer to it & on that account is to be highly valued". This statement is also reminiscent of f. 619r-v due to its focus on the study of God from phenomena, i.e. "[t]he arguments w^{ch} all men are capable of understanding & by w^{ch} the belief of a Deity has hitherto subsisted in the world is taken from Phænomena" (f. 619v). The fragment ends with a rather vague and underdeveloped statement on the images in man's sensorium.

As we explain more fully in the appendix, f. 249_{bis}r-v is a peculiar fragment because it is the last currently known draft for the 1706 edition of *Optice* and because Newton made additions to it while preparing the 1717 edition of the *Opticks*. Even though the bulk of the fragment corresponds to the 1706 edition of *Optice* a crucial sentence from this edition (namely: "*Annon ex phænomenis constat, esse Entem Incorporeum, Viventem, Intelligentem, Omnipræsentem, qui in Spatio infinito, tanquam Sensorio suo, res Ipsas intime cernat, penitusq; perspiciat, totasq; intra se præsens præsentes complectatur; quarum quidem rerum Id quod in nobis sentit & cogitat, Imagines tantum ad se per Organa Sensuum delatas, in Sensoriolo suo percipit & contuetur?*" [15, p. 314-315]), corresponds only partly to the abbreviated Latin sentence, inserted by the hand of Clarke, on the bottom of f. 249_{bis}r ("~~Annon Spatiū universū, Sensor: est Ent: Immat: Vivent: & Intellig: quod res~~ Ips: ~~cern: & complect: intiās, totasque penitus & in se~~ [illegible] ~~praesentes perspiciat; quarū Id quidē~~ [illegible]~~q^{d} i Nob: sent: & cogitat, Imag: tant: i cer: contuetur~~."). and the English continuation of this Latin sentence which Newton himself inserted on f. 249_{bis}v ("~~&~~ ↓whence is it↓ ~~that they move all manner of ways in Orbs very excentric & Planets~~ ↓all↓ ~~one & the same way in Orbs concentric & in~~ And of which things the images only ~~are~~ [illegible] carried through ~~our sensoriums~~ the organs of sense into our little sensoriums ↓are↓ there seen & beheld by that w^{ch} in us perceives & thinks"). As it turns out, this passage was written at a crucial moment during the preparations for the 1706 edition of the *Optice*. Alexandre Koyré and I. Bernard Cohen have uncovered that some printed versions contained the extract quoted above, while other versions contained an alternative passage, namely: "*Annon Spatium Universum, Sensorium est Entis Incorporei, Viventis, & Intelligentis; quod res Ipsas cernat &*

complectatur intimas, totasq; penitus & in se praesentes perspiciat; quarum id quidem, quod in Nobis sentit & cogitat, Imagines tantum in Cerebro contuetur?" (quoted from [4, p. 563]). According to Koyré and Cohen, initially only copies containing the latter passage were printed, and, when the printing was completed, the page containing it was cut and replaced by a new page that contained the qualifier "tanquam" [4, p. 563-566]. Note that the sentence occurring in the initial print is virtually identical to the abbreviated Latin sentence and Newton's English continuation of it on f. 249_{bis}r-v, except that 'incorporeus' is used instead of 'immaterialis' which does not make a big difference. We may therefore confidently conclude that f. 249_{bis}r-v is the draft on which the initial print was based. The printed version and the corresponding draft on f. 249_{bis}r-v indicate, at least initially, that space *is* God's sensorium, a claim that was theologically precarious since it seems to ascribe an organ to God. By contrast, with the addition of "tanquam" space is only metaphorically speaking God's sensorium (for a sensible explanation, see [5, p. 195]). As is well-known, Gottfried Wilhelm Leibniz (1646-1716) criticized Newton on exactly this point [4]. Note that the abbreviated Latin sentence on f. 249_{bis}r is struck through and that the colour of the ink with which it was struck through matches the colour with which the abbreviated Latin sentence was initially written. This means that Clarke also deleted it, but it is unclear when exactly. Additionally, Koyré and Cohen have suggested that the initial version without the qualifier "tanquam" expressed Newton's real conviction [4, p. 566]. Folio 249_{bis}r-v does not confirm this contention, but neither does it by itself disprove it. The case cannot be decided based on the draft used for the initial print.

The subsequent version alters the methodological statements slightly and introduces explicit charges against the mechanical philosophy. Furthermore, the rhetorical question on the motions of comets and planets is rephrased (f. 247r). In the version thereafter, Newton implements all corrections and made only one minor change. This version remained unchanged in all subsequent versions [16, p. 343-345; 17-19]. Not surprisingly, all post-1706 drafts we have mentioned here have the qualifier "as it were" when mentioning God's sensorium.

4. Fragments related to God's design

After an earlier and shorter attempt (f. 244r), Newton began to put forward a number of design arguments. The first argument he presented in support of God's design was that He created the particles of matter hard and solid so they would not disintegrate and once combined, remain stable as time progresses. In the following lines, Newton added other arguments in favour of God's design. He claimed that "blind fate" could never make the planets move along concentric orbits and rotate in the same direction, pointing out that this must be "the effect of choise". On the same folio, he noted the structure of human organs and animal bodies are the effect of "↓the↓ wisdome & skill of a powerful ↓ever living↓ Agent" (f. 243r), which is followed by a discussion of God's sensorium already discussed in section 3. Newton's list of arguments ends rather abruptly in the

sentence "The business of Experimental Philosophy is only to find out by experience & Observation ↓not how things were created but↓ what ~~are~~ is the present frame of nature" (f. 243r). This statement sits quite uneasily with the opening of the fragment where Newton made claims on how in the "↓first creation↓" God created particles of matter hard and solid, and perhaps for this reason it never resurfaced in any of the subsequent versions of this fragment we discuss.

The subsequent draft is more or less identical to the preceding one, save some minor changes irrelevant to our purposes (f. 242r). Newton, however, in the midst of his discussion of God's purposeful creation of the particles of matter as hard and solid, added new material on active and passive principles that over time would develop into a separate paragraph in the 1706 edition of the *Optice* and all subsequent editions. These paragraphs were probably inspired by some of the earliest fragments covered in section 2, but evolved independently from one another from that point onward. Newton stated that the particles of matter were purposely created to be hard and require active principles for their motions. For Newton, this shows yet again that the motions of particles and the bodies they compose cannot occur without the counsel of God. Towards the end of this draft Newton also added a passage that points to his voluntarist conception of God, in which he stated that God is able "to vary the Laws of Nature, & make worlds of different sorts in several parts of y^{e} Universe" (f. 242v). The draft contains a number of insignificant additions (preparatory material is to be found on f. 244v). This version corresponds to the published version in the 1706 edition of the *Optice* [14, p. 343-347].

In draft material prepared for the 1717 edition of the *Opticks*, Newton added the following caveat to his discussion on God's sensorium, cautioning that "we are not to consider the world as the body of God or the ~~parts~~ several parts thereof as the parts of God" and that He has no need for a sensorium (f. 283r). This draft corresponds to the published version of this fragment in the 1717 edition of the *Opticks* and remained unchanged in all later editions of the *Opticks* and *Optice* [17, p. 407-412; 18, p. 375-380; 19, p. 375-380].

5. Fragments related to natural philosophy, God and moral philosophy

Newton endorsed the view that natural philosophy has ramifications for our knowledge of God, the first cause, and for moral philosophy. Moreover, he was convinced that our true knowledge of God is limited by natural philosophical findings based on phenomena. In the earliest draft we found, Newton claimed that natural philosophical progress and moral philosophical progress go hand in hand (f. 243r). In subsequent drafts, Newton gradually extended this material on f. 242v and f. 244v, until he arrived at the version on f. 286r, which was faithfully translated in Latin by Clarke [14, p. 348]. This version was also re-used in draft material prepared for the 1717 edition of the *Opticks* on f. 284r and it corresponds to the published version [16, p. 381-382].

In the 1719 edition of the *Optice*, an additional sentence absent from the 1717 edition of the *Opticks*, was added: "Which in fact a majority did [i.e. to teach us the worship of our true Author and Benefactor], before they had corrupted their spirit and morals. To be sure, from the beginning the moral law for all nations were those seven precepts of the Noachides, of which the first one was that only ONE is to be acknowledged as the Lord God and that the worship of him is not to be transferred to others. Truly, with this principles virtue would be nothing else than a mere name." [17, p. 315] This statement is significant since "ONE [UNUM]" is known to have an anti-Trinitarian connotation in Newton's General Scholium [2, 20]. We have not found an English fragment in Cambridge University Library, Add. Ms. 3970 that corresponds to the addition appearing in the 1719 edition of the *Optice*, leaving it unsure whether the statement that "only ONE is to be acknowledged as the Lord God" comes from Newton's pen or whether it was an addition by Clarke. Only in an annotation in Newton's own copy of the 1717 edition of the *Opticks*, did he elaborate on the seven precepts of the Noachites (Huntington Library, San Marino, California, call n° 700873, p. 382). A final addition was introduced in the 1721 edition of the *Opticks* [18, p. 382] (see furthermore [8, 9, 21]).

Shapiro has argued that Newton introduced the term 'experimental philosophy' (and the related terms 'induction' and 'deduction from the phenomena') only shortly before the publication of the second edition of the *Principia* (1713) as rhetorical ammunition to counter Leibniz who had provoked him [7]. As a result, Newton began to distance his own natural philosophical method from that of his opponents which, according to him, was based on hypotheses. In a draft prepared for the 1717 edition of the *Opticks* he maintained that hypotheses are "not to be regarded in Experimental Philosophy" and added the following note: "† ~~Metaphysical proofs ↓of a deity↓ not grounded on Phænomena are ↓no better↓ dreams~~ † And even in proving a Deity all aguments [sic] ↓not↓ taken from Phænomena are little better then dreams" (f. 621v). In another draft, in which Newton argued that the existence of active principles can be convincingly shown from phenomena, he elaborated on the matter. He pointed out that final causes can be established from phenomena and that affirming more than is revealed from experience is precarious, adding that "to affirm any thing more then I know by experience & good reasoning upon it is precarious" (f. 619r). Next, he explained that in demonstrations of the existence of God, metaphysical arguments must be rejected and arguments taken from phenomena are preferred: "↓Even arguments for a Deity if not taken from Phænomena are slippery & serve only for ostentation.↓ ~~An A~~ An Atheist will allow that there is a Being absolutely perfect, necessarily existing & the author of ~~all th~~ mankind & call it Nature […] And heel ↓may↓ tell you further that y^{e} Author of mankind [~~illegible~~] was destitute of wisdom & designe because there are no final causes & that matter ↓in space & therefore necessarily existing and having always the same quantity of motion, would↓ in infinite time ~~would~~ run through all variety of forms one of w^{ch} is ↓that of↓ a man ↓ [~~illegible~~] Metaphysical arguments are intricate & understood by few↓ The arguments w^{ch} all men are capable of understanding & by w^{ch} the

belief of a Deity has hitherto subsisted in the world is taken from Phænomena. We see the effects of a Deity in the creation & thence gather the cause & therefore the proof a Deity & what are his properties belongs to ~~Natur~~ Experimental Philosophy." (f. 619r-v)

Newton makes a number of significant points here. First of all, he states that metaphysical arguments for the existence of God are "slippery and serve only for ostentation". Next, he provides a number of examples of metaphysical theses which according to him contradict the phenomena. Finally, he concludes that the demonstration of God's existence and his properties pertains to experimental philosophy. This draft is particularly important for nowhere else did Newton spell out his empiricist commitments in Theology more explicitly than there.

6. Conclusions

In the preceding sections, we explored how certain well-known theological and religious statements in the Queries and *Quaestiones* to the *Opticks* and *Optice* took shape and gradually, after several consecutive revisions and reformulations, reached their published version. We showed that in the earliest drafts in which Newton provided support for active principles he relied on material derived from the 'Classical Scholia', but that few traces of this material remain in the published version of the *Optice* and *Opticks*. In addition, we analysed the development of Newton's statements on God's sensorium, which he made in two distinct contexts, namely in the context of Newton's discussion of active principles and in the context of the arguments he developed in favour of God's design. Furthermore, we revealed that aspects of Newton's matter theory, namely the hardness he ascribed to the particles constituting lumps of matter, have a teleological underpinning, i.e. those particles were created hard so they would not disintegrate over time. We also identified the draft material on f. 249_{bis}r-v used for the initial print of the *Optice*, which contains the statement "*Annon Spatium Universum, Sensorium est Entis Incorporei, Viventis, & Intelligentis; quod res Ipsas cernat & complectatur intimas, totasq; penitus & in se praesentes perspiciat; quarum id quidem, quod in Nobis sentit & cogitat, Imagines tantum in Cerebro contuetur?*" and argued whether or not this utterance reflects Newton's own view cannot be decided from the nature and contents of the draft. Finally, we uncovered the empiricist strands in Newton's theological thinking that were nowhere as clear as in the drafts we considered. We hope that by making all theological and religious fragments in the Queries/*Quaestiones* and the corresponding draft material available, others will be incited to draw on them in their own research.

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