A Concord of Alchemy with Theology: Isaac Newton’s Hermeneutics of the Symbolic Texts of Chymistry and Biblical Prophecy

by

Paul Timothy Greenham

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Institute for the History and Philosophy of Science and Technology (IHPST)
University of Toronto

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Abstract

That early modern natural philosophers such as Isaac Newton were deeply preoccupied by religious concerns, which were entwined with their study of nature, has become—at last—a fairly uncontroversial commonplace. In the area of the relationship between Newton’s natural philosophy, alchemy, and theology, Dobbs’ *Janus Faces of Genius* has had an enduring impact. However, the new historiography of alchemy and insights gained from the application of book history to the history of science—particularly the bookishness of alchemy—require Newton’s alchemy and theology to be revisited. Accordingly, this dissertation makes two main arguments: 1) Specific connections between Newton’s alchemy, or, to use the more inclusive term, “chymistry”, and his theology can be found by considering Newton’s methods of interpreting symbolic texts—as opposed to searching for specific unity of subject matter. Analysis of Newton’s textual research methods reveals his cross-comparative organization of textual sources and his particular *descriptive-translational* approach to symbolic texts: figurative alchemical texts and the prophetic texts of the Bible. 2) General connections between Newton’s chymistry and theology can be seen as his overall trend to incorporate statements of God into his natural philosophy was specifically
manifested in physico-theological and divine metaphysical arguments that he built from chymical phenomena in his optical writing, particularly the Queries to the *Opticks*.

The dissertation develops these arguments through analysis of Newton’s reading practices, evidenced by his particular method of dog-earing the books he owned and his organizational lists of hermeneutical rules and figurative vocabulary. Additionally, it analyses Newton’s integration of chymical sources and experimentation into his published optical work and its accompanying natural-philosophical discourse of God. While the necessary connectedness of Newton’s thought, the “unified mind” thesis articulated by Dobbs, may no longer be a viable way of conceiving Newton’s various intellectual (and practical) pursuits, this does not mean that they were unrelated. On the contrary, a uniquely textual connection can be seen within Newton’s work with the symbolic texts of alchemy and prophecy: his descriptive-translational approach. Moreover, Newton’s well-documented integration of matter theory and concepts of God are revealed to have an essential foundation in alchemical experimentation and theory.
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Soli Deo gloria.
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Introduction

At some point after 1675, Isaac Newton transcribed the following opening words from an alchemical manuscript “communicated to Mr. F. by W. S. 1670, & by Mr. F to me 1675”:

It may seem an admirable & new Paradox that Alchemy should have concurrence with Antiquity & Theology; the one seeming merely humane & the other divine; & yet Moses, that ancient Theologue describing & expressing the most wonderful Arithecture [sic] of this great world tells us that the spirit of God moved upon the water, which was an indigested chaos, or mass created before by God with confused earth in mixture; yet in his Alchemical extraction separation sublimation & conjunction so ordered & conjoyned [it] again ... This divine Alchimy through the operation of the spirit ... was the beginning of time ... [and of] terrestrial existence by which all things have moved & have their being, consisting of body soul & spirit whether they be vegetables minerals or Animals, only with this difference, that the souls of men & Angels are reasonable & immortall according to the image of God himself.¹

While these words do not necessarily demonstrate Newton’s commitment to the concord of alchemy with theology—particularly given the transcribed manuscript’s strong statement of Trinitarian doctrine further on—Newton’s recording of these words for his personal alchemical use raises the question of his own views regarding the connection between alchemy and theology: How exactly are Isaac Newton’s alchemy and theology related? Is there a specific connection between the two, more fundamental than that amongst his other pursuits? Does the superficially similar appearance of figurative language in the symbolic texts of each hide a deeper connection?

¹ Isaac Newton, “Transcription of Manna,” Keynes Ms. 33, King’s College Library, Cambridge, fol. 5r.
These are the central questions of this dissertation. They are not new questions, although developments in the historiography of alchemy and of scholarship in the early modern period necessitate their re-evaluation. I argue that Newton adopted a philological approach to the interpretation of symbolic texts, as he perceived the figurative language both of biblical prophecy and of alchemical texts to be an actual dialect communicated—and enciphered—in symbolic forms and capable of being translated into a plain descriptive meaning. Newton’s reading of the symbolic texts of alchemy and of biblical prophecy did not employ a translational hermeneutic specific to these fields alone, rather his translational approach represents a universal feature of his scholarship and characterized his reading of all symbolic texts, from Pythagoras to Hermes. Nonetheless, Newton’s employment of his descriptive-translational method in his reading of biblical prophecy and of alchemy was a necessary source for his access to knowledge—of post-Apocalyptic events and of alchemical procedures and products—in ways that his reading of the symbolic texts related to subjects in natural philosophy was not. In this regard a more specific connection can be seen between Newton’s alchemy and his theology, albeit as a stronger case of a more general phenomenon.

1. Perspectives of Newton’s Alchemy and Theology

To fully answer the question of how Newton’s alchemy and theology are related, we must understand what Newton and his contemporaries meant by alchemy and by theology. Modern conceptions of what both alchemy and theology were in the period of the “scientific revolution”—and their relationship to science—are frequently at odds with what we find when we investigate the complexity of early modern people and their world. Rather than the occult pseudo-science characterized by the previous generation of historians of science, early
modern alchemy reveals itself to be an experimentally and theoretically rigorous endeavour, grounded in the practices of the laboratory and the application of erudite scholarship to a multitude of symbolic texts. Likewise, the rigorous hermeneutical practices central to early modern theology, or “divinity” as it was commonly labelled, shared a common source with methods of organizing natural knowledge and may have influenced early modern scientific thought, rather than being a barrier against which developments in science struggled.

Theology, or divinity, was the study of God, his nature, and his attributes, and, while frequently systematic, it was ultimately grounded in revealed truth or religious tradition. However, when we read statements about God, his divine nature, and his relationship to the natural world, it is important to realize that early modern natural philosophers assumed the appropriateness of philosophy—and that branch dealing with the natural world, natural philosophy—to discourse of God. In other words, ‘God-talk’ in early modern philosophical writing was not necessarily theological nor inherently a subset of divinity. Discussions of God in natural philosophy were frequently metaphysical and had as their end a discovery not of the divine nature but of the nature of things, even as a consideration of the divine illuminated the natural world.

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Isaac Newton stands as a paradigmatic example of the relationship between early modern theology and natural philosophy, as scholars have debated the relationship between his extensive biblical scholarship and his achievements in mathematics, physics, and scientific method. 4 Newton’s hermeneutical rules for the interpretation of biblical prophecy have provided ample scope for comparison to his scientific and mathematical methods. 5 Moreover, his careful analysis and cross-comparison of multiple historical sources—driven by his concern for the corruption of true original knowledge (of both nature and religion) over time—has been linked to his methods of analysing experimental data as he sought to overcome the limitations of sensory perception. 6 Nonetheless, perhaps the most

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5 Frank Manuel suggests that Newton’s interpretive rules for biblical prophecy in his unpublished treatise on Revelation, Yahuza Ms. 1.1, National Library of Israel, Jerusalem (composed in the 1670s or 1680s), were a replica of the Regulae philosophandi in his Principia (1st edition, 1687), and were guided by the same principle of simplicity, see Manuel, Religion of Isaac Newton (Oxford: Clarendon Press, 1974), 98. Maurizio Mamiani counters that the Regulae philosophandi were written after Newton wrote his hermeneutical rules (Yahuza Ms. 1.1) and that the methodological structure of both are representative of the kind of reasoning advocated in Robert Sanderson’s Logice artis compendium (1631), one of Newton’s early textbook purchases at Cambridge (in 1661) (HL 1442), see Mamiani, “Newton on Prophecy and the Apocalypse,” in I. Bernard Cohen and George E. Smith, eds., The Cambridge Companion to Isaac Newton, (Cambridge: Cambridge University Press, 2002), 387-408. Rob Iliffe discusses Newton’s complex hermeneutics in his attempts to synchronize the seven vials and seven trumpets in the Apocalyptic vision. According to Iliffe, Newton’s interpretation relied on a precise computation of the dates of historical events, which then provided empirical figures to support his synchronization theory, see Iliffe, “‘Making a Shew’: Apocalyptic Hermeneutics and the Sociology of Christian Idolatry in the Work of Isaac Newton and Henry More,” in Force and Popkin, eds., The Books of Nature and Scripture: Recent Essays on Natural Philosophy, Theology, and Biblical Criticism in the Netherlands of Spinoza’s Time and the British Isles of Newton’s Time (Dordrecht: Kluwer, 1994), 73. Sarah Hutton analyses Newton’s hermeneutics in comparison with his contemporary, Henry More. She emphasizes the systematic scope of Newton’s comparison of Scripture with Scripture, characterizing Newton’s view of the symbols of biblical prophecy as a kind of divine algebra whose values could only be deduced through a comprehensive comparison of every individual occurrence of a given symbol, see Hutton, “More, Newton, and the Language of Biblical Prophecy,” in Force and Popkin, Books of Nature and Scripture, 49.

6 Jed Buchwald and Mordechai Feingold identify a cross-referencing pattern in Newton’s work with chronology, resulting from his concern for the corruption of ancient historical sources. They argue that this
A comprehensive attempt to unite Newton’s theological interests and his investigation of the natural world is that provided by Betty Jo Teeter Dobbs in her exploration of Newton’s alchemy, theology, and natural philosophy in *The Janus Faces of Genius* (1991).

In this work Dobbs directly addresses the main question of this dissertation—how Newton’s alchemy and theology are related—arguing for a unified pursuit of God’s activity in all of Newton’s work, from his alchemy to his Arian theology to his physics. In Dobbs’ characterization, Newton’s theology, rather than being peripheral, becomes central and his alchemy the means of linking the rational and the spiritual. Thus for Dobbs, alchemy represented a bridge, a mediator between theological and scientific pursuits. In alchemy Newton studied the sources of activity in nature, in the operation of certain “active principles”, and the properties of matter. Dobbs linked the presence of a universal vegetative spirit bestowing activity in all alchemical processes—putrefaction, fermentation, generation of metals and of life—to the *pneuma* of the Stoics and ultimately to the Arian Son of God in Newton’s theology. Since God was the ultimate source of all activity in the world, but was absolutely transcendent (in Dobbs’ account of Newton’s Arianism), Christ, the created-yet-divine Son, the spiritual mediator between God and man, also mediated God’s activity in the

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natural world and lay behind Newton’s characterization of the vegetative spirit. Hence for Dobbs alchemy was of perhaps greater importance to Newton than his natural philosophy, coming closer to his secretive and dogmatic core beliefs and unifying them with his ardent investigation of the natural world. Even as she acknowledges its complexity and practical applications, Newton’s alchemy remains for her a hybrid of the mystical and the scientific.\(^9\)

Dobbs’ characterization of Newton’s alchemy as a more spiritually sensitive and religiously oriented practice than the rest of his natural philosophy reflects an earlier conception of early modern alchemy that has recently been challenged. Similar views towards Newton’s alchemy can be found throughout mid-twentieth-century accounts of the “other Newton”, the hidden, mystical side of the celebrated genius. John Maynard Keynes famously declared Newton to be “the last of the magicians, the last of the Babylonians and Sumerians.”\(^10\) Richard Westfall’s monumental biography, Never at Rest (1980), treats both alchemy and theology in the same chapter: they are mutual expressions of Newton’s rebellion against established authorities, be it mechanical philosophy (the vitalism of alchemy) or orthodox theology (Newton’s anti-Trinitarianism).\(^11\) In an article specifically analysing Newton’s alchemy, Westfall argued that Newton approached it with his characteristic quantifying spirit and extensive genius, distilling practical methods and cogent

\(^9\) Dobbs’ concept of the esoteric and spiritual nature of alchemy was influenced by Carl Jung, especially in her earlier work on Newton’s alchemy. See Dobbs, Foundations, 26-32. That Dobbs should both treat alchemy as a mystical practice and link it to developments in natural philosophy was not unusual. Her work fits into a trend of studies of the “Hermetic” origins of science, of the links between natural magic and the control of nature. See Newman’s discussion in Newman, “‘Decknamen or pseudochemical language’? Eirenaeus Philalethes and Carl Jung,” Review of the History of Science 49:2-3 (1996), 159-88.


natural philosophical truths from a “dark and turbulent sea”. Westfall linked Newton’s willingness to accept action at a distance in the operation of gravity to his familiarity with the active principles of alchemical explanation. Yet in Westfall’s analysis the alchemy was something other, something divorced from natural philosophy, something that his initial interest in chemistry deviated towards. Even if that study had profound effects on Newton’s concept of the working of the natural world, it was not in itself synonymous with the study of that world. Alchemy remained other-worldly, mystical, spiritual. And in that regard, Newton’s hidden heresy and his occult alchemy appeared inherently connected.

This view of alchemy has been challenged in the past couple decades. As William Newman and Lawrence Principe argue in “Alchemy vs. Chemistry: the Etymological Origins of a Historiographical Mistake,” the categorical distinction between alchemy and chemistry only developed in the eighteenth century and had its origins in the seventeenth-century textbook tradition. Newman and Principe suggest using the actor-category: “chymistry,” based on the absence of succinct boundaries between what we label “alchemy” and “chemistry” in seventeenth-century discourse. This term, for them, expresses the inclusivity required of any historical research of chemistry and alchemy in the sixteenth and seventeenth century.

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14 Newman and Principe, “Alchemy vs. Chemistry,” 33, 41. Whereas the terms “alchemy,” “chemistry,” and “chymistry” were used interchangeably by the seventeenth-century practitioners thereof, alchemical/chemical textbook writers developed the erroneous notion that the “al” of alchemy derived from something more than the Arabic definite article and denoted “great,” a referent to a specific “exalted” subset of chymistry. Hence the more sublime aspect of the Art, that of transmutation, or gold-making (*chrysopoeia*), was associated more and more with “alchemy.” And, as transmutation increasingly lost favour into the eighteenth century, alchemy received a fixed definition, usually negatively contrasted with experimentally and theoretically vigorous chemistry, that did not reflect its earlier breadth.
centuries. In this view, Newton was one of the last of the chymists to engage in the full range of alchemy/chymistry while drawing no distinctions. He was only the “last of the magicians” in as much as he was a sincere chymist at the turn of the eighteenth century. That he should have engaged in both “chemistry” and “alchemy” and drew experimental and theoretical conclusions from his “alchemy” becomes less remarkable: these are merely different expressions for the same endeavour.

Regarding Newton’s alchemy—or chymistry—and his theology, Principe suggests that the two are no more inherently connected than Newton’s astronomy or physics and his theological discourse.¹⁵ The only reason Newton’s alchemy appears to be a uniquely intermediary field between spiritual or religious interests and natural philosophy is the degree to which early modern alchemy in general—unlike other early modern “sciences”—appears discontinuous from its successive modern science, chemistry, and thereby retains the explicit religious or spiritual language now absent in the modern sciences. Moreover, Principe argues, various “alchemical” texts that Newton studied likely held different purposes for him, some related to experimental and theoretical investigations of the material world, but others focused on reconstructing ancient chronology and original religious knowledge. Without understanding the distinct motivations behind Newton’s reading of the plurality of alchemical texts, conclusions that Newton’s alchemy was more religiously motivated than his other investigations of the natural world could merely be drawing on sources that were religiously oriented anyway, and not related to the main business of his chymical research: understanding the nature of matter.

Principe’s division of alchemical subjects bears some similarity to Rob Iliffe’s argument for the disciplinary incoherence of different areas of Newton’s scientific interests. Iliffe, in “Abstract considerations: disciplines and the incoherence of Newton’s natural philosophy,” emphasizes the disciplinary boundaries between such fields as philosophy, chemistry, geometrical optics and rational mechanics.\(^1^6\) Iliffe’s position differs from an earlier positivism exemplified by I. Bernard Cohen in that Iliffe insists that Newton pursued all these fields “at the same time and with the same commitment” rather than, for example, seeing his alchemy as a result of some nervous breakdown or mid-life crisis.\(^1^7\) Nonetheless, Iliffe states, “Although [Newton’s] writing in these fields ostensibly concerned identical phenomena (such as gravitation), for the most part they were fundamentally incompatible and there was little if any interaction or connection between them.”\(^1^8\) Thus when Newton spoke of a “Greene Lyon” devouring the sun, he was merely using the language of his given discipline (in this case, alchemy), a discipline he was certainly devoted to, but one with its own vocabulary and set of problems that had no bearing on the problems of mechanics or optics.

While Iliffe’s position is a necessary corrective to the concept of an “essentialised and psychologized ‘mind’ ... the nescio quid that underpins the connectedness of [Newton’s] work,” invoked in Dobbs, it swings too far in that correction.\(^1^9\) The same can be said for Principe’s division of alchemical sources into chymical and non-chymical. Newton’s

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\(^{1^7}\) Iliffe, “Abstract Considerations,” 430, (emphasis his).

\(^{1^8}\) Iliffe, “Abstract Considerations,” 430.

\(^{1^9}\) Iliffe, “Abstract Considerations,” 451.
writings—and the material record of his reading practices—do contain just the sorts of connections between the various disciplines that imply the interaction Iliffe and Principe question, particularly in Newton’s interpretive approach to symbolic chymical texts and to biblical prophecy. Iliffe does not necessarily discount this; rather he wishes to unravel an a priori commitment to Newton’s connectedness and to emphasize “Newton’s subtle manipulations of disciplines, setting and audience,” leaving the search for potential conceptual links to further scholarship. Hence this dissertation provides a new analysis of these potential links in Newton’s alchemy—or chymistry—and his theology, from a perspective shaped by the new historiography of alchemy and uncommitted to any necessary connectedness in Newton’s thought. However, rather than conceptual links, I argue for the primacy of a methodological connection between Newton’s chymistry and theology in his descriptive-translational approach to symbolic texts.

2. A New Approach to Newton’s “Chymistry” and Theology

The new historiography of alchemy necessitates a new approach to the project that Dobbs attempted over two decades ago. Rather than a focus on the apparent secrecy and inherent mysticism of the symbolic chymical writings, a fruitful analysis of Newton’s alchemy, or “chymistry”, as an intermediary between his theology and his natural philosophy lies in perceiving chymistry’s unique integration of textual and experimental practices. Early modern chymistry combined the necessary ability to read and interpret complex texts with the skills of the artisan in the careful manipulation of chymical substances. As such,

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evaluating Newton’s interpretation of symbolic chymical texts—and its similarity to his interpretation of biblical prophecy—situates the discussion within current scholarship that relates the history of the book to the history of science.\(^{21}\) Newton’s significance for a study of the role of texts in the history of science and religion lies not only in the gravity of his own scientific and mathematical discoveries, but in the sheer volume of historical source material he left to posterity. And while much excellent work has enabled the transcription and analysis of large portions of Newton’s manuscript writings across many fields, comparatively little analysis of his textual research in his use of his personal library, his unusual method of dog-earring in particular, has thus far occurred. In this dissertation I redress this imbalance by tracing Newton’s reading practices in his targeted use of dog-ears to organize his reading of symbolic chymical books and by drawing the connections between the dog-eared record of his textual research and his manuscript chymical notebooks. I then compare this process to Newton’s cross-comparative organization of prophetic scriptural passages and ancient linguistic sources to uncover the plain meaning of the figurative prophetic dialect.

The structure of the dissertation follows two main arguments: 1) that a methodological connection can be found in Newton’s cross-comparative organization of textual sources and his particular descriptive-translational approach to symbolic texts, manifested in his reading of figurative alchemical texts and of the prophetic texts of the Bible; 2) that the matter theory

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espoused in Newton’s optical work and its synthesis with his natural-philosophical conception of God drew heavily on his chymical experimentation and theory, and as such that his optical publications—particularly the final Queries to the *Opticks*—demonstrate the overlap between his chymistry and his understanding of God. The first three chapters develop the first argument, considering first Newton’s textual chymistry, then his hermeneutics of biblical prophecy, and finally how the two relate to each other and to his overall work with texts. The fourth and final chapter considers Newton’s integration of chymical phenomena and theory into his discussion of God in his optical work.

In Chapter 1, I establish the textual nature of Newton’s chymistry, demonstrating how this rigorous experimental and theoretical enterprise was thoroughly informed by a comprehensive investigation of chymical texts, both symbolic and prosaic. In this investigation, I analyse Newton’s use of dog-ears, by which he folded the corner of a page to point to a specific word, name, or phrase, finding a general pattern to his reading of the symbolic literature of chymistry that focused on the identity of chymical products and procedures and that considered the origins of pagan religion. I articulate how Newton’s deciphering of the symbolic language of the chymical literature furthered his own laboratory research even as his experimental results assisted in the determination of the meaning of symbolic forms he encountered in his reading.

In Chapter 2, I provide a similar analysis of Newton’s reading of biblical texts, focused on his manuscript statements of his hermeneutics of biblical prophecy and his written discussion of the transmission of biblical manuscripts. I demonstrate Newton’s concern for the corruption over time of biblical documents and his attempts to find the most original reading through a vigorous cross-comparison of textual sources. Regarding Newton’s
reading of the symbolic texts of the Bible: biblical prophecy, I articulate his attempt to
reconstruct the prophetic dialect in which the figurative language of prophecy had been
written such that a reliable and straightforward translation of the prophetic forms into
political events could be performed. In this process, Newton employed his cross-comparative
methods, comparing Scripture with Scripture and also with ancient interpreters of the
prophetic dialect. Throughout, Newton adopted a translational approach to the prophetic
dialect, seeing an original natural-political analogy by which political entities and events had
been assigned natural imagery for their description. Newton believed that this analogy could
be straightforwardly reversed, deciphering the symbolic forms back into an original meaning
that did not involve fanciful interpretive leaps, but relied on trustworthy textual practices
grounded in the cross-comparison of Scripture and ancient interpretive sources.

In Chapter 3, I compare this pattern in Newton’s prophetic hermeneutics to his reading
of the symbolic texts of chymistry, detailing the evidence for a common approach to
figurative texts in all of Newton’s scholarship. I label this approach Newton’s descriptive-
translational method, whereby Newton believed all symbolic texts to have an underlying
plain descriptive meaning that the enlightened (adept) interpreter could access through a
direct translation of the figurative forms. Rather than Newton’s systematic and rigorous
methods of organizing textual sources and meanings arising from the application of a prior
scientific mindset to humanistic study, I argue that this approach to texts arose from his first
encounter with scholarship at Cambridge in the early 1660s. The origins of Newton’s cross-
comparative methods and his descriptive-translational approach more likely lie in his
learning the commonplace and indexing techniques of humanist scholarship and his early
study of the nature of language than in his later application of experimental method to textual
sources. In his organization of the specifics of the figurative languages of both chymistry and prophecy, Newton compiled extensive lexical lists, comprehensively compared multiple sources for the meanings of the given symbols, and sought the original meanings behind their inevitable corruption. For Newton, understanding how the original symbolic language had been misinterpreted and corrupted into false religious belief and inaccurate natural knowledge was an essential part of tracing its true interpretation. I argue that a significant component to Newton’s research of the *prisca* tradition—the search for original wisdom or knowledge (of God and of nature) from the time of Noah or Adam—was in fact translational, part of his drive to decipher the symbolic texts he encountered into their plain meaning in terms of future political events and entities (the prophetic texts) or chymical substances and procedures (the chymical texts).

Finally, in Chapter 4, I provide a philosophical consideration of the relationship between Newton’s chymistry and theology by articulating the intersection between his chymical work and his philosophical view of God in his optical writings. Newton used chymical theory and phenomena to build a natural-theological—or physico-theological—argument for God. At the same time he depended on *a priori* concepts of God’s attributes to understand the generation of new motion—activity—exhibited by chymical phenomena. In my analysis I draw on Andrew Janiak’s proposal of a divine metaphysics undergirding Newton’s epistemology, whereby Newton grounded his conception of God’s relationship to the natural world outside of strictly empirical arguments. 22 I extend Janiak’s concept of divine metaphysics to a consideration specific to Newton’s chymistry, as a subset of Newton’s general discussion of God within natural philosophy. This does not necessarily

mean that the chymistry of Newton’s optics engaged directly in theology, or divinity. Rather, I analyse Newton’s integration of chymical theory and phenomena with his concept of God in his *Opticks*—particularly Query 31—according to the categories of divinity, physico-theology and divine metaphysics. Even in this process Newton’s descriptive-translational approach emerges, as his interpretation of the Genesis creation account according to chymical theory relied on a particular understanding of the language that scriptural descriptions of nature were written in. Newton’s interpretation of the Genesis account indicated his belief that the enlightened natural philosopher could translate descriptions of the natural world in Scripture out of accommodated language (originally written for non-philosophical audiences) and into plain descriptions of natural phenomena, which could then be analysed to provide true accounts of previous natural events. Moreover, even in Newton’s articulation of the nature of matter and of activity, arising from his analysis of chymical phenomena, he depended on the scriptural assertion of the *imago Dei*—mankind in the image of God—to draw the analogy between God’s activity in the world and the mind’s control of bodily motion. In both of these regards links between Newton’s chymical theory—and the investigation of chymical phenomena—and his theology, or divinity, can be found, even as they form the specific manifestation in Newton’s chymistry of a general trend to integrate aspects of his theology into his natural philosophy.

New approaches to the understanding of the past call for contemporary historians to re-evaluate significant historical studies in their fields. In the area of the relationship between Newton’s alchemy and theology, Dobbs’ *Janus Faces of Genius* has had an enduring
However, the new historiography of alchemy, in addition to insights gained from the application of book history to the history of science—particularly the bookishness of alchemy—requires the relationship between Newton’s alchemy and theology to be revisited. In this dissertation I revisit the relationship from the perspective of Newton’s interpretation of symbolic texts. I argue that there is a methodological connection between his alchemy—or chymistry—and his theology, as a predominant expression of his general drive to translate all figurative texts into their plain descriptive meaning. Newton’s alchemy and theology are particular in this process, as correctly employing descriptive translation was vital to the generation of genuinely new knowledge in these fields: obtaining the correct knowledge of which political entities and events matched those prophesied by divine revelation and the correct assignment of chymical substances or procedure to a figurative description of an experimental process. Newton’s descriptive-translational approach characterized his interpretation of all symbolic texts and extended to his general hermeneutical integration of Scripture and natural philosophy. However, outside of his chymistry or theology (including his investigation of the origins of pagan religion), this approach tended to have a

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23 Examples of the continuing influence of Dobbs’ Janus Faces of Genius can be seen in a number of dissertations written on the topic of Newton’s alchemy and theology or in works that attempt to incorporate the relationship into the main argument. A notable case can be found in the recent “The Alchemical Apocalypse of Isaac Newton,” by Irene Zanon (University of Venice, 2013). Zanon considers Dobbs to be the foremost researcher into the field of Newton’s alchemy and seeks to extend her project, which she considers to be more focused on the practical aspects of the field, to Newton’s millenarianism. Thus in her linking of Newton’s alchemy to the specifically prophetic aspects of Newton’s theology, Zanon’s project is parallel to mine. However, in her focus on the subject matter of each field, and her characterization of Newton’s alchemy as a mystical and occult practice, Zanon’s approach is more reflective of earlier views of early modern alchemy. I argue for a connection between Newton’s method of reading the apocalyptic text rather than in a form of spiritual alchemy or in millenarian motivations to Newton’s alchemy. Similar uncritical reliance of Dobbs’ characterization of Newton’s alchemy and theology can be found in Gabriel Rupp’s dissertation, “The Police in Different Voices: Isaac Newton and his Programme of Purification,” (University of Oklahoma, 2005). Additionally, Tessa Morrison’s consideration of Newton’s description of the structure of the temple (in Babson Ms. 434), draws directly from Dobbs when discussing potential connections with Newton’s alchemy, see Morrison, Isaac Newton’s Temple of Solomon and his Reconstruction of Sacred Architecture (Basel: Springer, 2011), 25-27. This is a recurring pattern, particularly in studies focused on Newton’s more “esoteric” interests, such as biblical prophecy, which also attempt to draw some form of connection to his alchemical work.
supplementary role in the creation of knowledge: functioning more as rhetorical support—in ancient authority—of already-determined facts (such as the inverse law of gravity) than as the source for those facts.

My focus on Newton’s use of texts in this dissertation and on the commonality of his approach to the textual sources of disparate fields contributes to an understanding of the interaction between textual and non-textual methods of reasoning in the early modern sciences. In this context, the relationship between Newton’s alchemy and theology becomes part of a much larger investigation of ways of knowing in the early modern world. Newton’s general descriptive-translational approach to symbolic texts assumed an objective underlying reality behind linguistic and figurative signifiers reminiscent of his expectation of a consistent and objective world behind sensible phenomena. While the necessary connectedness of Newton’s thought, the “unified mind” thesis, may no longer be a viable way of conceiving Newton’s various intellectual (and practical) pursuits, this does not mean that they were unrelated. On the contrary, a uniquely textual connection can be seen throughout Newton’s work. I expect that the research and conclusions of this dissertation will contribute to the wider discussion of the role of textual practices in the rise of modern science, and to inform debates on the place of biblical hermeneutics in the development of scientific method. Moreover, in the more specific field of Newtonian scholarship, I anticipate my delineation of the chymical foundations for Newton’s natural-philosophical statements about God in the articulation of his matter theory in the *Opticks*, to provide helpful new insights into the well-traversed topic of how Newton’s theology related to his science.
Chapter 1: Newton’s Textual Chymistry

1. Textual Chymistry

When Newton died in the early morning of March 20, 1727, his pre-eminent reputation in English natural philosophy and mathematics rested securely, established by his ground-breaking works of physics and over two decades at the helm of the Royal Society. John Conduitt, the husband of Newton’s half-niece and his personal assistant in his seniority, emphasized, in a memoir sent to the Frenchman Bernard de Fontenelle, Newton’s moral character, his achievements in natural philosophy, and, of course, his priority over Leibniz in the calculus disputes. However, neither Conduitt nor any of the other early biographers concerned themselves with defending Newton’s reputation as an alchemist. Newton’s extensive labours at the furnace during his time at Cambridge (in the 1660s to 90s) passed quickly from the scientific hagiography that rapidly developed around England’s foremost natural philosopher. And yet the record of Newton’s immersion in alchemy remains in more than one million words relating to alchemical topics in Newton’s private papers. Moreover,


25 This is not to say that biographic material written about Newton neglected to mention his alchemy, for Humphrey Newton gave much detail of his chymical experimentation. However Newton as celebrated alchemist, as interpreter of the corpus of alchemical books, was not the biographers’ emphasis.

26 These documents, together with most of his private writings, were judged unworthy of publication after his death and eventually passed into the hands of the Portsmouth family. In 1888, the portion of Newton’s private papers judged to be “scientific” and worthy of preservation were donated to the Cambridge University Library (CUL) and catalogued. These documents included Newton’s “Chemical Notebook,” CUL Add. Ms. 3975, CUL, Cambridge and his later records of chymical experimentation, CUL Add. Ms. 3973, CUL, Cambridge—as well as drafts of optical material, papers related to various editions of the *Principia* and numerous other papers on mathematical and physical topics. As discussed below, this separation of his “alchemical” writings from his notebooks of “chemical” experiments in the laboratory contributed to the categorization of the majority of his alchemical writings as appositional to his natural philosophy and
as William Newman and Lawrence Principe discuss in their appeal for a new historiography of alchemy, seventeenth-century alchemy was not the mystical pseudo-science characterized by mid-twentieth-century scholars.27 On the contrary, Newman and Principe emphasize the experimental and theoretical strength of early modern alchemy. Newton’s manuscripts certainly reveal his theoretical and experimental interests in his alchemical practice.28 However, for the careful student of Newton’s manuscripts an equally important goal to Newton’s alchemical work readily emerges: the organization and interpretation of the dizzying array of symbolic alchemical literature.

Throughout his alchemical work—manuscript lists of alchemical *decknamen*, his selection choices of alchemical book desiderata, and the patterns of dog-ears in his personal alchemical library—Newton displayed a desire for comprehensive knowledge of the entire alchemical corpus and attempted to determine the plain meaning of alchemical figurative expressions. Building on the nomenclature of the new historiography, I consider Newton’s systematic research of the alchemical (and chemical) literature to be his “textual chymistry,” an activity to be considered alongside his experimental chymical practice. Using the seventeenth-century actor-category “chymistry” prevents an anachronistic division of texts and activities into the dichotomous categories of “chemistry” and “alchemy.” It allows us to


understand Newton’s laboratory experiments and his reading of arcane texts as parts of a continuous spectrum rather than as incommensurable disciplines. In this chapter, I investigate the vital role that the interpretation and organization of chymical texts played in Newton’s overall chymical career and argue that it should be seen as an integral part of the same overall field. While the majority of the work on Newton’s chymistry has focused on his chymical manuscripts, I consider the evidence in Newton’s library of his research of texts, providing a new analysis of his use of his own chymical books through an in-depth consideration of the under-explored method of his dog-earing. I argue that in addition to its experimental and theoretical strength, Newton’s chymistry should be understood as a thoroughly textual pursuit. Newton’s textual chymistry had its own comprehensive research program, evidenced in multiple manuscript compilations to organize and interpret the field—especially the “Index Chemicus”—and in the patterns of dog-ears in his personal chymical books, which indicated his tendency to decipher symbolic and prosaic terms and mythological stories or figures.

1.1 The importance of textual scholarship to early modern chymistry

The importance of texts and their correct interpretation to alchemical practice in the early modern period has been a central theme in recent historical accounts of the chymical arts. In Tara Nummedal’s summary of the current scholarship, “Words and Works in the History of Alchemy,” she emphasizes the simultaneously “bookish, experiential, and experimental”

aspects of alchemy, which “stubbornly resists any attempt to separate out the histories of reading, writing, making, and doing.” Alchemical practitioners brought their books into the laboratory and incorporated resulting recipes and descriptions of alchemical processes into new alchemical texts. The study of alchemy usually began in the library, and involved “collecting, assessing, comparing, and commenting on” alchemical texts, both those of the historical canon and new treatises and commentaries. Bruce Moran looks specifically at Andreas Libavius’ combination of humanist erudition with the technical and vernacular language of the workshop. Moran shows how Libavius emphasized an understanding both of “the language of artisanal praxis,” gained through practical experience in the workshop or laboratory, and of humanist methods of scholarship to adequately read the confusing and ambiguous figurative alchemical texts. For Libavius, the procedures of Lull and Arnold (canonical alchemical writers) contained clear descriptions for those versant in the processes of the Art. I argue that Newton held a similar attitude towards the symbolic texts of chymistry and, as discussed in Chapter 3, considered them to consist of plain descriptions of chymical products and procedures represented in a figurative language. Moreover, like

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Libavius, Newton used his practical experience at the furnace to interpret the language of the symbolic texts, fitting into a general trend within early modern chymistry. As Moran states,

> Making knowledge in early modern chemistry involved more than observation, reasoning, and technical know-how. In understanding nature, there was also the matter of how knowledge was to be organized and expressed. In this regard, texts and practices enlightened one another. Thus chymia required a knowledge of both words and things.\(^{35}\)

Jennifer Rampling reveals a similar integration of praxis and textual scholarship in her article, “Transmuting Sericon: Alchemy as Practical Exegesis.”\(^{36}\) Rampling describes the perplexity and frustration experienced by early modern alchemists—similar to those of modern historians—when faced with the multiplicity of symbolic cover names, or *decknamen*, used to disguise the materials and processes of the Art.\(^{37}\) In response, early modern readers of the symbolic texts of chymistry integrated their own practical observations into the textual chymical tradition. As she states, “much of the vigor of early modern alchemy stemmed from its dual identity as *scientia* and *ars*. This identity demanded, besides practical skill, the ability to construe texts.”\(^{38}\)

In this chapter I consider how this general trend to integrate textual and experimental practices in early modern chymistry was specifically manifested in Newton’s research of symbolic chymical texts. Understanding how Newton’s textual research program related to the rest of his chymistry, in both his experimentation and his integration of chymical

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\(^{38}\) Rampling, “Transmuting Sericon,” 29.
observation and theory into the rest of his natural philosophy, provides a necessary background to the overall goals of this dissertation: exploring the connections between Newton’s chymistry and his theology. This is particularly poignant for texts traditionally included in the alchemical spectrum that Newton owned, but which do not have an overt connection to Newton’s chymical experimentation or theory. Lawrence Principe, for example, questions whether Newton’s research of certain “alchemical” texts, particularly those related to ancient chronology and pagan religion, can even be included in the same field as Newton’s attempts to understand the nature of matter.\textsuperscript{39} If Principe is correct, connections between Newton’s interpretation and translation of these symbolic texts and the symbolic texts of Biblical prophecy—which I explore in Chapters 2 and 3—do not, in fact, tell us much about the connections between his chymistry—as a branch of his natural philosophy—and his theology. Hence, in this chapter, I demonstrate the commonality of Newton’s research methods with all of his chymical texts and his comprehensive approach to the full range of chymical literature available to him. The textual components of Newton’s chymical research drew no boundaries. Moreover, the unique integration of textual scholarship into experimentation and theorizing about the natural world in Newton’s chymistry, which generally categorized early modern alchemy/chymistry, makes chymistry the ideal site for a consideration of how Newton’s theology related to his natural philosophy. However, before considering the overlap of textual methods between Newton’s chymistry and this theology in his common descriptive-translational approach to symbolic texts (Chapter 3), the extent of his textual interests in chymistry must be considered.

\textsuperscript{39} Principe, “Reflections on Newton’s Alchemy,” 205-219.
1.2 Continuity in Newton’s textual chymistry

In his suggestion of the internal discontinuity between Newton’s chymical interests, Principe points to the internal diversity of alchemy itself—or what has historically been labelled alchemy. Historical figures, lumped into the “alchemist” category, pursued a range of applications and interests, from transmutation—which he labels “chrysopoeia” from the Greek for “gold-making”—to chemical medicine and pharmacy, to chemical industry. Even among those attempting transmutation, they did so from a range of theoretical frameworks: “Among chrysopoeians alone one can find Scholastics, Neoplatonists, praisers, damners and ignorers of Paracelsus, corpuscularians, vitalists, mechanists, and so on.” Principe concludes, from this non-essentialist nature of seventeenth-century alchemy, that studies of Newton’s alchemy should consider Newton’s specific motivations for writing or copying a specific text. Just as some of his activities traditionally labelled “alchemy” should fit into the broader category of “chymistry” along with his chemical research notes and the chemistry of the *Opticks*, so other activities should not perhaps be seen as chymical at all. Principe gives the example of texts among Newton’s “alchemical papers” which comment on writings attributed to Hermes Trismegistus, a legendary author as ancient as Moses and a potential source for uncorrupted divine wisdom. Other texts, equally labelled “alchemical” by historians of Newton’s alchemy, deal with sources such as Eireneus Philalethes, whose Helmontian chymistry exhibits striking resemblances to Newton’s matter theory. Principe argues that these are completely different subjects, with the former a source for Newton’s reconstruction of ancient chronology and the *prisca sapientia* (original wisdom of the

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40 Principe, “Reflections on Newton’s Alchemy,” 216.

41 Principe, “Reflections on Newton’s Alchemy,” 216.
ancients) and the latter a part of Newton’s researches into the inner workings of the natural world. Rather than attempting to find a common purpose and unifying principle to the complete set of “alchemical manuscripts,” Principe argues for finding the intention behind individual manuscript groups. Thus the question is not so much, “What was the meaning and influence of Newton’s alchemy?” so much as “Why did Newton read or follow the experiments of this author?”

This is not to revert back to the excision from seventeenth-century natural philosophy of theological motivations and concepts, advocated by Newton’s nineteenth-century biographers, or to revive the mystical characterization of alchemy akin to that of Richard Westfall and Betty Dobbs. Rather, as Principe puts it,

‘Alchemy,’ as a field which ‘died’ before the widespread secularization of the sciences, preserves in its written remains all the marks and expressions of pre-Enlightenment piety, and thus when laid alongside the secularized descendants of early modern physics, astronomy, and other sciences, it naturally appears more closely linked to theological and spiritual preoccupations.42

Hence, according to Principe, early modern alchemy, or “chymistry” was just as theologically motivated and just as experimentally and theoretically rigorous (if not more so) as the rest of early modern natural philosophy. It was not inherently more connected to religious or spiritual interests. And those of Newton’s “alchemical” manuscripts which are more explicitly religious may well be misclassified. Principe argues that there are no more inherent connections between Newton’s chymistry and his theology than there are between his astronomy, or physics, and his theology.

42 Principe, “Reflections on Newton’s Alchemy,” 214.
I contend, however, that investigating the connections between Newton’s chymistry and theology remains nonetheless quite necessary for two primary reasons. The first is fairly trivial: the similarity of theological motivations and discussions within Newton’s chymistry to connections between his theology and other natural philosophical interests—and indeed to the “scientific” interests of other natural philosophers—by no means makes their investigation less worthwhile. Rather, by studying Newton’s theological motivations in his chymistry and his use of God’s nature in constructing his matter theory, new light can be shed on the well-trodden path of relating Newton’s concept of God to his understanding of the natural world. I explore this aspect in more detail in Chapter 4.

My second reason for advocating an investigation of connections between Newton’s chymistry and his theology is that I am not convinced that Principe is right to balkanize Newton’s alchemical work. To the extent that it is every historian’s job to demonstrate the complexity of any historical situation, his emphasis certainly moves the study of Newton’s alchemy in the right direction. Newton’s chymistry does reflect a diversity of interests and was likely used for different purposes, be it matter theory or chronology. Furthermore, Newton’s alchemical reading and writing extended through decades of his life, reflecting different interests and research goals at different times in addition to being conducted under his own changing theoretical frameworks. Yet the fact remains that Newton would have considered all of these diverse activities as “chymistry”, and labelled them as such in the organization of his library. Moreover, Principe’s division of alchemical subjects does not leave room for overlap between the interpretation of symbolic representations of chymical products, procedures, or matter theory and the *prisca sapientia*, especially when certain books in Newton’s “chymical” library appear to have been used for both purposes. This is
especially poignant when we consider that one of the central purposes to Newton’s investigation of the *prisca sapientia* may have been translational, as he sought to understand the original scheme by which knowledge of the natural world—such as the inner structure of matter—had been represented by symbolic figures in ancient texts. As I demonstrate in Chapter 3, Newton used a common descriptive-translational approach to determine the plain meaning of symbolic representations of chymical procedures, matter theory, and pagan religion, linking the idolatrous origins of the latter to the misreading of the symbolic representation of the former two.

While eighteenth- and nineteenth-century interpretations of alchemy inserted ahistorical psychological superstructures into the symbolism of seventeenth-century alchemical writing, that symbolism itself is unmistakeably present and provides a consistency across the “alchemical” books of Newton’s library—both “Hermetic” and “Philalethian.” One might argue that mixed in with the symbolic books are mechanistic and non-symbolic “chemistry”, such as Lemery’s *Cours de Chemie*, included equally by Newton into his list of chymical works with Hermetic and Philalethian texts. The conclusion I draw from this, however, is that the limits of “chymistry” should actually be expanded, such that Newton’s chymistry includes symbolic and non-symbolic treatments of matter theory, chemical experimentation and procedure, as well as connections to ancient knowledge and religion. I agree that we need to specify precisely how Newton used the *symbolic literature of chymistry*—as I label seventeenth-century “alchemical” texts. However, I do not think that doing so necessitates declaring the literature that he generally used for “non-scientific” purposes to have nothing to do with his chymical interests. This is especially true in the cases

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43 For the Jungian interpretation see Newman, “‘Decknamen’ or pseudochemical language’,” 159-88.
where Newton’s interest in symbolic chymical texts related to ancient knowledge and religion may have had utility to him as a means to understand the overall symbolic language used in the chymical literature, allowing the correct interpretation of symbolic representations of chymical procedures and theories, as seen in Chapter 3. As will be demonstrated below, Newton’s interest in chymistry was comprehensive: he sought every text he could get his hands on and, not content with current (and modified) editions, purchased older versions to ensure he lacked nothing. Newton’s approach to the literature of chymistry—and the symbolic literature in particular—reflected an attitude that did see them as interrelated, even if he found varying uses for the volumes once collected. Moreover, his approach to the symbolic language of chymistry appears to be consistent across his chymical library, as he deciphered its emblems and metaphors into chymical products and procedures—which he incorporated into his experimental notes—as well as into representations of the developments of ancient religion. Hence a detailed consideration of Newton’s chymical library and how he used it is necessary for understanding his general methods in alchemy/chymistry. Only then can connections with other fields, such as theology, be considered. Separating out the works of symbolic chymistry that deal with natural philosophy and labelling them as categorically different from other symbolic works that use the same language—and even the same exemplary symbols and stories—prejudges whether there are any connections. This runs the risk of losing sight of the unique expression within chymistry of that general pattern—strongly advocated by Principe—of theological motivations and connections in every discipline of seventeenth-century natural philosophy. Rather, an analysis of Newton’s textual chymistry reveals that he used the same sources and methods to determine the true meaning behind symbolic expressions of experimental
procedures and products as well as less “scientific” symbolic meanings related to chronology and the origins of pagan idolatry. Before investigating the details of Newton’s reading of the symbolic chymical literature, however, let us first consider the context of Newton’s overall chymical career.

2. Isaac Newton, Chymist

2.1 The early years

Newton’s first exposure to the world of chymistry likely came when he was sent to Grantham in 1655 to go to grammar school at the age of 12. He lodged with a certain Mr. Clark, an apothecary, and his three step-children.44 Not much is known of his degree of interest in the pharmaceutical business of his lodgings, but he would have had an early glimpse into the procedures and materials involved in the work of a chymist. Chymistry was not an official subject of study in the European universities, and Newton’s early book purchases and notes reflect this. His Trinity College notebook begins with notes taken from standard texts in the seventeenth-century scholastic curriculum, such as the Physiologiae peripateticae of Johannes Magirus and the Axiomata philosophica of Daniel Stahl.45 Notes from Newton’s final undergraduate years indicate his branching out from the standard texts and his early encounter with the mechanical philosophy of Gassendi and Descartes. In a section labelled, “Questiones quaedam Philosophiae,” Newton set out a series of pages, each with a heading regarding a certain subject or debate in natural philosophy, such as: “Of a

44 Westfall, Never at Rest, 58.

Vacuum & Attomes,” “Of Violent Motion” and “Of Comets.” The content of these pages ranged from Newton’s personal observations (in the case of comets, for example) to direct quotes from current natural philosophers (such as Robert Boyle) to Newton’s synthesis of current opinion. Most of the material conforms theoretically to a general mechanical philosophy, and even at this stage Newton’s early predilection for atomism can be seen. A second notebook appears to be a continuation of these studies, written in a similar style and beginning in a hand that matches his work from the mid 1660s: Add. Ms. 3975 in the Portsmouth collection at the Cambridge University Library (CUL). This notebook demonstrates Newton’s increasing reliance on Robert Boyle as it covers topics such as “Of Colours,” “Of Cold, & Heat,” and “Rarity, Density, Elasticity, Compression, &c.” Yet again these sections served to collate Newton’s readings of the mechanical philosophers; but the subjects covered tended more and more towards chymistry.

Westfall labels Add. Ms. 3975 “Newton’s chemical notebook” and describes its shift from initial “chemical” entries to a direct involvement in “alchemy”. While Westfall’s clear distinction between chemistry and alchemy no longer fits the current historiographical picture, he does demonstrate Newton’s deeper involvement in the full literature of chymistry, and his growing awareness of and interest in symbolic chymical writings. This notebook, however, has notes in a mid-1670s hand from both Westfall’s “chemical” and “alchemical”

46 Newton, “Trinity College Notebook,” CUL Ms. Add. 3996, fol. 88r-135r.
47 Westfall, Never at Rest, 96.
categories.\footnote{Westfall, “Alchemy in Newton’s Career,” 192-3. Westfall discusses the interspersion of notes from Newton’s experiments between pages with topical headings. He sees this as a \textit{possible} implication of a connection between Newton’s “chemistry” and “alchemy”. In the new understanding of alchemy, this is not problematic – it is a clear indication of their connection in Newton’s mind and a fruitful source of investigation into exactly how Newton turned his reading of symbolic chymistry into specific (and frequently dated) experiments.} The difference for Westfall appears to be associated with the specific texts or topics that Newton was recording from and hence to be an arbitrary external division based on a prejudgment as to what counts as “chemical” and what is “alchemical”. Rather than seeing a shift from “chemistry” to “alchemy” we should see Newton’s deepening involvement in the holistic field of chymistry. What began with initial reading from Boyle and Newton’s own experimental notes expanded into notes on a wider range of chymical writings, including Starkey’s \textit{Pyrotechny Asserted} and \textit{Ripley Reviv’d} (under the pseudonymous, Eirenaeus Philalethes) and John de Monte-Snyder’s, “Commentatio de pharmaco catholico.” Add. Ms. 3975 was classified among Newton’s ‘scientific’ papers in the 1888 Portsmouth donation to the Cambridge University Library and subsequently separated from the rest of Newton’s chymical writings. However, rather than seeing it as a record of Newton’s incommensurably rational and scientific chemistry, it should be read in parallel with his other chymical manuscripts, both as a record of his developing interests in chymistry and an avenue into his own experimental path and research interests in an integrated field. As will be discussed below, a number of the later entries in Add. Ms. 3975 actually reveal Newton’s integration of his textual chymical research into his experimentation, as he recorded chymical procedures from symbolic texts in addition to those from more straightforward chymical texts (such as Boyle and Starkey).
2.2 Chymical networks and acquaintances

Newton’s engagement with chymistry did not happen in isolation. Rather than the traditional idea of the solitary scholar, pursuing individual and eccentric subjects, Newton was a member of an intellectual community, and this is specifically clear in the case of chymistry. Most of Newton’s chymical manuscripts appear to be transcriptions or copies of the writings of other people.\(^{51}\) These were from published volumes that Newton was unable to acquire or from manuscripts that were either never published or only published after Newton had copied them. In some cases a previously copied manuscript would later enter Newton’s library as a published book. A few of the manuscripts in his collection were written in hands other than that of Newton. One example is the collection of papers at King’s College, Cambridge, labelled Keynes Ms. 67. This collection seems to date from the 1660s—based on notes written in Newton’s early hand—and contains manuscripts written by at least three different hands. It appears to have been loaned to Newton and never returned, since he made copies of several of the same works—which are now present in a separate collection (Keynes Ms. 62).\(^{52}\)

Similarly, a treatise entitled, “Manna”—mostly written in a non-Newtonian hand—contains the following note by Newton, “Here follow several notes & different readings collected out of a M.S. communicated to M' F. by W. S. 1670, & by M' F. to me 1675.”\(^{53}\) The identity of this “M' F.” and “W. S.” remains a mystery, but the existence of


\(^{52}\) Westfall, “Isaac Newton’s Index Chemicus,” *Ambix* 22:3 (1975), 180, n. 26. Westfall suggests that these manuscripts could have been purchased by Newton, although there is no record of such a purchase. It is more likely that they were loaned for study and transcription, given Newton’s own copies.

\(^{53}\) Newton, Keynes Ms. 33, fol. 5r. See also Westfall, *Never at Rest*, 288 and Dobbs, *Foundations*, 111.
these manuscripts and their use point to a community of chymists, likely in Cambridge, sharing their work.⁵⁴

How Newton first became acquainted with this network of chymists remains almost as much of a mystery as its membership. Westfall draws great significance from the secret nature of Newton’s alchemical circle. It was “largely hidden from public view” providing a “background of deliberate secrecy.”⁵⁵ Moreover, these authors engaged in that secretive practice—common to most alchemists—of using pseudonyms, such as Starkey’s “Eireneaus Philalethes”. Even Newton may have used an alchemical pseudonym: “Ieova sanctus unus” an anagram of his own name, “Isaacus Neutonus,” and Westfall speculates that some of the clandestine alchemical documents circling around seventeenth-century England had his hidden authorship.⁵⁶ For Westfall all of this secrecy illustrates the sharp distinction between alchemy and chemistry and the non-scientific nature of the former. Alchemy lacked transparency and its symbolic language hindered reproducibility. However, one wonders to what extent the ‘secrecy’ of Newton’s chymical network is merely the result of missing historical data.⁵⁷ It is known that Newton and Boyle had a regular correspondence, yet only

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⁵⁴ Dobbs suggests Ezekiel Foxtrot as the mysterious “M’ F.,” see Dobbs, Foundations, 111-12. Foxtrot was a Fellow of King’s College from 1652 to 1675, a mathematical Lecturer for some time, and was connected with Henry More. Newton also refers to a “M’ F.” in his “De scriptoribus chemicis”—a list of chymical desiderata (see below)—as the translator of Christian Rosencreutz’s Chymical Wedding, a work that was only published in 1690, fifteen years after Foxtrot’s death. Karin Figala contests this association due to the year for Foxtrot’s death being given in the Eton College Register as 1674, see Karin Figala, “Newton as Alchemist,” History of Science 15 (1977), 103.

⁵⁵ Westfall, Never at Rest, 289-90.

⁵⁶ Westfall, Never at Rest, 289.

⁵⁷ That chymistry’s inherent secrecy and symbolism did not, in fact, obviate its ability to communicate innovative experimental techniques and matter theory has been demonstrated in more recent approaches to the subject and to secrecy in craft and trades. On secrecy as denoting highest value, see Newman and Principe, Alchemy Tried in the Fire, 179; and Pamela Long, Openness, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance (Baltimore: Johns Hopkins University Press, 2001). Moreover, secrecy in the communication of natural knowledge was not unique to alchemy/chymistry. Galileo was exceptionally guarded in the face of requests from other astronomers for his telescopes. See Mario Biagioli,
two letters of it remain. Perhaps Newton’s chymical connections tended to be made in person and those letters that were sent were not preserved, lacking any individuals with Henry Oldenburg’s penchant for correspondence. One can only speculate how Newton became involved in this group. Dobbs suggests the influence of Isaac Barrow and Henry More, although this is based on little concrete evidence and dated equations of Hermetic interests with alchemy (in the case of Henry More). Dobbs may be a more promising source, although Figala points out in her review of Dobbs’ *Foundations* that the only direct source for Barrow’s chymical co-labour with Newton comes from a letter by John Collins to David Gregory in 1675 regarding how their “Chimicall Studies and practices” had dried up their mathematical speculations.

Nonetheless, the possibility of mutual chymical interests between Barrow and Newton raises the question of how closely related Newton’s work in optics—very much initiated and founded on Barrow’s optical lectures—was to his early chymistry. Newton continued to use experimental results from chymistry in his optical work, both in his 1675, “Hypothesis explaining the Properties of Light,” and in the printed *Opticks*. Optics and chymisty were very much related in his work: examples include his use of colours to determine the particulate structure of matter and his use of chymical matter theory in his

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*Galileo, Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: University of Chicago Press, 1993). Galileo was happy to demonstrate his telescopes to the nobility, which is not, in fact, that different from accounts of alchemists making open demonstrations to kings and potential patrons.

58 Dobbs, *Foundations*, 95-111. Dobbs connects Henry More to chymistry via his interest in the *prisca sapientia* and Hermetic writings. However, without any evidence of actual chymical experimentation or the collection of specifically chymical works (whether attributed to Hermes or not), this connection can only be based on a dated perception of the equation of alchemy with Hermeticism. This is not to state that seventeenth-century chymistry included no Hermetic speculations, as Newton’s extensive collection indicates, but rather that More’s use of the Hermetic corpus, absent any other chymical interests (gold-making, chemical industry, pharmaceuticals, etc.) should not then be substituted for those interests.

conception of light, which will be explored in more detail in Chapter 4. While little has been done to explore chymical concepts in Barrow’s optics, perhaps his well-documented influence on Newton’s interests in mathematics and optics could extend to his chymistry. Unless one wishes to engage in Dobbs’ style of speculative reasoning, however, there is not enough concrete evidence to make this case.

2.3 The importance of knowing Boyle

That Robert Boyle was a major figure in Newton’s chymistry is beyond doubt. Newton’s library contains twenty-four of Boyle’s books (more than any other single author) and his manuscripts indicate—as discussed above—his complete dependence on Boyle in the early stages of his chymical inquiry. In addition to his chymical notebook (CUL Add. Ms. 3975), Newton composed a glossary of chymical terms in the mid 1660s, drawn exclusively from his reading of Boyle. This glossary demonstrates Newton’s initial mastery of the techniques and tools of the chymical trade. Its entries include, “Amalgam,” “Crucible,” “Extraction,” and “Abstraction” (the process used to obtain a dissolved salt through evaporation or distillation). Boyle’s works in Newton’s library are heavily dog-eared, demonstrating extensive use, and many of them are gifts from the author. Boyle sent Newton the first of...
these gifts soon after Newton’s initial 1672 paper on colours appeared in the Royal Society’s *Philosophical Transactions*. Newton met Boyle in 1675 during his trip to London and attendance at the Royal Society and they appear to have had a regular correspondence on chymical subjects until Boyle’s death in 1691. This friendship included a number of trips to London in the early 1680s, which possibly involved chymical experimentation, and the sharing not only of printed works, but transcriptions of chymical manuscripts. After Boyle’s death, Newton wrote to Locke, responsible for Boyle’s personal chymical papers, requesting a sample of “red earth,” which Boyle had procured “for his friends.” He also requested and received an encoded recipe for a chymical process related to a special mercury that would grow hot upon mixing with gold, which Boyle appears to have held back from sharing with his erstwhile chymical correspondent.

The role that Boyle played in Newton’s chymical career should not be underestimated. Boyle, like Newton, genuinely believed in the possibility of transmutation, and pursued it in his experimental chymical practice. Likewise, Boyle was involved with practising “alchemists” and read and collected extensive texts within the symbolic literature

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64 Westfall, *Never at Rest*, 268, 286, 370-77.

65 Westfall, *Never at Rest*, 373-4.


68 See Principe, *Aspiring Adept*, for the degree of Boyle’s interest in transmutation and the practices of “traditional alchemy,” and his authorship of alchemical tracts.
Boyle thus forms a bridge between Newton and earlier English chymical circles, such as that of Samuel Hartlib, and explains some of the importance Newton gave to Starkey’s pseudonymous Philalethian texts and the recurring presence of a Helmontian chymical framework in his matter theory. Boyle’s early experimentalism involved intensive collaboration with Starkey, and his incalescent mercury, the recipe which Newton requested from Locke, most likely originated with Starkey. While neither Boyle nor Newton deduced Starkey’s authorship of the Philalethian texts, Principe demonstrates how this mercury is the Philosophical Mercury at the heart of the Philaletheian corpus. In both the *Introitus apertus* (1667) and *Ripley Reviv’d* (1678) the same method expressed plainly in Starkey’s 1651 letter was detailed in the symbolic chymical imagery of “dragons, rabid dogs, and the doves of Diana.” While Newton had become interested in Philalethes before beginning his correspondence with Boyle, his earliest reading in chymistry was completely overshadowed by Boyle’s work. It should therefore come as no surprise that as Newton become more engrossed in the subject he should turn to more cryptic expressions of the same material he was encountering in his reading of Boyle.

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69 Principe, *Aspiring Adept*, 98-113, 139-143.

70 See Newman, *Gehennical Fire*, 54-91, for Starkey, the Hartlib circle and Boyle, and 110-14, 141-69 for an overview of van Helmont’s chymistry in Starkey’s work. See also Newman and Principe, *Alchemy Tried in the Fire*.

71 Principe, *Aspiring Adept*, 159-61. Starkey communicated the recipe for a “mercury that dissolves the metals, gold especially” to Boyle in a letter dated April/May 1651. This letter includes Starkey’s claim that his method can produce out of common mercury that philosophical mercury necessary for the production of the philosopher’s stone. See also Newman, *Gehennical Fire*, 76.

72 Principe, *Aspiring Adept*, 162.
2.4 Mastery of the field

Westfall and Dobbs detail Newton’s transition from Boylean “chemistry” to the less straightforward alchemy in the late 1660s. And while the new historiography of alchemy reveals this transition to be non-problematic and indeed merely a more in-depth pursuit of the same subject his earlier notes of Boyle had investigated, this is the period in which Newton began to read, takes notes, and derive experiments from the more symbolic texts of chymistry. By 1669 he had read Basil Valentine, Sedivogius, Philalethes and Michael Maier.73 Moreover, his financial records of that year indicate his purchase of the *Theatrum chemicum*, a six-volume set representing the most comprehensive collection of chymical works available in published form, which Newton used extensively throughout his chymical career.74 Newton’s 1669 records also indicate his purchase of £2 worth of chemicals (aqua fortis, fine silver, antimony, spirit of wine, white lead, salt of tartar, mercury, etc.), a regular furnace and a “tin furnace”.75 Westfall dates the handwriting of Newton’s earliest experimental entries into CUL Add. Ms. 3975 to this period, corresponding to his purchase of the tools of the trade.76 The experimental entries are not written in allegorical or symbolic language, although they are interspersed among notes taken from the symbolic chymical authors mentioned above, notes which did make use of the symbolic language of their originals. Thus Newton was clearly reading symbolic chymistry and deriving experimental

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74 Newton, Fitzwilliam Notebook, Fitzwilliam Museum, Cambridge, fol. 8v. On Newton’s copy of the *Theatrum Chemicum* see HL 1608.

75 Newton, Fitzwilliam Notebook, fol. 8r.

procedures from it, the results of which he then recorded in plain text, as detailed below (Section 6).

This pattern continued until Newton’s move to London. Newton recorded new chymical experiments in another “chemical notebook” (Add. Ms. 3973) providing them with specific dates, ranging from 1678 to 1696. He actively collected symbolic chymical books through the 1670s, 80s and 90s and most of his “alchemical” manuscripts are notes, commentaries and transcriptions of this literature composed during this period. In fact, the main focus of Newton’s work during these decades could be characterized as an intense focus on chymistry and theology, punctuated by brief excursions into optics, mathematics and, for the years of 1684 to 1687, leading up to the publication of the *Principia*, physics.77 Yet even in his work on the *Principia*, elements of his primary concerns in chymistry surfaced, as Newman has demonstrated in his analysis of the chymical elements involved in Newton’s discussion of matter theory in an unfinished “Conclusio” written for the *Principia* but never published. As Newman argues, Newton’s chymistry was frequently related to his other work in natural philosophy, particularly in the area of the structure of matter, emerged in his public works on optics (both the Queries to *The Opticks* and the earlier 1675 “Hypothesis”), and was made explicit in his *De natura acidorum*, a “chemical” piece written in the 1690s but only published in 1710.78 These works, when analysed in light of Newton’s chymical reading, annotation, and compilation reveal a clear borrowing of specific Philalethian concepts and reveal the effect of seventeenth-century “alchemy” on integral

78 Newman, *Gehennical Fire*, 228-39. See Chapter 4 of this dissertation for an in-depth discussion of the connections between Newton’s chymical research—both textual and experimental—and his published optical work, particularly Newton’s “theological” speculations in the final Queries to the *Opticks*.
aspects of Newton’s natural philosophy. As Newman demonstrates, Newton’s theory of the structure of matter incorporates the shell theory of Philalethes, which posits an inner core of mercury (Newton’s earth) surrounded by a sulfuric shell (Newton’s acid) as the fundamental structure of the basic building blocks of matter. Rather than then the “nutshell theory” advocated by Arnold Thackray, Newman presents Newton’s matter theory as fundamentally tied to a long standing chymical theory of all matter being composed of mercury and sulphur. Newman does not deny that Thackray’s nutshell presentation (originally advocated by Karin Figala) represents Newton’s understanding of the mathematical or proportional distribution of matter and vacuum within the layered corpuscle and resulting composite matter, but merely that Thackray’s geometric division does not represent Newton’s specifically structural understanding of matter. Rather, Newton held to a Philalethian layered corpuscle. Aside from hints in the 1675 “Hypothesis,” however, Newton’s published ruminations on the structure of matter only became available after his move to London, and his apparent abandonment of “alchemy.”


81 Thackray’s presentation of the Newtonian “nutshell theory” posits a very small amount of actual matter in the universe—enough to fill a nutshell. The inner structure of matter is such that at the most basic level one can imagine a cube composed half of vacuum and half of solid matter. These cubes then fill a second level cube in which half of these are again of vacuum and the other half composed of cubes of the first level (for a total proportion of matter to vacuum of 1:3) This continues at increasing levels, such that the third structural level has a ratio of 1:7, the fourth of 1:15, the fifth of 1:31 and so on. See also Figala, “Newton as Alchemist,” 112-28 and an abbreviated version in Figala, “Newton’s Alchemical Studies and his Idea of the Atomic Structure of Matter,” in A. Rupert Hall, Isaac Newton: Adventurer in Thought (Oxford: Blackwell Publishers, 1992), 381-6.
2.5 The late phase of Newton’s chymistry

Westfall considers Newton’s “alchemical” activities to have terminated when he moved to London in 1696 to take the position of Warden of the Mint. His dated chymical experiments (in CUL Add. Ms. 3973) end in 1696 and his habit of extensive note-taking from chymical books all but dried up. However, Newton did continue to collect and read symbolic chymical books and correspond with authors of symbolic chymistry through the early 1700s. A surviving manuscript (Ms. New College 361/II) contains what appears to be an itemized bill from an unidentified bookseller for a shipment of books to Newton headed: “Books for Mr. Newton.” Eleven of the sixteen books in this list are chymical and all of them in French. Based on the publication dates and Newton’s designation as “Mr.” and not “Sir”, the list dates from between 1701 and 1705 (the year of Newton’s knighthood). Westfall dismisses this list’s potential as evidence for Newton’s continued chymical interest by interpreting it as an expression of Newton’s desire to improve his French. In an article on Newton’s late alchemy, Figala and Petzold disagree. They demonstrate the continuity of this list with the interest Newton developed in the French chymical literature resulting from his close friendship with Fatio de Duillier.

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82 A very small number of the Mint papers contain alchemical notes, but nothing from Newton’s newer alchemical book purchases. See Westfall, *Never at Rest*, 530-1.


84 Figala and Petzold, “Alchemy in the Newtonian Circle,” 175.


Newton offered to buy Fatio’s two-volume *Bibliothéque de philosophes (chimiques)* (1672-78), engaged in a number of translation projects (of chymical works) with Fatio, and developed a deliberate program of acquiring French chymical books in the 1690s, well before the list of “Books for Mr. Newton.” Furthermore, Figala and Petzold detail Newton’s correspondence, in 1701-2, with William Yworth, an émigré Dutch chymist (with the pseudonym Cliedophorus), whose *Mercury’s Caducean Rod* (1702) Newton owned and dog-eared. One of the letters from Yworth (c. 1702) indicates his sharing with Newton of a chymical manuscript, ‘Processus mysterri magni philosophicus.’ Newton’s chymical papers contain a copy of this document, transcribed in Newton’s hand, with frequent corrections, additions and underlined paragraphs. At the very least this correspondence indicates that Newton continued to have chymical contacts, and maintained some semblance of his earlier interest in copying and annotating symbolic chymical literature. However, even given evidence of his continued interest, the move to London marked a definitive shift in his interaction with the field of chymistry. Moreover, following the publication of the *Opticks* (1704), little to no evidence of Newton’s direct involvement in chymistry—particularly an analysis of the symbolic literature of chymistry—remains. This should not, however, indicate Newton’s rejection of this extensive earlier period of his life.

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Following Newman’s suggestion for connections between Newton’s work in chymistry and his optics, I propose that the lack of explicitly chymical notes beyond the publication of the *Opticks* should not indicate a lack of interest in chymistry. To the extent that Newton continued to develop new ideas in natural philosophy in the last decades of his life, the connection between his *Opticks*—and especially the evolving Queries in the 1700s and 1710s—demonstrates precisely this interest in a new guise, which I develop in more detail in Chapter 4. In addition to his ruminations on the structure of matter, the nature of the aether, electrical, magnetic and other micro-forces in the Queries, Newton’s interest in the nature and composition of metals—an integral component of his earlier chymistry—likely lived on in his work at the Royal Mint. Newton drew on his early notes from Boyle in the mid-1660s to derive a method for refining gold by lead.\(^90\) Moreover, in 1710, when the quality of his coinage was questioned, he used his knowledge of antimony—central to the transmutation process—as part of his argument for the degrees of refinement possible with gold: “Chymists also tell us that gold may be made finer by Antimony then by Aqua fortis … but the Goldsmiths know not how to refine Gold by Antimony.”\(^91\) Although Westfall uses these incidents to demonstrate Newton’s pervasive genius, he still considers Newton’s appointment at the Mint unconnected to his chymistry, implying that had the Lords Commissioner of the Treasury been fully informed regarding his alchemy, they may have formed a less favourable opinion. In contrast, considering the less pejorative understanding of alchemy offered by the new historiography, the Lords Commissioner may well have

\(^{90}\) Westfall, *Never at Rest*, 282.

\(^{91}\) Westfall, *Never at Rest*, 284-5. In one of Newton’s chymical manuscripts, he describes “Experim of refining Gold wth Antimony made by D’ Jonathan Goddard,” to which process he is likely referring in this case. See Newton, Babson Ms. 725, Huntington Library, San Marino, CA.
known and indeed chosen Newton based on his extensive expertise in precisely that field most helpful to refining metals: chymistry. This is, however, a question for further consideration beyond the scope of this dissertation.

When considering the sum of Newton’s chymical career, however, the overwhelming majority of his work appears to come from before 1696, and should largely be considered within the scope of this period. During this time, his chymistry can be characterized by two interwoven parts: 1) his reading and note-taking of chymical works, and 2) his experimentation in the laboratory. Both of these features appear to have occurred simultaneously throughout his time at Cambridge and to have affected the other. In the traditional historiography the first has been labeled Newton’s alchemy and the second his chemistry. Dobbs and Westfall successfully demonstrated their interrelated nature while still considering them separate overall categories. The new historiography shows that they really are part of the same field, chymistry, merely its textual and practical expressions—both of which share the same theoretical basis. Moreover, Principe would further divide the textual expression of Newton’s chymistry into reading and note-taking directly related to the theoretical and practical expression of chymistry and that which did not directly relate, categorizing everything not related to chymical experimentation or matter theory as not chymical at all. As will be demonstrated below, however, many of Newton’s symbolic chymical or “alchemical” texts, and indeed notes on those texts, show elements both related to chymical experimentation or matter theory and elements more associated with original religion or the prísca sapientia, all in the same text or manuscript. I label this combined practice “Newton’s textual chymistry” and consider, in subsequent chapters how this central aspect of Newton’s chymistry, his methods of textual collection, collation, annotation, and
translation connect to his methods in Biblical and prophetic interpretation. In order to fully understand Newton’s textual chymistry, however, we need to consider Newton as a reader of books, especially chymical ones, be they symbolic or literal.

3. Newton’s Chymical Library

A fairly unexplored area of Newton’s work with chymical texts lies in the analysis of the specific chymical books in his library. The majority of conclusions about Newton’s “alchemy” have been drawn from his extensive corpus of chymical manuscripts. While an impressive one million words have been counted related to “alchemy,” most of Newton’s chymical manuscripts are copies of the works of others, as discussed above. Not all of these documents are direct transcriptions, however, as a number of manuscripts display a similar pattern of note-taking, commentary and summary to that of his early college notebooks. Westfall describes Newton’s “alchemical” essays as “filled with references to alchemical literature, [forming] a continuous spectrum with papers that appear to be essentially compilations of notes, so that any distinction between them is arbitrary.”92 More recent scholarship has shown some of the compositions attributed to Newton to have been mere copies, such as the “Clavis”, now attributed to Philalethes (Starkey).93 Nonetheless Westfall’s description generally holds true. Newton did compile some original works, such as his “Praxis” (Babson Ms. 420) and the voluminous “Index Chemicus” (Keynes Ms. 30), both of which grew out of a more standard Newtonian compilation of notes from the

92 Westfall, Never at Rest, 529.

chymical literature into an independent document. These manuscripts are covered in more detail below (Section 5).

Newton’s library suffered a similar fate to his manuscripts, being preserved intact for almost two centuries before its sale and dispersal in the early twentieth century, which John Harrison details in *The Library of Isaac Newton*. An analysis of the composition of Newton’s library and his patterns of acquiring and organizing chymical books—including books that he owned and his lists of desiderata—provides insight into his overall approach to the chymical literature of his day. Newton attempted to acquire the oldest and most original versions of chymical texts, finding greater veracity in antiquity. He sought after breadth in his chymical desiderata and classified symbolic and literal chymical texts together, showing no evidence of a division between “Hermetic” and experimentally or theoretically oriented chymical texts in his system of classification. Newton’s construction of his personal chymical library reflected his overall aims to achieve a comprehensive knowledge of the

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94 See Newton, “Praxis,” Babson Ms. 420, Huntington Library, San Marino, CA; and Newton, “Index Chemicus,” Keynes Ms. 30.1, King’s College Library, Cambridge.

95 For the history and dispersal of Newton’s library following his death see John Harrison, *The Library of Isaac Newton* (Cambridge: Cambridge University Press, 1978), 28-57. A list of the books in Newton’s library was composed after his death to assist in the sale of the books and the settlement of Newton’s estate. Fortunately for historical reconstructions of Newton’s reading practices, the library was purchased as an entire set by John Huggins to help establish his son, Charles Huggins, as a Rector at Chinnor, near Oxford. The library remained there and passed to Charles’s nephew (in-law) James Musgrave in 1750. Musgrave was aware of the significance of his library and appears to have welcomed visitors to come see it and Newton’s original annotations. Musgrave had the library catalogued and organized, and bound many of the smaller pamphlets into grouped volumes (often of fairly unrelated works). In 1920 the majority of the books—whose provenance had by this point been forgotten—were put up for auction by H. W. Wykeham-Musgrave, the current owner of the collection, together with the contents of his house at Thame Park. The remaining 500 to 600 books were later purchased by the Pilgrim Trust in 1943 and donated to the Trinity College Library, where they were have been added to by successive donations. Many of the books sold in 1920 can be traced to Newton via distinctive bookplates added by Huggins and Musgrave. Additionally, the catalog lists composed at the time of Huggins’ purchase and Musgrave’s inventory give a close idea of the actual contents of Newton’s library at the time of his death.
chymical literature, such that original chymical truths could emerge from a cross-comparison of multiple texts and figurative descriptions.

3.1 The composition of Newton’s library

The following table (Table 1), based on Harrison’s assessment of Newton’s library, gives an approximate overview of the composition of the library at the time of Newton’s death.
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<th>%</th>
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<td>27.2</td>
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<td>2. Alchemy/Chemistry</td>
<td>169</td>
<td>9.6</td>
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<td>3. Classical literature (Greek and Latin)</td>
<td>149</td>
<td>8.5</td>
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<tr>
<td>4. History (ancient and contemporary)</td>
<td>143</td>
<td>8.2</td>
</tr>
<tr>
<td>5. Mathematics</td>
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<td>7.2</td>
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<tr>
<td>6. Reference (dictionaries, etc.) and periodicals</td>
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<td>5.1</td>
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<td>7. Travel and geography</td>
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<td>4.3</td>
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<tr>
<td>8. Contemporary literature (English and Latin)</td>
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<td>3.3</td>
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<td>9. Medicine/anatomy</td>
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<td>16. Other non-“science” (including antiquities, numismatics, medals)</td>
<td>114</td>
<td>6.5</td>
</tr>
</tbody>
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**Table I.1: Composition of Isaac Newton’s Library**

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96 John Harrison, *Library*, 58-59. Harrison gives the total number of works as 1752, rather than the approximately 1900 volumes from the Huggins list. This reduced number is due to the unknown number of tracts contained in the sets of pamphlets which were later bound together and have a hitherto unknown location and also due to a number of the volumes being copies of the same work.
Naturally the division of this library into specific subjects necessarily reflects twentieth-century categories, which Harrison acknowledges. Nonetheless it does give an idea of Newton’s broad range of interests. As Harrison states, the percentage composition of Newton’s library should not be taken as a direct correlation with his share of interest in a given topic. After all, Newton only seriously began to build his own library following the death of Isaac Barrow—whose library he catalogued and in small part inherited—in 1677. Moreover, some of the theological and historical works found their way into the library during its sojourn in Huggins and Musgrave hands. Nonetheless, the sheer proportion of books relating to theology and biblical studies give some hint of Newton’s interest in the subject, as does the sizeable number of volumes relating to chymistry. Harrison counts 138 books on “alchemy” and 31 on “chemistry,” although he lists them together as a single category when calculating their relative proportion to the whole library. Likely his categorization of “alchemy” applies to the symbolic works, while “chemistry” to those works of authors such as Boyle and Lemery who gave direct formulae and laboratory procedures. Some works naturally straddle the fence, as Harrison discusses in his category choices. Given the new historiography of alchemy, these categories should indeed be merged, and Principe would possibly remove some from the category of chymistry altogether. Some other works, however, also share an ambiguous boundary with chymistry, such as Webster’s Metallographia, which provides an extensive overview of the chymical arts as a necessary prerequisite to knowledge of working with metals—including mining and coining—the

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97 See n. 71 for details of the library’s history following Newton’s death.

98 See John Harrison, Library, 65.
Regardless, not only had Newton collected a large number of chymical books and books related to chymistry by the time of his death, but his manuscript records demonstrate a specific intentionality behind his chymical book collecting. The unique nature of this manuscript evidence suggests that this intentionality was not present with any of the other general subjects in his library and provides insight to his methods in the text-based aspects of his chymical endeavours.

### 3.2 Newton’s acquisition and organization of chymical books

Newton constantly added to his library, and its chymical selection was no different. As already seen, the 1690s were a period of interest for Newton in the somewhat new area of French chymical literature. Moreover, Newton’s chymical manuscripts provide evidence for a consistent pattern of organization and targeted acquisition of chymical books. About 1696-97 he composed a document entitled, “Lib. Chem.,” which lists 112 chymical titles in 139 volumes.\(^{100}\) This list gives the only evidence of a shelf-marking sequence related to Newton’s library, running from 2.4.1 to 2.7.18, even though the individual volumes retain no indication of this numbering system.\(^{101}\) Together with the “Books for Mr. Newton” document (c. 1702) most of the chymical volumes in Newton’s library at his death can be accounted for, along with an approximate date before which they must have been purchased. However,

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\(^{101}\) John Harrison, *Library*, 41
a number of other manuscripts associated with Newton’s chymistry give additional insight into Newton’s acquisition of chymical books. Figala et al. discuss a document headed, “De Scriptoribus Chemicis” (Stanford University Library, M132 Ms. Container 2, Folder 4) initially composed in the late 1660s or early 1670s and updated at some point after 1692, which appears to be a list of Newton’s chymical desiderata drawn from Pierre Borel’s *Bibliotheca chimica* (1654).\(^{102}\) A couple related documents among Newton’s chymical papers include a revised version of “De Scriptoribus Chemicis” and a draft of extra items extracted from Borel’s *Bibliotheca*.\(^{103}\) A similar set of manuscripts can be organized around another list of chymical authors titled, “Of Chemicall Authors & their writings” (Huntington Library, Babson Ms. 419).\(^{104}\) Also dating from the early 1670s, this document differs from “De Scriptoribus Chemicis” not only in its composition in English, but in its apparent purpose as an historical reconstruction of chymical authors, rather than a list of books to be acquired. This manuscript derives largely from Michael Maier’s reconstruction of chymical history in his *Symbola aureæ* and also received a number of draft expansions and updates, all loosely based on Maier. These documents supplement the physical books on chymistry in Newton’s library, allowing for a tentative chronology of his chymical book purchases and thus what chymical books he considered most important at certain points in his chymical career.

Newton’s “De Scriptoribus Chemicus” and related manuscripts give an opportunity to look at Newton’s selection pattern and criteria in acquiring chymical books. Figala et al. give

\(^{102}\) The initial dating derives from the style of handwriting used, while the updated entries include a reference to a work with the publication date of 1692. Figala et al., “De Scriptoribus Chemicis,” 137.

\(^{103}\) Figala et al., “De Scriptoribus Chemicis,” 141.

\(^{104}\) Figala et al., “De Scriptoribus Chemicis,” 142.
a tentative overview of Newton’s purchases based on “De Scriptoribus Chemicus” (which they label “Stanford A”) and his later updated versions: a similar “De Scriptoribus Chemicus” document drawn up in the late 1680s (which they label “Stanford B”), and a final short list of twelve volumes composed in the early 1690s (Keynes Ms. 13)—all of which contain extracts from Borel. From this loose chronology, Figala et al. detail Newton’s comprehensive approach to the chymical literature of his day. In the 1670s and early 1680s Newton built on his purchase of the *Theatrum chemicum* by acquiring volume sets that included ancient and medieval authors, such as the *Artis auriferae, quam chemiam vocant, volumina…* (1610), the *Philosophiae chymicae IV. Vetustissima scripta…* (1605), and the *Ars chemica* (1566), which included the “Septem capitula” by Hermes. In fact, of the thirty-eight ancient and medieval authors listed in the original Stanford A version, only eight continued in the later Stanford B document, the rest having made their way into Newton’s library by 1690. Another remarkable difference is the absence in the second list (Stanford B) of any of the eight volumes related to mineralogy or metallurgy listed in the first (Stanford A), two of which Newton acquired, and the other six which he abandoned.

In the period between the composition of Stanford B (late 1680s) and Newton’s move to London (1696), Newton acquired yet further compendia of chymical works: the *Alchemiae, quam vocant artisque metallic doctrina…* (1572), the *Opuscula quaedam chemica…* (1614), and Fatio de Duillier’s copy of *Bibliothéque de philosophes*. His library also absorbed Roger

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105 Figala et al., “*De Scriptoribus Chemicis*,” 153–4. Newton also purchased a number of significant single author items at this time, including Georg Agricola’s *De re metallica* (1621) (HL 20), Albertus Magnus’ *De rebus metallicis* (1541) (not in Harrison’s *Library*) and probably Martin Ruland’s *Lexicon alchemiae* (1612) (HL 1426).

106 Figala et al., “*De Scriptoribus Chemicis*,” 151–2. The two works Newton acquired were the Agricola and Albertus Magnus works mentioned above (n. 105).
Bacon’s *De arte chymiae scripta*… (1603) and up to seven chymical works attributed to Raymond Lull.¹⁰⁷ (Pseudo) Lull seems to have risen in importance to Newton during this period, as the Stanford B list contains ten items by Lull (compared to Stanford A’s single entry), six of which Newton’s final library possessed.¹⁰⁸ These works were additionally marked and underlined in the Stanford B list. The final years of Newton’s documented acquisition of chymical books appear to be dominated by the French chymical literature, as discussed above, epitomized by the list of “Books for Mr. Newton” (c. 1702). Newton acquired up to ten more chymical books between 1702 and his death in 1727, although only an updated 1709 edition of Philalethes could be categorized as part of the symbolic literature of chymistry. The evidence suggests that Newton’s earlier intentionality in the acquisition of chymical books—especially those of a symbolic nature—had somewhat cooled by the publication of the *Opticks* (1704).

In many ways the current access to understanding the specifics of Newton’s chymical library is indeed unique, especially to the level of pinpointing exact decades in Newton’s life for when he demonstrated interests in certain authors or came into possession of certain volumes. A few general observations flow from his collection habits. Above all else these manuscripts demonstrate Newton’s intention to be comprehensive in acquiring chymical books. Figala et al. point out the relative importance within chymical circles of the volumes Newton sought and acquired. As they state, “[these volumes] embrace almost the entire corpus of alchemical literature available until the three-volume first issue of the *Theatrum* ¹⁰⁷

Figala et al., “*De Scriptoribus Chemicis*,” 153-4.

¹⁰⁸ Figala et al., “*De Scriptoribus Chemicis*,” 155-6.
chemicum appeared in 1602.” In fact, the Theatrum chemicum, although it contained most of the same texts, did not make them obsolete, as Lazarus Zetzner (the publisher) only published the most recent version of a given classical text, which, over the course of much pseudepigraphical manipulation, was not guaranteed to contain the same information. Figala et al. thus explain Newton’s zeal in acquiring chymical compendia after his purchase of the Theatrum chemicum in 1669 as an insistence on having the full range of the older chymical material. Additionally, this explains Newton’s inclusion in his desiderata lists (the “De Scriptoribus Chemicis” manuscripts) items described by Borel as being available in manuscript only, even if later printed editions became available: Newton wanted to have every version possible.

Newton’s sources for chymical works were not limited to what he found in Borel. The “De Scriptoribus Chemicis” lists contain an intriguing paucity of English works, especially compared to the proportion of chymical volumes of an English provenance that actually ended up in Newton’s library. A list of six books not in Borel was added to the bottom of both versions of “De Scriptoribus Chemicis.” These works, all in English, likely came from William Cooper’s Catalogue of chymicall books (London 1675), which Newton owned. Cooper was a London based bookseller and a significant publisher of symbolic chymical books and a likely node in the chymical networks of the capital. Figala et al. argue that Newton had no need of composing a bibliographical list like the “De Scriptoribus

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111 Westfall, “Newton’s Index Chemicus,” 176. Newton’s library itself, and his obvious interest in Cooper’s books thus give a further clue to his involvement in chymical networks. Beyond Cooper, numerous chymical books and manuscripts, such as those of Philalethes, could likely have come from Newton’s personal contacts, both in Cambridge and in London.
Chemicis” for English chymical works (both those in English and those in Latin of an English provenance), since Cooper’s list was easily comprehensible and contained no repetitions.112 In contrast, Borel’s Bibliotheca chimica was a confusing mess of mythical and actual authors, whose works were frequently repeated—in various locations across 4000 entries—under different titles, editors or as included in a separate compendium.113 Thus the very existence and nature of the “De Scriptoribus Chemicis” demonstrate aspects of Newton’s method in textual chymistry.114 Confronted with a source like Borel, Newton extracted concise bibliographical data, looking for the works that he needed to complete his textual sources of chymistry and attempting to find the oldest possible versions.

3.3 Newton’s comprehensive approach to the literature of chymistry

Newton’s search for original chymical publications reflects a general trend in his research into the texts of chymistry, as his other list of chymical authors, “Of Chemicall Authors & their Writings” (Babson Ms. 419) demonstrates.115 This document, derived from Maier’s Symbola auræ, organized a list of 120 authors alphabetically, providing for each a summary of the details of their lives and the significance of their works.116 Unlike the “De Scriptoribus Chemicis,” Babson Ms. 419 gives no specific bibliographic data—place and date of

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113 Figala et al., “De Scriptoribus Chemicis,” 139-40.

114 Figala et al. describe Newton’s careful survey of Borel, as he worked page by page, searching for repeated items to collect the full bibliographical information across their multiple entries. The later version (Stanford B) excised all but essential data and corrected a number of the mistakes original to the Bibliotheca. See Figala et al., “De Scriptoribus Chemicis,” 149-50.

115 Newton, “Of Chemicall Authors & their Writings,” Babson Ms. 419, Huntington Library, San Marino, CA.

116 Figala et al., “De Scriptoribus Chemicis,” 142.
publication of currently available editions. A revised version of Babson Ms. 419, currently at St. Andrew’s University (Ms. Newton 3) gives a similar list of authors and works, also loosely based on Maier and organized according to nationalities. Finally, in a quarto folded manuscript containing a handful of notes related to the Mint, Newton provided a chronological arrangement of the same set of chymical authors (Keynes Ms. 13).

The initial folios of Keynes Ms. 13 contain some preliminary drafts, lists of authors which Newton later organizes according to the categories: ancient, Arab, “older European” (medieval), and modern. The next folio repeats this arrangement, but adds a section headed, “Authores magis utiles [More useful authors],” and a shorter list that includes Hermes, Artefius, Flammel’s “Hieroglyphs,” Ripley, Sendivogius, Maier, Faber, Philalethes, and Mundanus. In both lists Newton attempts to write the authors in chronological order, and provides specific dates for those he knows. Following a folio of unrelated notes on “moneys coyned since Christmas,” Newton gives another list of “Authores optimi,” similar to his list of “Authores magis utiles,” and inclusive of Hermes, Flammel, Sendivogius, Maier and Philalethes. This document also contains the rare instance of Newton’s potential pseudonym, “Jeova sanctus unus,” at the bottom of one folio.

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117 Figala et al., “De Scriptoribus Chemicis,” 142.

118 Newton, King’s College, Cambridge, Keynes Ms. 13. The notes on the Mint are upside down from the lists of chymical authors and demonstrate Newton’s multiple use of empty sheets in the same manuscript set. Nonetheless their juxtaposition demonstrates in the very least a similar timeframe for composition.

119 Newton, Keynes Ms. 13, fol. 1r-1v.

120 Newton, Keynes Ms. 13, fol. 2r.

121 Newton, Keynes Ms. 13, fol. 3r. This pattern continues, except for a brief list of twelve chymical books (fol. 4v.) in a more bibliographical format introduced with the word, “Desiderantur,” which derives from Borel.

122 Newton, Keynes Ms. 13, fol. 4r.
This set of documents (Babson Ms. 419, Ms. Newton 3, and Keynes Ms. 13) demonstrate an intriguing separate level of organization for Newton. This ordering of the works of chymistry—exclusively of the symbolic variety—was not merely an aid to bibliographic organization and acquisition. Figala et al. compare these manuscripts to Newton’s “Index chemicus,” originally an organizational tool for key words or symbols in chymistry. Rather than a list of alchemical _decknamen_, however, the “Of Chemicall Authors & their writings” manuscripts provided Newton’s proposed chronology for the entirety of chymical practice. This list allowed Newton to determine the relative age of the original work of a given author, and to navigate his collection of symbolic chymical books to get to primitive chymical knowledge, or the _prisca sapientia_ of chymistry.

The ordered arrangement of Newton’s bibliographical chymical manuscripts and Newton’s specifically chronological method in organizing the chymical corpus appears to be at odds with Principe’s suggestion that we consider Newton’s specific intentions with a given book and avoid looking at his chymistry as a whole. While Newton may have drawn his specific concepts of matter from Philalethes (Starkey) and followed his practices in the lab, these documents indicate that for Newton Philalethes’ writings were part of the same corpus as the seven chapters of Hermes. Moreover, while the “De Scriptoris Chemicus” lists draw from both the symbolic and the literal literature of chymistry, the list “Of Chemicall Authors & their writings,” appears to be solely a list of authors of symbolic chymistry—or what has traditionally been called alchemy. Nonetheless, this list includes Philalethes, and mentioned the range of works written under that pseudonym: his “Introitus apertus,” “Medulla,” “De Transmutatione,” “Fons. Rubinus,” and his commentary on Ripley’s “Epistle.”

123 Newton, Keynes Ms. 13, fol. 1r.
the “De Scriptoribus Chemicus” lists neglect Philalethes (but not Starkey), they include numerous symbolic works, some of which may have been used by Newton to recover original knowledge of ancient religion and the idolatrous confusion of chymical processes with pagan myths, as will be explored below. These lists, however, also include works that are somewhere in between symbolic and literal expressions of chymistry (such as Agricola’s *De re metalicis*), the works on metallurgy, as well as clearly literal expressions of chymistry (such as Starkey’s *Pyrotechny* and Boyle’s *Tracts of the growth of Metals in their ore*).124

The general principle of the new historiography of alchemy seems to hold in Newton’s chymistry. Those works which enciphered chymical procedures in mythological language should be evaluated as nonetheless the same general subject as more literal treatments of chemical processes—and possessing the same experimental and theoretical vigour. However, I suggest that Principe’s additional caveat that research of Newton’s chymistry divide between various alchemical subjects which have little to do with one another be modified to allow for the possibility of overlap. Newton’s organization of the body of chymical literature lends itself to this overlap, particularly in his incorporation—within his attempted chymical chronology—of the full range of works which Principe would see as composed of completely unrelated subject matter. Opening this possibility, and considering his chronological approach to the chymical authors, allows for the further possibility that the textual component of Newton’s chymical researches—requiring perhaps as much time and effort as the experimental component—was related to Newton’s other text-based researches,

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124 See Figala et al.’s transcription of the “Stanford A” and Stanford B” versions of “De Scriptoribus Chemicis” in “*De Scriptoribus Chemicis*,” 166-79.
particularly his theology. Given this possibility, let us consider in more detail Newton’s specifically text-based approach to the chymical books in his library.


Newton’s general research methods with texts were not specific to the chymical books in his library. Books on multiple subjects contain his characteristic underlining, marks, annotations and dog-ears. Some of the most underlined and dog-eared works are his own: printed editions of the Principia and the Opticks with additions and corrections in his own hand, some of which were then incorporated into later editions. His personal Bible is heavily annotated and dog-eared, and the pages of the books of Daniel and the Apocalypse are brown with use. Newton’s copy of Vossius’ De theologia Gentili is extensively dog-eared, with almost every other page either still turned down or showing evidence of having been dog-eared at one stage. However, the chymical books of Newton’s library show far more evidence of Newton’s use (annotations and dog-ears) when considered in proportion to the rest of the library. Of the eighty-two books listed by Harrison as having notes by Newton, twenty-seven are clearly chymical (most being works of symbolic chymistry) and an additional two works by Boyle on the properties of air and hydrostatics may be classified as chymical.125 Thus a third of the books that Newton annotated where chymical, more than three times the relative number (9.6%) of chymical books in his total library.126 While the nature of the annotations vary, this figure gives a small picture of the relative use Newton


[126] This proportion increases to forty percent if we remove from the total annotated books the twelve books authored by Newton himself.
made of his chymical books. When the degree to which certain books were dog-eared and others untouched is also factored in, the nature of Newton’s chymical library as a working library, heavily used, becomes apparent. And in these traces of Newton’s use of his chymical library, his annotations and dog-ears, the echo of Newton’s textual research activity remains, allowing an analysis of his methodology in his treatment of chymical texts.

4.1 Newtonian annotations in the chymical books

Harrison divides the annotations in Newton’s books into four groupings.\textsuperscript{127} 1) They can be marginal notes and general commentary, usually—but not always—discussing a specific point in the text. These notes can occasionally critique or contradict a specific statement, such as his inscription of “Error” on the pages of Norton Knatchbull’s *Annotations upon some difficult texts in all the books of the New Testament* (1693).\textsuperscript{128} 2) Newtonian annotations can also be specifically bibliographical in nature, giving a reference to another work—usually in Newton’s possession—that either discussed a similar topic or was the source for a specific quotation. Notes of this nature form the majority of annotations in Newton’s chymical books and point to his cross referencing and comprehensive approach to the chymical literature. 3) Some annotations take the form of manuscript corrections, often correcting a misspelled word, adding or deleting words and phrases, or even inserting a list of errata. This practice was not necessarily unique to the chymical books and it reveals a

\begin{footnotesize}
\begin{enumerate}
\item For a discussion of the nature of Newton’s annotations, see John Harrison, *Library*, 16.
\item Knatchbull, Norton, *Annotations upon some difficult texts in all the books of the New Testament* (Cambridge, 1693), Newton’s copy is at the Wren Library, Trinity College, Cambridge, shelf mark, NQ.9.41 (hereafter of the format, Trinity NQ.9.41); HL 889. To distinguish the individual copy of a book from Newton’s library (and its accompanying individual annotations/dog-ears) from the general printed version, the current location catalog entry is included with every relevant citation, in addition to the item number as listed in Harrison’s *Library*.
\end{enumerate}
\end{footnotesize}
small piece of Newton’s character, his meticulous reading of his library and his desire for textual accuracy. Finally, 4) annotations in books authored by Newton took the form of emendations or additions to previous editions—some of them extensive and inserted on interleaved sheets—which often ended up in subsequent printings.

To this list I would add a fifth group, specific to Newton’s chymical books, of deciphered sentences, phrases, or authorial pseudonyms. Harrison classifies notes of this kind according to the first group, but I think they are significant and different enough to deserve their own category. The prime example comes from Newton’s copy of Michael Maier’s *Themis aurea* (1618), where at the bottom of page 160, Maier had encoded his personal understanding of the symbolism associated with the R. C. of the Rosicrucians.\(^{129}\) Newton, having deciphered the code, wrote out the decoded sentence and below it provided the key he used: “a/u, e/o, l/r, m/n, s/t permutantur,” switch each of the letters a, e, l, m and s with u, o, r, n and t respectively.\(^{130}\) In other chymical books Newton deciphered anagrams of given author’s names, attempting to find the original author of the work. For example, in Newton’s copy of the ‘anonymous’ *Le Triomphe hermetique*... (1689) he renders “DIVES SICUT ARDENS, S***” on page 153 as “S. E. Sanctus Didierus” (Limojon de Saint-Didier).\(^{131}\) Likewise, the *Musæum hermeticum* (1625) has a series of numbers written above the name “HARMANNUS DATICHIUS” and higher up on the page the decoded name


“HADRIANUS a MUNSICHT,” has been written in.\textsuperscript{132} A later edition of the *Musæum hermeticum* (1678) similarly reveals “HINRICUS MADATHANUS” to be the same “HADRIANUS à MUNSICHT.”\textsuperscript{133} In both of these cases, however, the handwriting is possibly not Newton’s, as other annotations in these works are not from Newton’s hand. Nonetheless, even if this deciphering was not done by Newton, he benefited from it, including “Mynschyct” in his chronological list of chymical authors.\textsuperscript{134} If it is not Newton’s handwriting it demonstrates a more general practice of deciphering within Newton’s chymical circle and possibly the person—the unknown previous owner of these books—from whom he learned the process. It also demonstrates the caution necessary when searching for annotations within Newton’s chymical books, as some notes were not written by him, and can be misleading if mistaken for Newton’s own textual chymical research.

4.2 *Newton’s unique method of dog-earing*

Aside from the annotations Newton left in his chymical (and other) books, a more pervasive source for Newton’s personal scholarship remains evident in his library in the form of his unique pattern of dog-earing. Any student of Newton’s library will notice fairly quickly the high proportion of books that have pages with a corner either folded down from the top or up from the bottom. Moreover, even more books have evidence of pages once being folded in this way but now restored to their original position. In fact, almost a third of all of Newton’s

\textsuperscript{132} *Musæum hermeticum* (Frankfurt, 1625), Trinity NQ.16.115, 82; HL 1130.

\textsuperscript{133} *Musæum hermeticum* (Frankfurt, 1678), Trinity NQ.16.148, 53; HL 1131.

\textsuperscript{134} Newton, Keynes Ms. 13, fol. 2r.
books now housed at Trinity College show evidence of having been used in this way.\footnote{Harrison counts 122 of the 862 volumes at Trinity College to have folded down pages, and a further 152 volumes with evidence of once having been dog-eared. See John Harrison, \textit{Library}, 25.}

Some books have pages that appear to have been dog-eared multiple times, with the fold line appearing in a different spot on the page each time. Other books have both remaining folds and restored folds in the same volume. This may give insight into how Newton used the dog-ears in his research. If a later bookseller had cleaned up a book by restoring the folds, he would not have left some folds untouched. Moreover, the evidence of multiple folds on a given page points to a use of dog-ears unique to Newton.

When Newton turned down (or up) a page he was not merely bookmarking a general page to return to later, he actually turned the corner of the page down (or up) to point at a specific word or phrase in the text.\footnote{See John Harrison, \textit{Library}, 25-27 for his description of Newton’s unique pattern of dog-earing.} This pattern can be demonstrated across multiple volumes. A clear example from the chymical books lies in Newton’s copy of \textit{Mercury’s Caducean Rod} by Mystagogus (Yworth). In the front cover Newton wrote three lines of text: “Willis his search of causes p. 3, 21 / Sanguis naturæ p. 10 & Epistle p. 27 / Philadelphia p. 13.”\footnote{Cleidophorus Mystagogus, \textit{Mercury’s Caducean Rod} (London, 1702), Trinity NQ.16.131, inside cover; HL 1138.} Page 3 of the main text has the tell-tale line across the top corner of the page indicating a former dog-ear, and when the fold is digitally reconstructed along the line, one can see that the corner once pointed directly to the citation of “Willis, \textit{in his search of Causes},” (See Figure 1 and Figure 2).\footnote{Mystagogus, \textit{Mercury’s Caducean Rod}, Trinity NQ.16.131, 3.} Similarly the corner of page 10 folded down to
touch “Sanguis Naturæ” and page 13 folded up to touch “Philadelphia.” In all of these cases the folds pointed to a specific work referenced in the text and functioned in a similar way to an underline or marginal note. Most of the chymical books do not have an additional annotated list in the front cover, yet sport frequent folds which once pointed to specific references of other works. Newton appears to have used this technique throughout his life, and occasionally cleaned the folds himself for reuse at a later point.

Figure 1 - Pp. 2-3 of Newton’s copy of Cleidophorus Mystagogus (William Yworth), Mercury’s Caducean Rod (London, 1702). Note the line indicating a former dog-ear fold in the upper right corner. Courtesy of the Wren Library, Trinity College, Cambridge.

139 Mystagogus, Mercury’s Caducean Rod, Trinity NQ.16.131, 10, 13.
Figure 2 - Digitally reconstructed dog-ear of Newton’s copy of Mystagogus’ *Mercury’s Caducean Rod* (London, 1702), 3. The corner of the folded page pointed directly to the reference Mystagogus made to Timothy Willis, *The Search of Causes: Containing a Theophysical Investigation of the Possibilitie of Transmutatorie Alchemie* (London, 1616). Newton noted the page number for this reference on the inside cover of his copy. Courtesy of the Wren Library, Trinity College, Cambridge.
Harrison gives ample detail of the works in Newton’s library which still contain folded pages, and concludes that they mostly occur within the category of theology, geography, history and classics.\textsuperscript{140} While he mentions books that have evidence of previous dog-earing, he does not pay much attention to them. This omission causes him to pass over the tremendous amount of dog-earing actually present in the chymical works, most of which had been cleaned by the time of Newton’s death. In fact the significance of a book’s dog-ears remaining rather than being cleaned up may merely be a matter of timing. Books more likely to have been used by Newton closer to his death—particularly Vossius’ \textit{De theologia gentili} and other works related to chronology—are more likely to have been left ‘uncleaned.’\textsuperscript{141}

Given Newton’s declining interest in chymistry later in his life, particularly its symbolic forms, it should come as no surprise that his chymical books no longer show signs of active use, of dog-ears remaining folded. Harrison highlights the high proportion of extant dog-ears in Vossius’ \textit{De theologia gentili} (112 of 732 pages), but my perusal of Newton’s chymical library reveals a similarly high proportion of former dog-ears in numerous chymical books. Notable examples include: 1) The \textit{Artis aurifereæ}, a three-volume compendium of multiple alchemical tracts bound in the same book whose roughly 1000 pages contain evidence of dog-ears on 252 pages—with 49 of those pages showing evidence of multiple dog-ears;\textsuperscript{142} 2) The \textit{Musæum hermeticum} (1625) whose roughly 500 pages have former dog-ears on 79

\textsuperscript{140} Mystagogus, \textit{Mercury’s Caducean Rod}, Trinity NQ.16.131, 26.

\textsuperscript{141} Works related to chronology, geography, history and classics could all be argued to have pertained to Newton’s twilight efforts to complete his chronology of ancient kingdoms, which was finally published a year after his death.

\textsuperscript{142} \textit{Artis aurifereæ} (Basil, 1610), Trinity NQ.16.121; HL 90.
pages;\textsuperscript{143} 3) Fabre’s two volume \textit{Opera}, the first volume of which has former dog-ears on 100 of 739 pages and the second signs of dog-earing on 123 of 1039 pages.\textsuperscript{144} This is a mere representative example; the chymical books of Newton’s library as a whole reveal an incredible degree of dog-earing, far exceeding the impression Harrison’s \textit{Library} gives. This fact, coupled with the scarcity of analyses of Newton’s specific method of dog-earing in contemporary Newton scholarship, reveals an area which historians of Newton—and of Newton’s chymistry or alchemy in specific—have left largely unexplored.

Newton’s dog-ears are usually applied in modern accounts of Newton’s work to establish whether Newton used and read a given book in his library, not to track his specific use of a given phrase or reference. As Harrison stated in his \textit{Library}, “[the] potential importance [of Newton’s unique pattern of dog-earing] to Newton scholars as an index to the direction of his mind as he read the books in his library has certainly not as yet been fully realized.”\textsuperscript{145} This statement is no less true after more than thirty years of Newton scholarship. In the case of Newton’s chymistry this unexplored dog-earing technique reveals his synthetic and comprehensive approach to the literature of symbolic chymistry. It also allows certain patterns to be seen within Newton’s chymical reading that not only demonstrate the internal connections across varying works of symbolic chymistry in Newton’s library (the spectrum from Hermes to Philalethes), but also suggest links with his ideas and methods in theology.

\textsuperscript{143} \textit{Musæum hermeticum} (1625), Trinity NQ.16.115.

\textsuperscript{144} Fabre, \textit{Opera}, vol. 1 (Frankfurt-am-Main, 1652), Trinity NQ.9.174, and vol. 2, Trinity NQ.9.175; HL 598.

\textsuperscript{145} John Harrison, \textit{Library}, 27.
4.3 Tracing Newton’s textual chymical research through the evidence of his dog-ears

In my analysis of Newton’s chymical library, I worked through fifty-three of about eighty books in the Trinity college collection pertaining to chymistry—almost all of the chymical books recorded by Harrison as having evidence of dog-earing—recording every annotation and every word or phrase to which a current or former dog-ear pointed.\textsuperscript{146} While this analysis is not conclusive—accounting for a third of the total chymical books known to have been present in Newton’s library—it is nonetheless representative. More than fifty of Newton’s chymical books have presently unknown locations, including certain works of great importance to this sort of study, such as the \textit{Theatrum chemicum}.)\textsuperscript{147} Nonetheless, the roughly fifty chymical books I have been able to study allow certain conclusions regarding Newton’s textual research in the field of chymistry based on the patterns of dog-earing that they contain.

At this point a caveat regarding Newton’s actual use for his particular pattern of dog-earing is necessary. Present throughout his library, Newton’s dog- eared folds pointed to a variety of referents, from quotations from another source, other works cited or referred to, specific individuals (in many cases Newton himself), place-names and proper nouns from history and theology, important or meaningful words and concepts (“sensorio” in his 1706 edition of the \textit{Optice}), and uncommon words or definitions.\textsuperscript{148} Newton’s use of the dog-ear

\textsuperscript{146} I was unable to look through all of the eighty chymical books in the Trinity collection to check for evidence of dog-earing which Harrison may have overlooked.

\textsuperscript{147} The actual number may be larger, given that at least two of the entries Harrison lists as having an unknown location are actually groups of tracts, see HL 1244 and HL 1624.

allowed him to ‘erase’ previous pointers to specific terms or phrases and thus apply a specific reading and marking of a book to a given task. One can imagine Newton at his desk with numerous chymical books in front of him, all with dog-ears to different referents, turning rapidly to one quotation and then another, as he wrote a manuscript or worked through another book. This system allowed Newton quick access to the information in his books and simplified the otherwise overwhelming research tasks his extensive and comprehensive chymical library would have presented. The question remains, however: when Newton dog-earred a chymical book was he compiling reference lists, marking quotations and concepts to include in his own chymical writings, or book-marking a procedure or chymical for use in the laboratory? The evidence from Newton’s chymical library appears to suggest all three possibilities, as will be considered below. Moreover, his chymical manuscripts similarly attest to this variety of uses and will be discussed in Sections 5 and 6.

The dog-ears in Newton’s chymical books have a variety of referents, but can be categorized into eight general areas: 1) References to other alchemical authors or books, 2) Direct quotations from other authors, 3) Procedural methods in chymistry (especially length of time for experiments), 4) Descriptions of chymical products or of the expected results from a chymical experiment, 5) Descriptions of the internal make-up of a given substance and discussions related to matter theory, 6) The actual product or substance behind a symbolic name, 7) The chymical or procedural meaning of a given mythological symbol or story, and 8) The origins of pagan mythology in the original figurative enciphering of chymical procedures and products.
References to other alchemical authors and books are some of the more prevalent dog-ear referents and demonstrate Newton’s intertextual research. These dog-ears were likely used in the composition of the “Index Chemicus” (discussed below). Some examples include the already referenced dog-ears in Mystagogus’ *Mercury’s Caducean rod* which pointed to Timothy Willis’s *The Search of Causes*, to the *Sanguis naturæ*, and to *Philadelphia*, written by the pseudonymous Eurenes Philoctetes.149 In another example, from the *Musæum hermeticum* (1625), Newton’s fold pointed to the words, “in Rosario Philosophorum,” part of a larger discussion of various authors’ differing names for the base material of the universal tincture, or philosopher’s stone.150 In one of Newton’s two copies of the *Ars chemica*, page 179 has signs of two dog-ears, the first of which pointed to “Morienes” and the second to “Rasis,” both in the context of how long multiple authors suggest burying a chymical mixture after heating.151

Direct quotations from other authors are a second general category of referents for Newton’s dog-ears. These referents are less common than folds pointing to specific authors or works, although they likely performed a similar function, allowing easy access to quotations from other volumes and a more rapid assessment of what the range of chymical authors had to say about a given subject. Moreover, in a number of cases, the quotations are from works that Newton was unable to get a hold of and represent his closest access to a

149 Mystagogus, *Mercury’s Caducean rod*, Trinity NQ.16.148, 3, 10, 13. Two of these volumes were present in Newton’s library: Anonimus [C. Grummet], *Sanguis naturæ*... (London, 1696), Trinity NQ.16.172; and Eyreneus Philoctetes, *Philadelphia, or Brotherly love*... (London, 1694), location unknown; HL 1445 and HL 1296. Timothy Willis, *The Search of Causes: containing Theophysical investigation of the possibilitie of Transmutatorie Alchemie* (London: J. Legatt, 1616) was not included in any of the lists of books in Newton’s library.


151 “Solis et Lunæ,” *Ars chemica*... (Argentorati, 1566), Trinity NQ.10.145, 179; HL 84.
given work or author. For example, Maier’s *Secretioris naturæ secretorum*—which Newton labelled “Emblemata” for short-hand—quotes from “Basilius nostras” (Basil Valentine) on page 3 and the bottom corner of the page folded up to rest in the middle of the italicized quotation.\(^{152}\) Maier’s quotation comes from Basil Valentine’s “De Lapide Sapientum” and his Twelve Keys. The direct quotation can be found on page 406 of Newton’s copy of the *Musæum hermeticum* (1678).\(^{153}\) Another example comes from Mytagogus’ *Mercury’s Caducean Rod*, where the top of page 14 folded down to an italicized quotation from Artephius: “for here (according to Artephius) the Artist must put the hard and dry bodies into the Water once for all…” (italics original).

A third category for dog-ear referents involves pointers to the specifics of chymical procedures, whether directly stated or enciphered in symbolic language. Fairly common examples of this are specific time lengths for various reactions, such as how long a concoction is to be buried or for how many days a mixture is to be left on the furnace. For example, page 57 of *Sanguis naturæ* describes the process of preparing “the Earth” (Sulphur) to a “citrinity and viscosity”. In Newton’s copy, the page once folded down to the beginning of the phrase “take one or two pounds [of sulphur] and Powder it subtilly in a strong Mortar,” the point at which the procedure for preparing “the Earth” begins in the text.\(^{154}\) Likewise, Ripley’s “Medulla philosophiæ chemicæ,” on page 157 of his collected works (*Opera omnia chemica*), discusses the preparation of philosophical mercury. In Newton’s copy, page 157

\(^{152}\) Maier, *Secretioris naturæ secretorum scrutinium chymicum ... ingeniissima emblemata ...* (Frankfurt, 1687), Trinity NQ.16.88, 3; HL 1045.

\(^{153}\) *Musæum hermeticum* (1678), Trinity NQ.16.148, 406. I am grateful to Derrick Mosley for showing me this connection.

\(^{154}\) *Sanguis naturæ*, Trinity NQ.16.172, 57.
folded up to point directly at the phrase beginning the actual process: “Sovle igitur
Mercurium in aquam lacteam [Dissolve therefore Mercury in a milky water]….” An example of a dog-ear to a specific time-length for a given procedure can be found in Newton’s copy of the Lulli chemici tractatus ([Raymond] Lull’s Chemical tracts). On page 302 (in the tract “Experimenta”) Lull instructs the reader concerning a mixture of “spiritum animatum solis, & spiritum animatum lunae [spirit of the soul of gold and spirit of the soul of silver],” to “Fiat hæc circulatio per 60. dies: [let it be rotated for 60 days],” after which the reader would have a true mineral menstruum. Newton’s dog-ear pointed directly to the word “Fiat.”

The fourth general category for dog-ears in Newton’s chymical books are descriptions of chymical products or of the expected results from a chymical experiment. Lull’s “Experimenta,” in the Lulli chemici tractatus gives one example. On page 293 he discusses the results of a product, dried in the sun and calcined over a low fire. The product “sit citrine coloris, vel rubini, non nigri [should be orange in colour, or red, not black],” and in Newton’s copy the page was once turned up to point at the word “rubini [red].” In another of Lull’s works, the Codicillus fontes alchimæ arsit, evidence of a Newtonian dog-ear on page 59 points to the words “ȹ est nigredo, sine quæ artificium feliciter inchoari non poterit [‘ȹ’ is black, without which it is not possible for the artificer to begin].”

155 George Ripley, Opera omnia chemica ... (Cassellis, 1649), Trinity NQ.10.149, 157; HL 1405.
156 [pseudo] Raymond Lull, Lulli Chemici Tractatus ... (Basil, 1572), Trinity NQ.16.37, 302; HL 1000. The spirit of the soul of gold and the spirit of the soul of silver possibly refer to the resultant products of distilling dissolved gold and silver.
157 Lull, Chemici Tractatus, Trinity NQ.16.37, 293.
158 Lull, Liber, qui codicillus, seu vade mecum inscribitur ... (Cologne, 1573), Trinity NQ.16.133, 59; HL 997.
In a similar manner to referents to descriptions of the external appearance of a substance, the fifth general category of Newton’s dog-ears explores the internal material of certain substances, fitting into the category of a discussion of the nature of matter. Lull’s *Codicillus* gives an example of this, where the bottom corner of page 31 folded up in Newton’s copy to point at the phrase: “quod minus tenant de natura argenti vivi, & magis de natura sulphuris, maiors sunt corruptionis [what holds less of the nature of quicksilver (mercury) and more of the nature of sulphur is more corrupt].”¹⁵⁹ Likewise page 74 of Newton’s copy of Maier’s *Secretioris* (Emblemata) folds down to point at the phrase: “sulphure extracto, habente in se naturam humiditatis & frigiditatis [the sulphur extract, having in itself a humid and cold nature].”¹⁶⁰

The sixth general referent for Newton’s dog-ears in his chymical books involve pointers to the real substance behind an enciphered chymical symbol. There were a number of basic symbols or mythological figures that represented given chymical products or substances and some of them were repeated with regular frequency in the chymical literature. One of the more common for Newton to highlight with his dog-ears was the identity of the green lion. Page 103 of Lull’s *Codicillus* folded up to point at the sentence: “Alii appellantur hanc terram Leonem viridem fortem in prælio [Others called this earth the Green Lion strong in battle].”¹⁶¹ This description fit into a list of figurative chymical cover names for a specific product formed in the process of making the philosopher’s stone. Maier’s *Secretioris* discussed the “Leo viridis [Green Lion],” which occurred at a given point

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in the reaction after the water goes fetid, on page 111. He then quoted from Rosarius who suggested that the Green Lion was a leprous body of sulphur (or possibly copper), which accounted for its distinctive colour. In Newton’s copy the page corner once folded down to point at this discussion.\(^{162}\) Another substance was a certain black earth, produced by slow decoction (heating) and putrefaction, which Basil Valentine called the Raven’s head in his *Triumphant Chariot of Antimony*. Newton’s copy of this book had a dog-ear on page 171 which folded up to Valentine’s discussion of this black earth, pointing directly at the phrase: “This terrestrial [sic] and dry Element, is called, *Laton*, the *Bull, black Dreggs, our Metall, our Mercury*” (italics original).\(^{163}\)

The seventh general referent for Newton’s chymical dog-ears points, in a similar manner to the sixth, to the chymical or procedural meaning behind a mythological story. The symbolic chymical literature has many of these stories, and often the steps in the process for making the philosopher’s stone are represented as a series of these stories (occasionally with accompanying emblems, as in the case of Maier’s *Secretioris* or Emblemata). The chymical author would give the story, or refer to the various symbols, and then proceed to describe the process, usually using symbolic language, but sometimes explaining the process behind the symbolic description. While more of Newton’s dog-ears pointed to direct meanings of symbols that refer to specific substances, a few of them pointed to these instances of procedural explanation in non-symbolic language. Maier’s *Secretioris* is an excellent example of the process symbolized and then explained. On page 8 of Newton’s copy, a dog-ear once pointed to a reference to the Rosarius Philosophorum’s description of washing and

\(^{162}\) Maier, *Secretioris*, Trinity NQ.16.88, 111.

purifying by fire the equipment for chymistry according to the story of the Prince Duenech and his bath.\textsuperscript{164} On page 41, Maier discussed the symbol of the dragon (or serpent) eating its own tail, the Ouroboros symbol, and after listing a number of chymical authors, said this, to which Newton’s former dog-ear pointed: “Per Dracones vero illi nihil aliud intelligent quam subjecta chymica [Truly by this dragon they understand nothing other than the (whole) subject of chymistry].”\textsuperscript{165} Maier then described the various operations of sulphur, and how they can be represented by the Ouroboros. An example of this pattern outside of Maier can be found on page 394 of the \textit{Musæum hermeticum} (1678) in the tract “De Lapide Sapientum” by Basil Valentine. Valentine discussed Jupiter, the king, the son of the aged Saturn, and the manner of his rebirth after Saturn had devoured him. Valentine interpreted the story according a certain process in which the compound he had been discussing was consumed by another substance (likely a derivative of lead—hence the association with Saturn) and then returned. The former dog-ear in Newton’s copy pointed to the beginning of the story, “senis Saturni filius est [he is the son of old Saturn].”\textsuperscript{166}

The final general category for the dog-ear referents in Newton’s chymistry goes beyond descriptions of mythological stories and their procedural meanings to what appears to be an attempt to understand how the given story became associated with the chymical procedure, and even to look at the origins of these stories themselves. Newton’s interest in these passages suggests a secondary motivation to his textual chymistry: his attempts to discover the \textit{prisca sapientia} and in so-doing to uncover the original translational principle.

\textsuperscript{164} Maier, \textit{Secretioris}, Trinity NQ.16.88, 8.

\textsuperscript{165} Maier, \textit{Secretioris}, Trinity NQ.16.88, 41.

by which chymical truths about the natural world had been rendered into figurative and
symbolic descriptions. A dog-ear on page 33 of Maier’s *Secretioris* once pointed to the
phrase, “Est autem Latona una ex 12 diis Hieroglyphicis Ægyptiorum, à quibus hæc aliaæque
allegorIæ ad reliquas gentes propagatæ sunt [Latona, moreover, is one of the 12 gods of the
Egyptian hieroglyphics by whom this and other allegories were propagated to the rest of the
pagans].” Maier goes on to discuss how the Egyptian priests understood the allegories to
refer to things of nature, but the people took them to be real gods and goddesses. Newton’s
dog-ear indicates his interest in Maier’s *Secretioris* for not only chymical procedures,
substances and even matter theory, but as a source of the *prisca sapientia* and the origins of
pagan idolatry. This aspect of Newton’s textual chymistry forms the subject of Chapter 3, as
Newton investigated both the origins of the symbolic language used in biblical prophecy and
chymical figurative representations and the negative consequences of the misinterpretation of
the original symbolic forms.

While a number of additional examples can be found in Maier’s work, the generality of
Newton’s interest in this aspect of written chymistry can be seen from a couple of examples
further afield. On page 289 of *La Lumière sortant des Tenebres*, the unknown author
discussed how the powers of the philosopher’s stone appeared to be miraculous to the
ignorant. Newton’s dog-ear pointed to the phrase which claimed that it was nothing but
“l’effet de la simple magie naturelle [the effect of simple natural magic],” but the ignorant
considered it the production of a demon, and impiously attributed to a malign spirit what was
in fact solely caused by nature, or by “l’Auteur de la Nature [the Author of Nature].”

167 [Marc-Antonio Crasselame], *La LumièrE sortant par soÿ mème des Tenebres ...* (Paris, 1687),
Trinity NQ.16.117, 289; HL 1003.
Finally, Newton once dog-eared the opening section of the “Clangor Buccinæ,” on page 288 of the *Artis auriferae*, which discussed the earliest natural philosophers’ understanding of nature and God. The unknown author claimed that Thales of Miletus, the first philosopher, said that the prime essence was “Antiquissimum entium Deus, ingenitum, æternum [God the most ancient being, unbegotten and eternal].” That Newton should refer to this last quotation almost certainly demonstrates his interest in this particular chymical text as a source for information on the original knowledge of God and of the natural world. In this instance, the author touched on aspects of God and nature that were quite important to Newton’s own natural philosophy: the nature of God’s immensity—or omnipresence—and his eternity, and how that related to the physical universe. This sort of information was precisely what Newton was searching for in his quest for the original knowledge, the *prisca sapientia*, before its corruption by pagan idolatry. Thus Thales’ opinion, the earliest Greek natural philosopher, would have been of great interest to Newton. Most of the dog-ears in this particular source, however, point to procedural methods in chymistry and discussions of matter theory—and not necessarily links to the *prisca sapientia*.

The above eight categories of dog-ear referents provide insight into Newton’s reading of chymical texts. The sheer volume of dog-ears and the interests that they indicate reveal how central the work with texts—both symbolic and literal—was to Newton’s overall chymistry. Newton’s chymical library was a working library. He used it to develop future experimental procedures, to understand results from his work in the laboratory, and even to develop his own theories of the nature of matter. He also used his library in an incredibly self-referential way. In the overwhelming evidence of Newton’s cross-references, his search

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for additional chymical texts, and his consistent annotation (via dog-ear) of multiple references to similar topics (dog-ear referent categories (1) and (2)) we can see not only the importance Newton placed on textual chymistry, but the actual process of his organizational work with chymical texts.

Newton’s dog-eared passages reveal the far ranging nature of his textual research in chymistry. Many of the dog-ear referents could fit into multiple categories. References to compounds (3) and procedures (4)—and even matter theory (5)—are often quotations or paraphrases of other chymical authors, and Newton’s ear-marking of them could fit better into the first and second categories, revealing his attempt to organize the full spectrum of chymical literature. Conversely, Newton’s references to specific authors (1) or direct quotations (2) might be part of his attempt to ensure he had every reference to a given procedure or substance to improve his experimental chymistry. Moreover, certain procedures or theories were described in symbolic language and then rendered into their plain meaning (6) and (7), and Newton’s dog-ears may reference either the specific procedure, the descriptive translation thereof, or, more likely, both. It is quite possible that a variety of motivations lay behind Newton’s choice to mark a given word or section by dog-ear, especially since these categories are not mutually exclusive. Additionally, the example of referents both to ancient conceptions of God and procedural and theoretical topics in the same work implies a variety of uses for a given chymical text, and thus suggests more caution when drawing a line, as Principe suggests, between texts that are purely enciphered chymical procedures or theories and those that deal with ancient religion or other “non-scientific” topics. Stepping back from the range of Newton’s individual motivations for dogearing, one can see that the dog-ears referents all point to one general function to the method:
the attempt on Newton’s part to organize the various aspects of chymistry—the numerous chymical authors and their works, the variety of chymical substances and procedures, and the often confusing symbolic language which encompassed the entire field—into an accessible whole. All of this work, as evidenced by the vestiges of Newton’s textual research—the remains of thousands of dog-ears—comes into focus in the light of his own chymical compositions, especially his greatest effort of chymical writing, the “Index Chemicus.”

5. Newton’s Textual Methods in his Chymical Writings: “Praxis” and the “Index Chemicus”

In spite of decades spent in the literature of symbolic chymistry, Newton’s publications barely reflect the centrality of his systematic research of chymical texts to his chymical interests. His “Hypothesis” (1675), *De natura acidorum* (1710), and the final Queries to the *Opticks* (first published in 1706) demonstrate his chymical interests, and reconstructions of his matter theory show the extent to which he drew on the symbolic literature for the chymistry represented in these works. Nonetheless, his published writings do not interact directly with the symbolic literature, even as the majority of his chymical manuscripts do. As stated earlier, however, many of these works are copies or extracted notes from chymical writings not original to Newton. One central exception is Newton’s “Praxis” (Babson Ms. 420) a document written in the same vein as the symbolic chymistry so ubiquitous in his library, which discusses the various approaches to the production of the philosopher’s stone and is replete with references to the symbolic chymical works of others. Newton began “Praxis” as a set of notes on the *Triomphe hermétique* of Alexandre St. Didier, demonstrating the identity of Didier’s chymical process with that of Sendivogius, Basil Valentine,
Philalethes and others. However, it soon developed into his own composition.169 “Praxis” went through two drafts, transforming from notes on Didier’s process into a compilation of all the major authorities on the process of multiplying gold, culminating in Newton’s approximation—using the symbolic language of the sources he cited—of the “wet way” to use the philosopher’s stone in multiplication.170 A number of Newton’s quotations and references in this document find corresponding evidence of dog-ears in the works Newton quotes from, revealing one importance purpose to which he put his dog-eared method of organizing chymical texts: the composition of chymical manuscripts. Additionally, this document begins with a fascinating table of twelve chymical symbols and their corresponding associations with pagan deities, natural phenomena (the seven planets, four elements and the unique ‘fifth’ element—earth or chaos), and their literal meaning in chymical substances.171 This table expresses Newton’s systematic organization of his dog-ear referents to the various meanings of chymical symbolism and their relationships to original pagan religion and deities, such as Maier’s list of the twelve gods of the Egyptians. Additionally, this table reveals the operation of Newton’s descriptive-translational approach to symbolic and figurative representations of realities—be they historical or natural—and the intersection of Newton’s application of that approach to both theological and chymical subjects, which will be explored in further detail in Chapter 3. Babson Ms. 420’s twenty-eight folios pale in comparison, however, to the more than 100 folios of the final draft of Newton’s “Index Chemicus” (Keynes Ms. 30.1).

169 Westfall, Never at Rest, 529.

170 Westfall, Never at Rest, 529-30.

171 Newton, Babson Ms. 420, fol. 1r-v.
Newton’s “Index Chemicus” fits into the general category of Newton’s organizational chymical writings. This document should in many ways be regarded as Newton’s magnum opus of his textual work in chymistry, as it attempted comprehensively to organize all of the symbols and referents used across the vast symbolic literature of chymistry.\(^{172}\) Similar to his bibliographic index of books and manuscripts to be purchased (“De Scriptoribus Chemicis”) and his list reconstructing the details of all the chymical authors (“Of Chemicall Authors & their writings”), the “Index Chemicus” organized the terms and symbols involved in chymistry and their use in the chymical literature. The “Index Chemicus,” however, went far beyond a hundred or so brief entries: it truly is what its title implies, an index of chymistry, of the entirety of the chymical literature available to Newton at the time of its composition. Going through five drafts, the Index was begun no earlier than 1678 and the final version finished in 1690 or shortly thereafter.\(^ {173}\) The bundle of manuscripts associated with this work at King’s College, together labelled Keynes Ms. 30, reveal three main compositional attempts of increasing detail, with an additional incomplete draft of the first and third versions.\(^ {174}\) The Index began as a series of headings, organized alphabetically, providing the location (author, abbreviated title and page number) in various chymical works of each term listed. Westfall links the first iteration of this list to Newton’s early list of chymical terms

\(^{172}\) See Westfall, “Newton’s Index Chemicus,” 174-85.

\(^{173}\) These dates ante quam and post quam derive from the publication dates of the works referenced in the Index and a lack of references to works published after 1690, whose presence, based on their inclusion in Newton’s list of “Authores magis utiles” in Keynes Ms. 13, would otherwise be expected. See Westfall, “Isaac Newton’s Index Chemicus,” 176-7. Westfall argues for a composition date as late at 1682 for the first draft, given Newton’s inclusion of an entry on Quercus cava (hollow oak) which Newton’s experimental notes began to feature in that year.

\(^{174}\) Westfall, “Newton’s Index Chemicus,” 175-8. The draft of the third version is the only piece of the Index not at King’s College, Cambridge (it now resides at the Yale Medical Library) and was abandoned before Newton had completed the A’s. See Westfall, “Newton’s Index Chemicus,” 178, n. 13.
from the mid-1660s, drawn from his reading of Boyle’s works. However, as Newton added to the list in the 1680s, it developed into more than an index of chymical references: Newton expanded many of the entries to discuss the multiple symbols and meanings associated with a given chymical term. By the composition of the final version (Keynes Ms. 30.1) the Index totaled 879 headings, with forty-six longer entries (averaging a page in length), filling more than 100 folio pages. Westfall calculates the entire document to contain roughly 5,000 separate references from at least 144 different works and 100 different authors. Westfall finds the document so comprehensive that he imagines it impossible to be the work of less than twenty years of focused and intense labour, even though it was composed in half that time, and during the decade in which Newton produced the *Principia*. While this level of productivity certainly gives insight into Newton’s unrelenting industry, I suggest that his unique pattern of dog-earing, and the organizational capacity it allowed him, has a lot to do with the incredible accomplishment that is the “Index Chemicus.”

As an example, I have looked through all of the dog-ears in Maier’s *Secretioris* and matched them to possible referents in the “Index Chemicus,” the results of which are recorded in Appendix I. For each page which showed evidence of being dog-earred, I searched Keynes Ms. 30.1 for a reference to Maier’s “Emblemata” (as Newton called the

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175 Westfall, “Newton’s Index Chemicus,” 175. The earlier list of chymical terms (Oxford Bodleian Ms. Don. b. 15) is discussed above.


177 Westfall, “Newton’s Index Chemicus,” 178.

Secretioris) and that specific page.\textsuperscript{179} Of the forty-two dog-ears (all of which have been folded back or ‘cleaned’) in Maier’s 150 page work, only four have no corresponding reference to the dog-eared page in any version of the Index. The remaining dog-eared pages in the Secretioris have at least one reference in the Index and possibly multiple references. Of the multiple references, the specific one dog-eared by Newton can usually be picked out by the content to which the folded dog-ear points. There is a degree of error, specifically when a dog-ear could point to two possible candidates, such as the fold on page 41, which could point either to “caduceum” or the word on the line below it, “Dracones.”\textsuperscript{180} In this case a reference to both possibilities can be found in the Index, one on folio 19r, the entry “Caduceus” (Mercury’s rod with its entwining serpents), and the other on folio 21r and 31r, the entries “Cauda draconis [the tail of the dragon]” and “Draco caudam devorans est Ἐ [the dragon devouring its tail is sulphur].”\textsuperscript{181} Both entries in the Index reference “Maier. Embl. p. 41,” and it may be that in this instance Newton used that particular dog-ear to earmark both symbols (possibly at separate times). Additionally, the “Index Chemicus” has more references to the Secretioris than there are dog-ears, and references a number of pages that are not dog-eared. Therefore dog-ears should not be taken as the sole means by which Newton researched and composed his Index. However, the consistent matching of entries in the Index with specific words and concepts directly pointed to by Newton’s dog-ears demonstrate the degree to which they were a research aid and allowed him to access the information he needed. Maier’s Secretioris is just one example. Sifting through all of

\textsuperscript{179} Newton, “Index Chemicus,” King’s College, Cambridge, Keynes Ms. 30.1 and Keynes Ms. 30.5.

\textsuperscript{180} Maier, Secretioris, Trinity NQ.16.88, 41.

\textsuperscript{181} Newton, Keynes Ms. 30.1, fol. 19r, 21r, 31r.
Newton’s dog-ear referents and attempting to find each possible manuscript match is a nearly impossible project, or at least one which could take as long to research as it took Newton to compose. Nonetheless, this example shows how Newton used his dog-ears in his manipulation of the physical texts of chymistry and his organization of its symbolic nomenclature. In fact the entire “Index Chemicus,” Newton’s longest chymical composition, could be seen as a sustained attempt to clarify the language of symbolic chymistry and to make the entire field and its literature accessible.

While the “Index Chemicus” began as a personal tool for organizing Newton’s chymical reading, it evolved into an attempt to expound on the entirety of the chymical Art. Westfall speculates whether it was intended for pseudonymous publication, or for distribution amongst Newton’s chymical network, given its explanation of basic chymical contents that Newton certainly did not need to record.182 Regardless of Newton’s intentions for the document, its purpose certainly relates to the organization of the symbolic chymical literature. The “Index Chemicus” completes the picture of Newton’s comprehensive approach to the symbolic literature of chymistry. Newton’s targeted book purchases—his attempts to access the most original manuscripts and publications—as well as his reconstructed history of alchemical authors become small components of a unified endeavour to make manifest the secrets of nature hidden within the disorganized complexity of the symbolic writings of the chymists. The “Index Chemicus” represents this attempt in manuscript form

182 Westfall, “Newton’s Index Chemicus,” 179-81. Westfall also suggests the possibility of Fatio de Duillier as a possible intended recipient.
Finally, the “Index Chemicus” also reveals the importance Newton placed on deciphering the symbolism of alchemy, revealing the methodological consonance between Newton’s interpretation of chymical and prophetic texts. Headings for mythological figures and symbolic representations find their translation into prosaic chymistry in the Index. The implications of this central property of Newton’s largest chymical composition will be explored in Chapter 3, as an example of how Newton’s descriptive translation of symbolic forms into their plain meaning bridged the gap between his experimental philosophy and his hermeneutical or textual research. The “Index Chemicus” functions as a tangible representation of what was going on in Newton’s textual research, as he dog-eared references to actual substances behind the symbols, the chymical procedures represented by certain mythological stories, and even a record of the development of those stories and their chymical associations (dog-ear referent categories (6), (7), and (8) of the previous section). Many of those dog-ears were likely generated in the production of the Index, but the pattern of dog-earing continued after its composition and thus they represent a more general pattern of textual chymical research that the “Index Chemicus” captured in manuscript form. Newton’s “Index Chemicus” captures a record of his research of symbolic chymical texts, and the organizational and deciphering motivations that drove that research. For Newton, the array of symbolic chymical texts were an additional resource to chymical experimentation for knowledge about the natural world and required systematic methods of textual scholarship and methodical deciphering of the chymical imagery to access that natural knowledge. However, these two sources of knowledge about the natural world were not incompatible. Rather, Newton, like many early modern alchemists, used his textual chymical research to determine recipes and experiments to attempt in the laboratory, even as his
Newton’s experimental results assisted his deciphering of the figurative forms used in the symbolic chymical texts.

6. Newton’s Integration of Textual and Experimental Chymistry

The evidence from Newton’s personal chymical library and his chymical manuscripts reveals the central importance that research and interpretation of symbolic texts held for Newton’s chymistry. However, early modern chymistry frequently entailed the integration of a careful analysis of symbolic texts with experimentation in the laboratory, and in this regard Newton was no different from his peers. Evidence of his use of experimentation to further his understanding of the chymical symbols can be found in his notes from chymical experiments, largely contained in the two manuscript collections, CUL Add. Ms. 3975 and 3973. For example, in CUL Add. Ms. 3975, Newton recorded an experiment conducted on February 29, 1683/84. He described the resulting products of a reaction involving mercury, fuller’s earth, and spirit of antimony:

The matter in the bottom looked redder than fullers earth & weighed 43\textsuperscript{grains} & on a red hot iron did not smoake. The sublimed salt & $♀$ [mercury] together weighed 26\textsuperscript{grains} besides a grain or two left in the retort neck. Fullers earth 60\textsuperscript{grains} after being well dryed in the fire in a fireshovel not red hot weighed 43 1/2\textsuperscript{grains}. The salt was very pouderous. Its tast strong sourish ungrateful & tasting something like sublimate. Part of it did not dissolve in water. Probably the tasting & dissolvable part is analogous to sublimate the undissolvable part to mercurius dulcis. Quaere! [Find out!]\textsuperscript{183}

Newton speculated that the resulting products contained material similarities to products he had experimented with before and had encountered in his reading, a certain sublimate and

\textsuperscript{183} Newton, CUL Add. Ms. 3975, fol. 69r-69v.
mercurius dulcis (sweet mercury). However, this experiment caused him to want to find out more about why this experimental result appeared (or tasted!) as it did, encouraging further investigation of both written text and experimental substance. A few folios further in the manuscript Newton recorded the results of another experiment, which, in this case, could assist in his understanding of a specific image used in the symbolic literature, the caduceus:

The matter dryed before the separation of the salt from it did not sublime with [sal ammoniac] but the salt extracted did sublime with [sal ammoniac] prepared, as freely as salt of [Venus/copper] if not more freely For it left a less remainder.. Nonne sal iste ♂ affinior quam sal ♀? Nonne mediator est inter utrumque ad caduceum componendum [Is this salt not more closely related to Mercury than the salt of Venus/copper is? Is it not a mediator between each for composing the caduceus?]\(^{184}\)

In a similar manner to the previous quotation, Newton’s experimental result, an extracted salt that sublimed with sal ammoniac, caused him to speculate about its relationship to known chymical products. However, in this instance Newton drew a clear connection between his experimental result and his reading of symbolic chymical texts: he suggested that the subliming salt might be the mediator associated with the “caduceus,” the symbol of the god Mercury’s staff. Newton’s reading of the meaning of the caduceus, a pervasive symbol in the literature and one of the more detailed entries in the “Index Chemicus,” gained interpretive clarity as a result of this particular experiment, demonstrating his synthesis of library and laboratory.

A specific example of the integration of Newton’s experimental and textual chymistry can be found towards the end of CUL Add. Ms. 3975, where the dog-eared sources for Newton’s recorded experimental procedures can be discerned. In a section titled, “Of the

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work with common ☉ [gold],” Newton listed a protracted process, possibly to extract the
essence or ‘seed’ of gold from common gold, drawn from a number of symbolic texts and
only partially rendered into plain chymical meaning. After each step in the process he listed
references for the source texts of the given symbolically described procedure. For example
Newton stated:

Afterward it must be distilled sometimes per se. ibid p. 239. Secrets Reveald p 55. 56. The doves are applied igne aperto [on an open flame] Snyders Pharm. Cath. p. 11, 12, 19 31, 38, 69, 70 & then the body at a certain sign appearing is to be quenched in ♂ [mercury].

Newton provided the source for the distillation step, Secrets Reveald by Eirenaeus
Philalethes (George Starkey), and for the need to apply “the doves” on an open flame, the
“Commentatio de pharmico catholico” by J. de Monte-Snyder. A few sentences later Newton
gave Snyder’s plain meaning for “the doves” as sulphur and niter (see below). In the list of
references for this specific step in the process, Newton gave the individual page sources in
Snyder. In Newton’s copy of the Reconditorium ac reclusorium (Trinity NQ.16.80), which
included Snyder’s “Commentatio de pharmico catholico,” pages 11, 12, 19, 31, 38, and 70 of
the “Commentatio” all have evidence of dog-ears that once pointed to the operation of a
certain fire, occasionally called an “igneum Magicum [magical fire].” The fold of the dog-ear
on page 19 once indicated the following sentence,

Separationum optima est haec, quando ad summum sulphur extrahitur, per
incensionem Magici ignis, qui sympathiam habit cum metallo; haec divisio &
segregatio parvo potest fieri tempore, igne aperto; [This is the best separation,
when sulphur is extracted the most, through the burning of a magical fire, which

\[185\] Newton, CUL Add. Ms. 3975, fol. 123v.
has sympathy with metal; it is able to be finely divided and separated with time, on an open flame].

The folded corner of page 19 pointed directly at “igne aperto [on an open flame],” revealing the immediate source for this experimental procedure. It appears that earlier, in his reading of the “Commentatio,” Newton had dog-eared this specific experimental procedure (an example of dog-ear referent category (3) from Section 4.3), which he then incorporated into his description of that same chymical experimental procedure in his laboratory notes. Newton had dog-eared all of the pages related to the operation of this special fire, and when recording the experimental application of his reading of Snyder’s “Commentatio,” he included all of the related references, in addition to the direct source for how to perform the crucial step over an open flame.

Similarly, a few sentences further in the manuscript, Newton recorded what to do next with “the doves,”

These doves are first to be enfolded in the arms of ♀ [Venus/copper] Secrets Reveal’d p 54. Snyders calls these sulphur & niter & says they are first to be united & then by their fiery spirit metal is to be burnt, & this he makes the key. p 65, 71. And calls this the Sympathetick fire hot cold mois & dry, & siccus liquorculus ex contrariis compositus ignibus [dry little liquor composed from contrary fires]. Pharm. Cath. p 11.

As referenced by Newton, page 65 of Snyder’s “Commentatio” does indeed refer to the uniting of “vulgare sulphur” and niter, which together burns the “sulphur of metals,” through a fiery spirit. And page 71 refers to the preparation of the magical fire, or key, from the

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186 J. de Monte-Snyder, “Commentatio de pharmico catholico,” in Reconditorium ac reclusorium... (Amsterdam, 1666), Trinity NQ.16.80, 19: HL 1378.

187 Newton, CUL Add. Ms. 3975, fol. 123v.

188 “Vulgare sulphur & nitrum sunt ambo efficaces ignes, verum infestissimi inimic; si scis hos reconciliare, ac tum metallicum sulphur per illorum igneum spiritum incendere...” Snyder, “Commentatio de pharmico catholico,” Trinity NQ.16.80, 65. The “sulphur of metals” refers not to vulgar sulphur (what we
two opposing fires, sulphur and niter. Both of these pages were once dog-eared in Newton’s copy, although the folded corner appears to have pointed more to the general discussion than to any specific word. However, Newton’s dog-ear on page 11 pointed directly to the words “sicco liquorculo,” the dry little liquor referred to in CUL Add. Ms. 3975. Snyder also described this substance as a universal menstruum, carrying opposing qualities, cold and hot, humid and dry, formed from the double sympathetic fire, and commonly called sulphur and niter by Philosophers. As with Newton’s description of an experimental procedure over an open flame, in this instance Newton incorporated his reading and earmarking of Snyder’s “Commentatio”—a symbolic chymical text—into his laboratory notes. In this case Newton used his prior textual research to describe the possible meaning of the symbolic terms used for a chymical product or reagent (an example of dog-ear referent category (6)). In fact, in this instance Newton’s reference to Snyder reveals the insight drawn from his research of chymical texts as to what may be happening at the internal structural level at this point in the procedure (the burning of the “sulphur of metals” and the composition of the dry liquor from “contrary fires”). As such it would reveal his integration of chymical theoretical ideas resulting from his textual chymistry (dog-ear referent category (5)) into his experimental notes. This pattern continues throughout the overall procedure, as

would consider to be sulphur today), but the inner sulphuric component of metals, the proportion of which to mercury (again different from vulgar mercury) determined the nature of the metal. Thus when these two “efficient fires” burned metals they were actually separating out component parts of the inner matter of the metals.

189 The more extensive quotation is, “verum & præparationem igneæ Magicæ clavis, quæ, ut percepisti sæpius, ex duobus contrariis repugnantibus ignibus preparatur, nempe ex sulphure & nitro...” Snyder, “Commentatio de pharmico catholico,” Trinity NQ.16.80, 71.

190 Snyder, “Commentatio de pharmico catholico,” Trinity NQ.16.80, 11.
Newton extracted procedural—and even chymical-theoretical details—from symbolic chymical texts to aid his own attempt to work with ‘common gold.’

Newton’s incorporation of his reading and dog-eating of Snyder’s “Commentatio” into his experimental notes is but one example of this practice. The procedure also references Philalethes’ (Starkey’s) Secrets Reveal’d and his commentary on George Ripley’s hermetico-poetical works (Ripley Reviv’d). Other procedures in the manuscript reference the Marrow of Alchemy, by Philalethes (Starkey) and an untitled work by “Minschict,” likely the “Aureum seculum redivivum” in the Musæum hermeticum (1625) whose author, Hinricus Madathanus, Newton had deciphered as “Hadrianus of Munsicht” (see section 4.1). In addition to these more symbolic sources for Newton’s recorded recipes and procedures in the laboratory notebook, Newton also relied on more literal, “chemical” sources, as evidenced by experimental procedures drawn from Starkey’s (non-pseudonymous) Pyrotechny Asserted and numerous references to Boyle’s works. For Newton reading and organizing chymical texts was an integral part of his chymistry. His laboratory notebooks and manuscripts intersperse experimental procedure with references drawn from his reading, comments on future investigation of the symbolic forms of experimental products, suggestions from his experimental results as to how to understand figurative descriptions or code words (decknamen), and indications drawn from his research of chymical texts as to changes in the internal structures of the substances experimented with.

\[191\] See Newton, CUL Add. Ms. 3975, fols. 132r and 134v.
7. Isaac Newton, Textual Chymist

In its emphasis on the textual aspects of Newton’s chymistry, this chapter has presented a nuanced perspective of Newton’s “alchemy.” As perspectives of Newton’s alchemy continue to shift, I argue that an appreciation of the central role of his reading and organization of chymical texts should be added to the understanding of his chymical study of the natural world. Newton’s alchemical endeavours have been accepted as an integral part of his overall natural philosophy, part of his experimental and theoretical investigation of the nature of matter. Drawing on the insights offered by the new historiography of alchemy, this chapter has treated Newton’s chemical and alchemical writings as the same subject, chymistry, and considered how the experimental and theoretical aspects of his practice of chymistry related to his research of its symbolic writings. In the case of Newton’s chymistry, I suggest a slightly different approach to that advocated by Principe, maintaining the unity of the symbolic writings and seeing a spectrum of purposes to which Newton put the range of his chymical books. If we wish to find divisions or categorizations within Newton’s chymistry, they would be between what I label his “textual chymistry” and his experimental chymistry. One was a hermeneutical pursuit, based on the interpretation and organization of texts, while the other was experimental and practical, focused on the activity of the laboratory and the records thereof. However, Newton, like many early modern alchemists, integrated the two—as he derived laboratory procedures from the results of textual research and organization, and used experimental results to explore the meaning of symbolic representations in the chymical literature. The recent history of early modern alchemy has emphasized the bookish nature of the chymical arts, often as an opportunity to consider the relationship between textual scholarship and experimental science. In this context, Newton’s alchemy, or chymistry, gives
an unparalleled insight into the considerable textual work involved in the chymical understanding of nature, as his extensive manuscript holdings and the corresponding chymical books of his library—with their particularly Newtonian dog-ears—directly reveal his approach to the symbolic literature of chymistry.

This chapter has given an overview of Newton’s chymical career, demonstrating the presence of the specifically hermeneutical practice of Newton’s textual chymistry. Its in-depth consideration of Newton’s chymical library and his manuscript evidence for collecting chymical books and organizing chymical authors, reveals Newton’s comprehensive approach to the symbolic literature of chymistry and questions treatments of Newton’s reading of chymical books that divide his work with symbolic texts into separate disciplines. Moreover, this chapter has explored the nature of Newton’s textual chymistry in his use of his annotations and dog-ears to navigate his extensive chymical library and his composition of the “Index Chemicus.” This aspect of Newton's chymistry reveals his systematic and organizational method and his interpretive impulse as he attempted to derive the plain descriptive meaning of chymical symbols and mythological stories. Finally, Newton’s laboratory notes indicate the extension of his textual chymistry to his experimental work, revealing the degree to which his chymistry combined textual, experimental, and theoretical endeavours.

It in this integration of interpretive, empirical, and theoretical approaches that Newton’s chymistry reveals a closer connection to his theology than his other natural philosophical pursuits. Principe argues that the integration of theological concerns into Newton’s chymistry equalled that of his astrology and physics, and that conceptions of chymistry or alchemy as an especially spiritual or theological endeavour reveal an
anachronistic understanding of early modern conceptions of the natural world. While I fully endorse Principe’s new historiographic understanding of alchemy, I nonetheless suggest that the exceptional integration of textual scholarship into Newton’s chymistry reveals a non-trivial connection between his alchemy, or chymistry, and his theology. This connection is not necessarily stronger in Newton’s chymical theories or conclusions—although this connection will be explored in Chapter 4—but in the methods by which he attempted to gain knowledge of the natural world. Newton’s textual chymistry displays a desire for a comprehensive understanding of the chymical literature, which involved the cross-comparison of texts and the search for plain descriptive meanings of figurative depictions across a variety of textual sources. In many ways this methodological approach to chymical texts mirrors his approach to similarly figurative texts and to the use of literary symbols in his interpretation of biblical prophecy, which I label Newton’s descriptive-translational approach and consider in detail in Chapter 3. It is not quite the via media that Dobbs suggested, navigating between the mystical or spiritual and the natural, but rather a bridge between the textual or hermeneutical and the experimental or theoretical. However, before turning to the details of how Newton’s approach to chymical texts—an integral part of his overall chymical study of the natural world—mirrors his biblical hermeneutics, we must investigate how Newton read and interpreted the symbolic texts of another of his enduring passions: biblical prophecy.
Chapter 2. Newton and the Symbolic Literature of Theology:
Prophecy

1. Newton and Biblical Prophecy

In this chapter I consider the methods of Newton’s textual research in his interpretation of biblical prophecy. I argue that Newton’s hermeneutical approach to biblical prophecy attempted to apply a coherent and comprehensive interpretive framework that employed a rigorous cross-comparison of texts and deciphered—or translated—the symbols of biblical prophecy into a consistent and plain meaning. I explore Newton’s use of humanist methods of reading texts in his own understanding of Scripture, particularly in light of seventeenth-century developments in biblical criticism. Newton doubted the authenticity of the received text of Scripture and sought to reconstruct the original by comparing variant manuscripts and tracing the process by which they had been corrupted. He found the prophetic texts to be more trustworthy than the plain and prosaic biblical accounts, as the figurative and symbolic forms by which prophecy had originally been written disguised their true meaning from the unworthy and allowed them to escape deliberate modification. Hence, he extended considerable effort towards the correct interpretation of the prophetic imagery.

Newton believed that the figurative language of biblical prophecy reflected an actual language, or prophetic dialect, which had once functioned among the prophets with its own grammar and vocabulary, founded on an analogy between the natural and political worlds. He constructed elaborate rules to “methodize” the prophetic Scriptures and drew up lists of consistent definitions for prophetic symbols used throughout biblical prophecy, based on
rigorous cross-analysis of Scripture and justification from ancient interpretative sources of similar figurative expressions. Additionally, I discuss the relationship between Newton’s research of prophetic texts and his work in natural philosophy in his attempts to recover original knowledge, or the *prisca sapientia*, and his reference to “the analogy of nature” as the interpretive key to the prophetic dialect. I argue that Newton’s specific use of analogy to interpret the symbolic language of biblical prophecy, while reminiscent of his use of analogy in aspects of his natural philosophy, was unique to the interpretation of symbolic texts in its literal deciphering function.

In the previous chapter, Newton’s manuscript lists of chymical books and desiderata and the record of his research of chymical texts in his particular dog-ears and the “Index Chemicus” provided material with which to draw conclusions regarding Newton’s approach to the symbolic literature of chymistry. The nature of Newton’s theological writings allows a somewhat different approach. While the theological books in Newton’s library—and his Bibles in particular—certainly contain the dog-eared remnants of his textual research, no indexed lists of secondary theological literature corresponding to those discussed in Chapter 1 are present. However, most of Newton’s cross-comparison of texts drew directly from the Bible. Newton’s theological manuscripts provide direct insight into Newton’s interpretive approach to Scripture in his manuscript descriptions of the correct method to interpret biblical prophecy and his proofs for his proposed prophetic lexicon. Hence this chapter analyses select theological manuscripts in which Newton provided his scheme for the interpretation of biblical prophecy—the symbolic literature of the Bible—particularly the method outlined in his early untitled treatise on Revelation, Yahuda Ms. 1. In the area of theology, Scripture formed a unique source text for Newton, a source with divine authority,
even though his citation and interpretation of this text relied on previous biblical interpreters (such as Joseph Mede and Henry More) and ancient sources of the linguistic context for the prophetic symbols. In the interpretation of biblical prophecy, Newton’s manuscripts record his own discussion of his methods and organization of theological sources (most of them directly scriptural). Newton’s theological manuscripts provide direct statements of his interpretive method when reading biblical texts and thus present a more focused source for investigating his methods of textual research than that provided by his chymical manuscripts. Thus while an in-depth investigation of the dog-ears in Newton’s theological books would provide further insight into his reading of Scripture, it is not necessary for the present discussion and is beyond the scope of this dissertation.

2. Theology and Prophecy in Isaac Newton’s Work

2.1 Newton’s theological writings

Newton wrote more on theological topics than any other general category, and the volume of Newton’s manuscripts limits what can be said of his theological writings as a whole. A number of manuscripts loosely described as “religious” on “The Newton Project” website could also fit into the categories of historical and chronological or even natural-philosophical.192 The documents themselves are distributed throughout multiple libraries,
although the majority, collected in the mid-twentieth century by Abraham Yahuda are currently at the National Library of Israel in Jerusalem. Other sizable collections include the Keynes collection at King’s College Cambridge, other collections at the Cambridge University Library, and the Babson collection at the Huntington Library in San Marino, California. Even the manuscripts related to the interpretation of biblical prophecy alone number over a million words.193 This chapter looks specifically at what Newton wrote concerning the interpretation of the symbolic language of biblical prophecy, focusing on Yahuda Ms. 1, his early untitled treatise on Revelation (mid-late 1670s).

Newton did not publish any overtly theological material during his lifetime, although his interests become more widely known in his posthumous publications. In the 1720s Newton actively worked on his Chronology of Ancient Kingdoms Amended, leading to its publication a year after his death in 1728. Five years later his Observations upon the Prophecies of Daniel, and the Apocalypse of St. John (1733) presented in print a version of the ideas he first cultivated in Yahuda Ms. 1, but with a more disguised Arianism or non-Trinitarianism.194 His “Two Notable Corruptions of Scripture,” sent to John Locke in 1690, was published in various forms in 1754 and 1785 and made Newton’s heresy publically

the various drafts of The Chronology of Ancient Kingdoms Amended are more directly about natural philosophy or chronology, they are additionally theological in their use and interpretation of scriptural passages or their occasional focus on the nature of God. The vast majority of the Newton Project’s “religious texts,” however, are clearly theological, either dealing directly with doctrinal questions, the interpretation of Scripture, the formulation of creeds, or providing detailed treatments of early church history and analysis of the Patristic authors.

193 See Appendix II for a breakdown of the individual manuscripts related to the interpretation of biblical prophecy and their word counts.

194 It was, however, subtly there for those who passed the work through finer theological scrutiny. See Scott Mandelbrote, “Newton and Eighteenth-Century Christianity,” in Cohen and Smith, eds., Cambridge Companion, 414-6. The posthumously published Observations upon the Prophecies of Daniel, and the Apocalypse of St. John (London: Darby and Browne, 1733) was largely drawn from Newton’s manuscript, Yahuda Ms. 7, National Library of Israel, Jerusalem.
 accesses. Nonetheless Newton’s reputation as an orthodox son of the Church of England remained in the nineteenth century, in part thanks to David Brewster’s mental gymnastics in the face of the clearly unorthodox texts to which he had access. While the story of Newton’s manuscripts and the discovery of his heresy is a topic beyond the scope of this chapter, a few comments on the portrayal of Newton’s writings on prophecy are necessary.

Following the Sotheby’s 1936 sale of Newton’s theological manuscripts, their private purchase, and subsequent availability to public research in the mid-twentieth century, Newton’s theology became an important part of an informed historical approach to his life and thought. Initial analysis considered how Newton’s theological ideas informed his natural philosophy, often seeking unity of thought and remaining focused on the intellectual context of his scientific ideas. This is best exemplified in Dobb’s Janus Faces of Genius, in which Newton’s theology and alchemy, while the main subjects of the book, are nonetheless still interpreted according to how they guided his natural philosophy. In the

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200 Dobbs, Janus Faces. Although Dobbs argues for a pursuit of God and his action in the world as the central driving force for all of Newton’s work, she structures her book around the periods before, during and
past two and a half decades, however, historians have shifted the focus to the actual religious
and theological environment in seventeenth- and eighteenth-century England to understand
Newton’s theological writings.\footnote{201} Newton’s interest in biblical prophecy, no longer portrayed
as an eccentric past-time, has been analysed in the context of the English Apocalyptic
literature, particularly that of Joseph Mede and Henry More, whose works Newton avidly
consumed.\footnote{202} Likewise, Newton’s persistent work towards the correct interpretation of
biblical texts has caused historians to evaluate Newton as a biblical scholar, in the context of
late seventeenth- and early eighteenth-century biblical criticism.\footnote{203} And while Newton was
not formally trained as a biblical scholar (not pursuing degrees in Divinity), his early
education and Cambridge fellowship set him on the path to this most enduring passion.

\footnote{201} The volume of this literature is exceptional. See for example the series of essays in the three
and Influence of Isaac Newton’s Theology} (Dordrecht: Kluwer, 1990); Force and Popkin, eds., \textit{The Books of
Nature and Scripture: Recent Essays on Natural Philosophy, Theology, and Biblical Criticism in the
Netherlands of Spinoza’s Time and the British Isles of Newton’s Time} (Dordrecht: Kluwer, 1994); and Force
number of essays in Force and Sarah Hutton, \textit{Newton and Newtonianism: New Studies} (Dordrecht: Kluwer, 2004). In addition to the Kluwer volumes, see Larry Stewart. “Seeing Through the Scholium: Religion and
Reading Newton in the Eighteenth Century,” \textit{History of Science} 34:2 (1996), 123-65, for the context of
eighteenth-century Christianity, and the aforementioned articles by Scott Mandelbrote and Stephen Snobelen:
Scott Mandelbrote, “Newton Reads the Fathers,” 277-97; Scott Mandelbrote, “Newton and Eighteenth-Century
Christianity,” 409-29; and Snobelen, “Newton, Heretic,” 381-419. Many of these works were influenced by
Frank Manuel’s \textit{Religion of Isaac Newton}, which may be seen as a forerunner in the trend to consider Newton’s
theological views in their own category.

\footnote{202} As some examples see Hutton, “The Seven Trumpets and the Seven Vials: Apocalypticism and
Christology in Newton’s Theological Writings,” in Force and Popkin, \textit{Newton and Religion}, 165-78; Iliffe,
“‘Making a Shew’,” 55-88; and Snobelen “‘A Time and Times and the Dividing of Time’: Isaac Newton, the

\footnote{203} Iliffe, “Apocalyptic Hermeneutics,”55-88; Popkin, “Newton as a Bible Scholar,” in Force
Burnet: Biblical Criticism,” 149-78; Scott Mandelbrote, “Duty of Greatest Moment,” 281-302; Snobelen, “‘Not
in the Language of Astronomers’,”491-530; and Snobelen, “‘To us there is but one God, the Father’:
Antitrinitarian Textual Criticism in Seventeenth- and Early Eighteenth-Century England,” in Ariel Hessayon
116-136.
Richard Westfall speculates that in addition to his basic study of the Bible in grammar school, Newton’s first introduction to theology came through perusal of the sizable theological library of his stepfather, the Reverend Barnabas Smith, which he later inherited. Newton’s first book purchases at Cambridge in 1661 included the *Institutes* of John Calvin, annotations on the New Testament by Calvin’s disciple, Theodore Beza, a biblical concordance and a basic theological text. Newton’s own serious theological compositions—beginning with Yahuda Ms. 1—appear to date no earlier than the mid-to-late 1670s, following his independent study of Scripture and early church history in preparation for the priesthood, a requirement for his continuation in the Lucasian chair of Mathematics and possible impetus for his departure from orthodoxy. Part of the process had involved preparing a speech outlining the orthodox case against Socinianism, which included reading from both sides of the debate. If he had not already encountered arguments against

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204 Westfall, *Never at Rest*, 51.

205 Westfall derives significance from the fact that four of Newton’s ten initial purchases were theological, see Westfall, *Never at Rest*, 309-10. The full titles, as described in Harrison’s *Library* are: John Calvin, *Institutio Christianae religionis, in libros quatuor nunc primum digesta...* (Geneva, 1561); Theodorus Beza, *Annotationes maiiores in Novum Dn. Nostri Iesu Christi Testamentum...* (Geneva, 1594); Isaacus L. Feguernekinus, *Enchiridii locorum communium theologiorum, rerum, exemplorum, atq; phrasium sacrarum..., 5th ed.* (Basle, 1604); Lucas Trelcatius, *Locorum communium S. Theologiæ Institutio per epitomem...* (London, 1608); see HL 335, HL 181, HL 609, and HL 1640. The set could, in fact, represent an early influence of specifically Calvinist theology in Newton’s life and is likely reflective of a more Puritan background. Beza (1519-1605) was a close disciple of Calvin and a major reformer in his own right. Feguernekinus’ concordance was published in Basel together with an appendix by the Calvinist Polanus von Polandsorf (1563-1610), *Partitiones Theologici*, a brief textbook on the fundamentals of the Reformed faith, see Amy Nelson Burnett, *Teaching the Reformation: Ministers and their Message in Basel: 1529-1629* (Oxford: Oxford University Press, 2006), 140. Trelcatius (1573-1607) was a member of the theology faculty at the Calvinist-leaning University of Leiden.

206 Westfall, *Never at Rest*, 310. See n. 287 for a discussion of the composition of Yahuda Ms. 1, one of Newton’s early extensive theological writings. Newton ended up obtaining an exemption from taking holy orders as part of continuing in the Lucasian chair. Wesfall argues that his desire for an exemption reflects his discomfort with the required Trinitarian vow, see Westfall, *Never at Rest*, 333.

orthodox doctrines of the Trinity before, he certainly had access to them in this endeavour. And Newton’s college library contained an unusually extensive collection of polemical works both in support of and in opposition to the orthodox position. Westfall claims that “[w]ell before 1675, Newton had become an Arian in the original sense of the term” and locates his pursuit of a clerical exemption in his distaste for the Anglican doctrine of the Trinity. While the exact path of Newton’s heterodoxy may be less clear than Westfall presents it, his interest in biblical prophecy was present from the beginning.

2.2 The role of biblical prophecy in Newton’s theology

Newton’s non-Trinitarian theology developed over time and forms a central core around which all of his theological writing—including his interpretation of the prophetic scriptures—can be organized. Newton’s earliest interpretation of biblical prophecy (among the earliest theological manuscripts) reveals his heterodoxy in his equation of the great

\footnote{Scott Mandelbrote, “Newton Reads the Fathers,” 283.}

\footnote{Westfall, Never at Rest, 315, 331.}

\footnote{Westfall’s strict correlation (and the subsequent standard position on Newton’s theology) between ancient Arianism and Newton’s heterodoxy has come under scrutiny in the past decade. Rather than a strict fourth-century Arianism, Newton’s non-Trinitarianism should be seen as a theological position in flux, changing over his life and not necessarily the same in 1713 as it was in 1673. A number of authors have questioned the strictly Arian thesis, see Thomas Pfizenmaier, “Was Isaac Newton an Arian?” Journal of the History of Ideas 58:1 (1997), 57-80 and Snobelen’s response in Snobelen, “Isaac Newton, Socinianism and the ‘One Supreme God’,” in Martin Mulslow and Jan Rohls eds., Socinianism and Arminianism: Antitrinitarians, Calvinists and Cultural Exchange in Seventeenth-Century Europe (Leiden: Brill, 2005), 261-2. See my discussion of Newton’s doctrine of God in Greenham, “Newton’s Doctrine of God in the General Scholium and the Theological Tradition,” in Stephen Ducheyne, Scott Mandelbrote and Stephen Snobelen, eds., Isaac Newton’s General Scholium to the Principia: Science, Religion and Metaphysics (forthcoming, 2016). Newton’s Christology and doctrine of the nature of God attempted to recreate a position he considered to have been held by early (first- and second-century) Jewish Christians, which was more similar to second and third century Dynamic Monarchianism—in which the unity between Father and Son was related to dominion and not being—than fourth-century Arianism. See also Remus Gabriel Manoila, “Newton’s (Dynamic) Monarchianism,” (unpublished paper, shared with author), rev. and trans. of Remus Gabriel Manoila, “Newtonian Monarchianism: A Study of Isaac Newton’s Theological Manuscripts” (MA thesis, CESI, University of Bucharest, 2013). Nonetheless, whether or not it was strictly Arian at all points in his life, Newton’s theology remained consistently non-Trinitarian.}
apostasy with the triumph of Athanasius and Trinitarian doctrine. Most of his writings on church history attempt to trace the developments of this ‘idolatrous’ doctrine as the prophetic words became the reality of human history. The issue was no less prevalent in his later life, as his manuscript lists of the tenets of the true religion and his call for peace and toleration based on those common core beliefs remain thoroughly non-Trinitarian.211 In spite of the consistency of this position throughout his life, Newton revealed it to a select few, concerned, no doubt, about the effects of being declared a heretic on his position at Cambridge and the Royal Mint and on his reputation as England’s foremost natural philosopher. Rather, he adapted the strategies of a Nicodemite, as Stephen Snobelen details, inserting hints of his true position into his public writings and waiting on God’s timing for the revelation of the ‘true’ gospel.212

The connection between Newton’s underlying non-Trinitarian theology and his obsessive work on the correct interpretation of biblical prophecy, should not, in fact, come as a great surprise. Interest in the Apocalypse and portrayals of one’s unique group as the final fulfillment of God’s prophetic word was fairly common amongst dissenting religious movements of the seventeenth century.213 Even so, Newton’s individual path to biblical

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211 The clearest example is Newton’s “Irenicum, or Ecclesiastical Polyty tending to Peace,” Keynes Ms. 3, King’s College Library, Cambridge, in which Newton condemns the Church’s excommunication of those disagreeing with more complex theological positions (such as the metaphysical nature of God and Christ) and the use of force to propagate theological opinions. Rather, Newton asserted, Christians should acknowledge a common core of belief in one God the Father and one Lord, Jesus Christ, and the general adherence to the commands to love God and neighbour. For Newton, those who enforce or require belief in the Trinity violate these general principles and demonstrate their own condemnation. Keynes Ms. 3 dates from 1710 or later.


213 See Paul Christianson, Reformers and Babylon: English Apocalyptic Visions from the Reformation to the Eve of the Civil War (Toronto: University of Toronto Press, 1978), 47-92 and 183-221; and Bryan W.
prophecy remains somewhat of a mystery. Its interpretation forms the content of his earliest substantial theological writings and his analysis relies heavily on Cambridge commentators such as Henry More and the earlier Joseph Mede.\textsuperscript{214} One may speculate as to why Newton became so interested in prophecy. One possible answer lies in his intellectual environment: as he became more acquainted with Ralph Cudworth, Henry More and other Cambridge Platonists and their writings, he was bound also to be caught up in their apocalyptic interests.\textsuperscript{215} Eschatological speculation was fairly common in seventeenth-century England, both during and after the Civil War and Interregnum (1642-1660), and Newton was not unusual in his description of his day as the “latter times” nor his assumption in his interpretation of Daniel and the Apocalypse that he stood in a privileged historical position.\textsuperscript{216}

Additionally, Newton needed justification for holding theological views that opposed the established orthodoxy. Unlike the majority of Apocalyptic interpreters, Newton

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\textsuperscript{215} See Hutton, “Language of Biblical Prophecy,” 41, for the influence of Henry More on Newton’s interest in biblical prophecy. See also Iliffe, “Apocalyptic Hermeneutics,” 60-61, for possible political incentives (the “Popish plot” of 1678) to study the Apocalypse.

understood—even in his earliest interpretations—the idolatry symbolized by the worship of the Beast and his image to characterize not just Roman Catholic practice (veneration of images and saints), but Trinitarian theology itself.\(^{217}\) Newton likely found inspiration for his opposition of the established Church in Protestant interpretations of the pope as the Antichrist, a position he shared but considered not to go far enough in locating the source of the great Apostasy. And given the orthodox-Protestant Mede’s location of the beginnings of the process of the corruption of the true church in the emergence of the temporal power of the Roman church, it was likely not a great stretch for Newton to locate that corruption in the ascendency of Athanasius (d. 373) and Trinitarian doctrine.\(^{218}\) A related question concerns which came first: did prophecy actually lead Newton to a non-Trinitarian position, or did he find early justification for his emerging views in his reading of the prophetic texts? The evidence from his manuscripts does not directly answer this question. Nonetheless, it is possible that the contemporaneous development of Newton’s interest in prophecy and his heretical doctrine of God points to a mutually reinforcing relationship in which Newton held to a working hypothesis of non-Trinitarianism, for which prophecy (and a subsequent analysis of church history) gave increasingly positive evidence.\(^{219}\)

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\(^{217}\) Newton, Yahuda Ms. 1.1, fol. 50r, Yahuda Ms. 1.6, fol. 11r, and Yahuda Ms. 1.2, fols. 26r-29r.

\(^{218}\) Mede interprets the two beasts of Rev. 13 as the secular nations of Christian Europe and the ecclesiastical power of the Roman church which emerged in the aftermath of the (Arian) Gothic invasions. The “two horned Beast, or false Prophet, is the Bishop of Rome, with his Clergie, ... successoar to the Dragon for tyranny and blasphemies, under the mask of Christian profession ... he brought it by little and little to that pass, that the Kings lately risen up out of the dissipated Empire of the Cæsars, in the Romane Common-wealth, with one consent subjecting their necks to him, and to Rome now otherwise without Empire, they put on the Image of the old and now-demolished heathen Empire,” see Mede, The Key of the Revelation ..., trans. by Richard More (London: J.L. for Phil. Stephens, 1650), vol. 2, 64-65.

\(^{219}\) The scope of this dissertation does not allow in depth analysis of this question. Buchwald and Feingold argue for Newton’s use of the working hypothesis method, drawn from his experimental work, in his chronological investigation of ancient sources, see Buchwald and Feingold, Newton and the Origin of
Finally, as Newton’s research into prophecy—and its fulfillment in the history of the church—matured into an informed and comprehensive analysis of the Patristic literature, it revealed another possible motivation for Newton’s interest: the promise of access to the original and true beliefs of the early Christian church. Newton’s theological writings broadened in the 1680s to an investigation of the origins of idolatry. This was the period in which he composed his “Theologiæ gentilis origines philosophicæ,” considering the origins of pagan religion in the corruption of the true worship of God and the deification of human persons and objects. Variations on this theme continued throughout his life, and were a central component in his dating of ancient cultures according to their successive deification of Noah and his sons in his posthumous *Chronology*. In the 1680s Newton began to combine his concept of the corruption of knowledge of God and true religion into his conception of the loss of true knowledge of the natural world. The trustworthiness of the biblical texts did not escape this process, and Newton advocated the prophetic books of Daniel and the Apocalypse as trustworthy above all other texts. Perhaps as Newton began to have doubts about the orthodox theology of his contemporaries he turned to the prophetic texts as a reliable and more ancient source. Newton’s first sortie into biblical prophecy certainly coincided with the period in which he was thoroughly engaged with the symbolic literature of chymistry, searching for original texts and attempting to arrive, through a correct interpretation of the chymical symbolic writings, at a more accurate picture of the chymical

*Civilization*. Their model may form a means by which to investigate Newton’s steadily reinforced non-Trinitarian position, but must form the topic of a future study.

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221 Scott Mandelbrote, “Newton reads the Fathers,” 284.

world. This is not to say that Newton began his avid reading of the prophetic texts as a direct result of his chymical interests, but rather that his research of the symbolic chymistry was teaching him to search for true meaning behind enciphered symbols and may have been one cause of his interest in the possibly more reliable truths behind the equally symbolic text of Scripture.

Newton’s exact motivations for the study of biblical prophecy remains speculation and likely involves a combination of his intellectual environment, support of his heretical ideas and a source of uncorrupted knowledge of original religion. What is clear is that throughout his life and his developing theological oeuvre biblical prophecy retained its central position and formed, from the beginning, the impetus for his historical research of church history and the Patristic literature. And, it is in Newton’s reading of biblical prophecy—particularly in his stated methods for interpreting prophetic texts—that his textual research methods in theology can be seen. First, however, we must consider how Newton’s treatment of the biblical text, as well as his historical and Patristic sources, demonstrates his training in text criticism and his adoption of humanist methods in scholarship.\footnote{See Scott Mandelbrote, “Newton and Eighteenth-Century Christianity,” 416, and “Newton Reads the Fathers,” 277-97, for an in-depth analysis of Newton’s appropriation of the methods of his humanist contemporaries and his unique manipulation of his historical sources.} For, even has he turned his critical eye to the biblical text, the symbolic text of the Apocalypse retained a special status as the least corrupted and indeed the provident record of the true faith for a chosen remnant.
3. Corruption and Biblical Prophetic Texts

3.1 Newton’s approach to historical texts

In their extensive analysis of Newton’s *Chronology of Ancient Kingdoms Amended* (1728), Jed Buchwald and Mordechai Feingold demonstrate Newton’s application of scepticism to the testimony of written historical texts. While they argue for a method unique to Newton in his cross-linking of multiple sources to provide a base of data, his scepticism regarding the transmission of words was not unusual, and one of the unifying features of early modern humanist scholarship. Indeed Newton’s concern for the corruption of texts and ideas over time—and thus the need to return to original sources and to determine the path of that corruption—was a product of his training in seventeenth-century scholarship. When considering Newton’s approach to the textual resources available to him, it is vital to understand him neither as a modern scientist nor as a “Sumerian magician,” but as a Humanist, and heir to the text-critical methods and patterns of thought of his immediate forebears.

Newton’s undergraduate training introduced him to the tradition of early modern scholasticism and the complex logical argumentation and rhetorical techniques of the Aristotelian textbook tradition. A number of authors have argued for the influence of this

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226 See Introduction, Section 1, and Keynes, “Newton, the Man,” 277, for Newton as the “last of the magicians.”

early education on Newton’s later work in natural philosophy and theology. In addition to possible sources for Newton’s mode of reasoning from effects to causes (regressus demonstrativus) and his distinction between proximate and remote causes, Newton’s training in rhetoric would have taught him to consider the structure of an argument and the importance of interpretive guides or frameworks to understand the meaning of a given text. Moreover, his developing scholarship demonstrates an increasing concern with the nature of language and the inadequacies of verbal testimony. Newton’s interest in the nature of language, from his earliest studies in Cambridge, and how it shaped his overall interpretive framework—particularly when applied to direct translations of the symbolic imagery used in figurative texts—is discussed in detail in Chapter 3.

By the end of his life, Newton’s scepticism regarding historical texts was quite evident in his critical use of ancient historical sources and his dramatic reconstruction of the dates of ancient history in the Chronology. Evaluating important sources for the history of ancient empires—Ctesias’ Persica for the Persians, Manetho’s Aegyptiaca for the Egyptians and the “Marmor Parium” for the Greeks—Newton pointed out various errors and omissions in their lists of kings and dynasties, particularly when compared to other ancient historical sources, such as Herodotus’ History. Yet Herodotus himself received the sharp scrutiny of

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229 Newton’s early undergraduate writing includes a piece “On the Universall Language,” see Westfall, Never at Rest, 88, n. 64. For more on this manuscript, see Chapter 3, Section 4. See also Buchwald and Feingold, Newton and the Origin of Civilization, 222-45 for Newton’s concern with verbal testimony.

Newton’s textual criticism for relying on Egyptian records that had been fabricated after the removal of the originals to Persia following its conquest of Egypt in 525 BC.\(^{231}\) Even Herodotus’ account, Newton concluded, was founded on the corrupt imaginings of the Egyptian priesthood. Throughout this radical criticism and reconstruction, Newton advanced his theory for a truncated origin of ancient civilizations which accorded more accurately with a literal interpretation of biblical genealogies. Newton was not alone in this practice, as his reliance on John Marsham’s *Canon chronicus* demonstrates. Marsham similarly privileged Herodotus over Ctesias and grounded his chronology in the timeline afforded by a literal reading of Scripture.\(^{232}\)

Newton’s scholarly method of critically comparing ancient sources, while similar to fellow chronologists such as Marsham, resulted in specific historical conclusions that differed from those of many of his contemporaries. And while Newton may have engaged in cross-comparison to a greater degree, he nonetheless tended to rely on secondary source compilations of quotations and translations for his citation of ancient authors, a common practice among Humanist scholars.\(^{233}\) Newton’s use of Gerard Vossius’ *Theologia Gentilis* for quotations of Patristic authors demonstrates this tendency, in which he directly marked (by dog-ear) and copied the secondary author’s Latin translations rather than making his own

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\(^{232}\) Buchwald and Feingold, *Newton and the Origin of Civilization*, 226-7. Newton drew one of his most important comparisons, that of the Egyptian king Sesostris with the biblical pharaoh Sesac, or Shishak, directly from Marsham.

\(^{233}\) Scott Mandelbrote, “Newton and Eighteenth-Century Christianity,” 416.
rendition from the Greek.\textsuperscript{234} Such compilations were part of the intellectual landscape available to Newton and he made full use of them.

\textit{3.2 Newton and seventeenth-century biblical criticism}

Early modern textual criticism had by the seventeenth century, however, extended towards the biblical texts themselves, and Newton was no stranger to this aspect of late Renaissance Humanism. Going far beyond the Reformers’ drive to discover the original texts and source languages of Scripture (embodied in Erasmus’ 1516 edition of the Greek New Testament), some seventeenth-century scholars questioned the accuracy of the source texts themselves and their nature as divine revelation.\textsuperscript{235} Of greatest concern to the traditional majority of interpreters (from Jewish, Catholic and Protestant persuasions) were the writings of Baruch (Benedict) Spinoza (1632-1677), a Dutch Jewish philosopher who considered the Hebrew Bible to be no more than a disjointed collection of ancient Hebrew writings.\textsuperscript{236} Spinoza pointed to the haphazard manner in which historical accounts were recorded, lacking dates and often repeated elsewhere with differing details, and the lack of a clear structure for the precepts of the Pentateuch, concluding that the biblical texts were, “promiscuously collected and heaped together, in order that they might at some subsequent time be more readily

\textsuperscript{234} Scott Mandelbrote, “Newton and eighteenth-century Christianity,” 416.

\textsuperscript{235} Two of the first to do this were Thomas Hobbes and Isaac La Peyrère. Hobbes suggested that the verses in Deuteronomy about Moses’ death indicated more authors of the book than Moses. La Peyrère claimed the Pentateuch was based on a diary of Moses, but composed by later authors using additional materials. La Peyrère’s later publication, \textit{Men before Adam} (London, 1655), additionally questioned Adam’s status as the first man. See Popkin, “Newton as Bible Scholar,” 106. Popkin’s article provides a decent overview for Newton’s text-critical context, particularly regarding Spinoza and Simon. The following discussion builds on Popkin’s work.

\textsuperscript{236} Popkin, “Newton as Bible Scholar,” 105. Spinoza followed La Peyrère in this claim, but unlike La Peyrère or Hobbes, used this understanding of Scripture to discount any divine revelation in the Bible.
examined and reduced to order.” Spinoza suggested Ezra as the final compiler. While Newton likely encountered Spinoza’s claims through the strong rebuttals of his Cambridge colleagues, Henry More and Ralph Cudworth, his more immediate source for seventeenth-century text critical approaches to the Bible lay in the works of the French Catholic priest, Richard Simon (1638-1712).

Simon opposed Spinoza’s denial of divine revelation, acknowledging the multiple authors and disjointed nature of such works as the Pentateuch, yet still attributing divine inspiration to the collection and editing process that resulted in the completed text. The editors themselves were prophets, “which the Hebrew Commonwealth never wanted [lacked] as long as it lasted.” Spinoza, Simon writes, “ought to have consider’d that the Authours of these alterations having had the Power of writing Holy Scriptures had also the Power of correcting them.” Nonetheless, the historical process of transmission and preservation left its effects on the text, such that genealogies were abridged (and made to contradict genealogical lists in other parts of Scripture) and the correct order of events confused. To which Simon comments, “we ought not to blame the Authours of the Holy Scripture for the

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237 Benedictus de Spinoza, *Theologico-Political Treatise*, e-book (Campaign, IL: Project Gutenberg, 199-), Part 2, Ch. 9, 36.

238 Newton’s library contained none of Spinoza’s works, although he likely had access to Spinoza’s *Tractatus Theologico-Politicus* through the library of Isaac Barrow, which he catalogued following the latter’s death. See Feingold, *Before Newton: The Life and Times of Isaac Barrow* (Cambridge: Cambridge University Press, 1990), 333-72. In contrast, Newton owned five of Simon’s works, three translated into English and published in the 1680s and containing dog-eared evidence of use. See John Harrison, *Library*, 239. For more on Simon’s influence on Newton’s Biblical criticism, see Justin Champion, “‘Acceptable to inquisitive men’: Some Simonian Contexts for Newton’s Biblical Criticism, 1680-1692,” in Force and Popkin, *Newton and Religion*, 77-96.


disorder in some places … but we ought to complain of a misfortune which has happened to all ancient Books.”

Moreover, numerous repetitions, especially of the laws in the Pentateuch (“the Books of Moses”), resulted from the transposition of texts rather than a particular Hebraic style of writing. Simon, as a Catholic, had no need to hold fast to the trustworthiness of the original documents in their current form, seeing in his textual criticism “great alterations which … utterly destroy the Protestants and Socinians Principle, who consult only these same Copies of the Bible as we at present have them.”

While Newton would have opposed Simon’s conclusion that the corrupted transmission of biblical texts entailed a reliance on the traditions of the Church (embodied in Catholic creeds and councils), he employed a number of Simon’s critiques in his own evaluation of Scripture. The opening section of the Observations described the Pentateuch and the following historical books (Joshua and Judges) as a continuous edited text compiled during the reign of Saul, likely by Samuel, yet based on genuine compositions by Moses and Joshua. Newton believed the creation account (Gen. 1:1-2:4) to have authentic Mosaic authorship. Other Old Testament books (Kings and Chronicles) were compiled at later times, likely by Ezra, “collected out of the historical writings of the antient Seers and Prophets.” Likewise the Psalms, authored by multiple individuals including David and

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241 Simon, *Critical History of the Old Testament*, preface. As an example of the disordered events, Simon cites the story of Abimelech falling in love with Abraham’s wife Sarah due to her beauty, which follows after a description of Abraham and Sarah as “well stricken in years.”


244 Newton, *Observations*, 5.

245 Newton, *Observations*, 9. Even the prophetic works attributed to a single author, such as Isaiah or Jeremiah, were considered to be composed out of works written at several times.
Moses, were probably “collected by Ezra into one volume.”246 Favouring an interpretation similar to Simon’s, Newton nonetheless concluded that the Scriptures did record divine revelation and with reliable historical accuracy. The Bible was open to critical examination, such as that offered by Simon’s Critical History, to assess the trustworthiness of its various historical claims just like any other ancient historical source. However, in the face of such criticism, the Bible demonstrated itself to be the oldest and most reliable document available to humanity, in spite of its irregularities.247 Nonetheless, close examination revealed to Newton that not all parts of Scripture, as available to him and his contemporaries (the received texts), were equally trustworthy.248

3.3 The orthodox corruption of Scripture

If the Old Testament was subject to the inevitable alterations that beset any ancient historical source, something more sinister had occurred in the New Testament text. Not only were New Testament texts liable to copying errors and unintentional corruption over time, but the Greek texts as currently available to Newton’s contemporaries displayed evidence to him of deliberate corruption to promote the orthodox doctrine of the Trinity. This was especially the case in the key verses of 1 John 5:7 and 1 Tim. 3:16, which Newton detailed in a series of

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246 Newton, Observations, 11.

247 Popkin, “Newton as Bible Scholar,” 114. The clearest indication of Newton’s reliance on the Bible as the most trustworthy historical document comes from his extensive work in his Chronology to fit historical accounts of the origins of Greek, Persian, Egyptian civilizations into the timespans allowed by biblical chronological accounts. Newton was far more willing to adjust extra-biblical sources to fit the biblical account than the inverse. See also Buchwald and Feingold, Newton and the Origin of Civilization, 224-6.

248 The “received texts” were Greek manuscripts that formed the official source for modern translations and printed editions of the Greek New Testament.
letters to Locke in the early 1690s.249 Newton had sent these letters to be published anonymously in the Netherlands and attempted to retract them just before publication (by Jean Le Clerc), suppressing the work that was later discovered and published as Two Notable Corruptions in 1754. Newton’s theological papers contain his drafts of the content of these letters written in 1690-91. Early modern theologians tended to use 1 John 5:7’s testimony of the “three in heaven” (Father, Son and Spirit)—the so-called comma Johanneum—as indisputable scriptural support for the doctrine of the Trinity.250 Newton’s letters, however, point to the lack of this verse being used by any of the third- and fourth-century Patristic authors during the Arian (and preceding) debates on the nature of Christ, which they certainly would have done had they had access to it.251 Rather, the source of the “three in heaven” was St. Jerome, whose Latin translation became the official Bible of the church and whose Trinitarian gloss became incorporated into the main Latin texts of the medieval church at the hands of “S. Bernard, the Schoolmen, Ioachim & the Lateran Council.”252 Accordingly all of the Syriac, Ethiopic, Egyptian Arabic, Armenian and Slavonic manuscripts lacked this reference, as did the more ancient Latin and Greek texts.253 In fact the only Greek texts that contained the Trinitarian reference were recent copies based on the

249 See also Iliffe, “Friendly Criticism: Richard Simon, John Locke, Isaac Newton and the Johannine Comma,” in Hessayon and Keene, Scripture and Scholarship, 137-57, for a discussion of these letters.

250 The alternative reading—generally accepted by modern biblical scholarship—points to the testimony of three on earth: spirit, water and blood.


252 Newton, New College Ms. 361(4), fol. 13r.

253 Newton, New College Ms. 361(4), fol. 6r-7r.
Vulgate reading and propagated back to the East by the Venetian Presses. As Newton stated, “the Greeks now they have got it in print from the Venetians, when their manuscripts are objected against it, pretend that the Arians rased it out.” Thus rather than the received story that the texts lacking the reference to the Trinity were the result of an Arian conspiracy, Newton marshalled historical evidence to demonstrate the opposite: the orthodox corruption of Scripture.

Similarly, Newton believed that the Greeks had changed 1 Tim. 3:16 to a defense of Christ as the incarnation of God through sleight-of-hand in the transcription process:

For by changing Ο in [into] ΟΣ & both into ΘΣ (the abbreviation of Θεὸς) they now read *Great is the mystery of godliness God manifested in the flesh*: whereas all the Churches for the first four or five hundred years, & the authors of all the ancient Versions, Jerome as well as the rest, read, *Great is the mystery of godliness which was manifested in the flesh*.

Changing the Greek article ο into θεὸς allowed the passage to discuss the nature of the incarnate Christ as fully God, rather than Christ as an incarnation or manifestation of a perfect or godly being, but not synonymous with God (Newton’s view). And, just as with the Trinitarian verse in 1 John, this verse, had it appeared in the original manuscripts as it was currently present (to Newton’s contemporaries), would surely have been used by the ancient defenders of Christ’s divinity. However, Newton pointed out, no mention of it is made in any of the Patristic writings, not even in Fulgentius’ copious lists of verses showing every

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254 Newton, New College Ms. 361(4), fol. 11r.

255 One proponent of the Arian corruption thesis had been Thomas Aquinas whom many of Newton’s contemporaries used to justify the authenticity of the verse, see Newton, New College Ms. 361(4), fol. 19r.

256 Newton, New College Ms. 361(4), fol. 26r.
scriptural mention of the divinity of Christ.²⁵⁷ Only recently had this verse acquired proof-text status for the divinity of Christ, demonstrating again the deliberate corruption of the received New Testament texts.

Newton continued with a discussion of other possible sites for the deliberate corruption of Scripture in favour of a Trinitarian reading. As he perceived the situation, “the attempts to corrupt the Scriptures have been very many, & amongst many attempts ’tis no wonder if some have succeeded.”²⁵⁸ Listing a number of texts with varying attestations in the manuscripts, Newton consistently argued that the manuscripts with a Trinitarian reading were the result of corrupt insertions while the non-Trinitarian versions contained the original text. In a similar manner to the corruptions of 1 John 5:7 and 1 Tim. 3:16, it was not the Arians who erased or modified key passages, but the Trinitarians who added words and phrases to prove their case, “for all corruptions are for imposing a new sense.”²⁵⁹ Newton attempted to link these corruptions to specific historical episodes in early church history, using complex historical arguments and extensive cross-referencing of existent manuscripts, in much the same manner as he would later analyse classical source texts in his *Chronology of Ancient Kingdoms Amended*.

By Newton’s account, during the fourth-century Arian controversy the Trinitarians had attempted to add statements on the divinity of the Holy Spirit to John 3:6 and Phil. 3:3, which were no longer in the received texts but still evident in Ambrose’s references to the

²⁵⁷ Newton, New College Ms. 361(4), fol. 26r.

²⁵⁸ Newton, New College Ms. 361(4), fol. 85r.

²⁵⁹ Newton, New College Ms. 361(4), fol. 89r.
modified texts.\textsuperscript{260} Corruptions emerged during the Eusebian controversy, in which the “Catholics struck ... out of their books” references to Christ’s “Infirmity below the nature & dignity of the Supreme God,” in Luke 19:41 and Luke 22:43-44.\textsuperscript{261} Likewise, the reference to the Son not knowing the day and hour of the second coming of Christ in Matt. 24:36 was “struck out first in the Greek MSS, & then in the Latin ones, in the heat of the Homousian controversy” such that by Newton’s day “the generality of the Greek & Latin MSS now extant want the words ‘neither the Son[’].”\textsuperscript{262} Newton detailed numerous other locations for Trinitarian tampering with texts, either by insertion or deletion, with varying degrees of successful retention in the received texts of the seventeenth century: 1 John 5:20, Eph. 3:14, Eph. 3:9, 1 Cor. 10:9, Jude 5, 1 John 4:3, John 19:40, Acts 13:41, 2 Thess. 1:9, Acts 20:28, 1 John 3:16, 1 John 2:14, Jude 4, Phil. 4:13, Rom. 15:32, Apoc. 1:11, 2 Pet. 3:18, Rom. 9:5 and Heb. 2:9.\textsuperscript{263}

Much like Fr. Simon’s textual criticism, Newton’s attack on Trinitarian readings of the New Testament manuscript variants attempted to erode the Protestant principle of relying on the received texts of Scripture. The Westminster Confession states the principle clearly: “The Old Testament in Hebrew ... and the New Testament in Greek ... being immediately inspired by God, and, by his singular care and providence, kept pure in all ages, are therefore authentical; so as in all controversies of religion, the Church is finally to appeal unto

\begin{itemize}
\item \textsuperscript{260} Newton, New College Ms. 361(4), fols. 85r-88r.
\item \textsuperscript{261} Newton, New College Ms. 361(4), fol. 89r.
\item \textsuperscript{262} Newton, New College Ms. 361(4), fol. 91r.
\item \textsuperscript{263} Newton, New College Ms. 361(4), fols. 88r, 93r-101r.
\end{itemize}
them.\textsuperscript{264} Newton doubted neither the inspiration of God nor the authority of Scripture in religious controversy (such as the nature of God and Christ). What he doubted was whether the nature of the texts as presently available to his contemporaries had been kept pure in all ages. He challenged their authenticity, not to promote a reliance on the Catholic tradition as Simon attempted, but to cast doubt on Protestant support for Trinitarian doctrine, on its scriptural foundation. Orthodox Protestant scholarship was not unaware of the variant manuscript readings, as Newton’s own copy of Beza’s annotations on the New Testament demonstrates—which Newton interacted with extensively in his “Two Notable Corruptions”—but it interpreted their presence differently. Variations could be laid at the feet of Arian and heretical corrupters, and regardless of occasional differences, the majority of texts agreed with each other on the important doctrinal issues and certain authoritative manuscripts—such as those used in Erasmus’ Greek New Testament—could be relied upon as the product of God’s providential care through the ages.\textsuperscript{265} Newton’s text criticism had a specific purpose, creating a scriptural vacuum of Trinitarian supporting texts, out of which could be found a simpler, non-metaphysical, concept of God according to a non-Trinitarian

\textsuperscript{264} The Westminster Confession of Faith, I.8; HL 427.

\textsuperscript{265} One of Newton’s text critical sources, Bishop Gilbert Burnet, did not draw Newton’s non-Trinitarian conclusions even as he distanced himself somewhat from the strong claim of the Westminster Confession. As Burnet wrote in his \textit{Exposition of the Thirty-Nine Articles of the Church of England}, 2\textsuperscript{nd} ed. corrected (London, 1700), 88, which Newton owned (HL 311): “The laying down a Scheme that asserts an immediate Inspiration which goes to the Stile and to every Tittle, and that denies any Error to have crept \textit{into any of the Copies} [italics his], as it seems to raise the Honour of the Scriptures very highly, so it lies open on the other hand to great difficulties which seem insuperable in the Hypothesis; whereas a middle way as it settles the Divine Inspiration of these Writings, and their being continued down genuine and unvitiated to us, as to all that, for which we can only suppose that Inspiration was given; so it helps us more easily out of all difficulties, by yielding that which serves to answer them, without weakening the Authority of the whole.” He had earlier stated, regarding the Old Testament, that there were “many various Readings, which might have arisen from the haste and carelessness of the Copiers,” but nonetheless, “in every thing that is either an Object of Faith, or a Rule of Life” the Scriptures were “preserved pure down to us,” Gilbert Burnet, \textit{Exposition}, 88.
monotheism. And yet in the process, Newton did not entirely abandon support for God’s providential guidance in the transmission of scriptural texts. For Newton, true knowledge of the original Christian faith and practice had been preserved in Scripture: in the figurative and uncorrupted text of biblical prophecy, sheltered in the symbolic language of the Apocalypse.

3.4 God’s providential care: the reliability of the Apocalypse

In one of his earliest theological works, the untitled treatise on Revelation (Yahuda Ms. 1), Newton revealed the privileged position that biblical prophecy, and the Apocalypse specifically, occupied in his theological framework. The prophecies of the New Testament, Newton explained, are of equal if not greater importance to us as the Messianic prophecies of the Old Testament were to Jesus’ contemporaries.266 And the prophetic content of the New Testament is largely contained within the Apocalypse. Newton opposed the tendency to treat biblical prophecy as extracurricular to the exhortatory and prosaically clear texts of Scripture. Rather, understanding prophecy “is no idle speculation, no matters of indifferency but a duty of the greatest moment.”267 The language of biblical prophecy should not discourage careful investigation, as “the obscurity of these Scriptures will as little excuse thee as the obscurity of our Saviours Parables excused the Jews.”268 Newton encouraged his reader to

Consider also the designe of the Apocalyps. Was it not given for the use of the Church to guide & direct her in the right way, And is not this the end of all prophetick Scripture? If there was no need of it, or if it cannot be understood,

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266 Newton, Yahuda Ms. 1.1, fol. 2r.
267 Newton, Yahuda Ms. 1.1, fol. 3r.
268 Newton, Yahuda Ms. 1.1, fol. 2v.
then why did God give it? Does he trifle? But if it was necessary for the Church then why doest thou neglect it ... ?269

For Newton, prophetic Scripture was a necessary part of God’s provision for the Church, containing vital information as important—if not more so in the present age—as Paul’s letters or the gospels to its guidance in the right path.

At the time of Newton’s writing of Yahuda Ms. 1, he had not yet engaged in his intensive study of the Patristic literature, nor read Fr. Simon’s text criticism and embarked on his own critical study of the New Testament text, embodied in the “Two Notable Corruptions” letters. Thus the untitled treatise on Revelation shows little direct concern for the accuracy of the text. However, Newton did consider the possibility of corruption, referring to Rev. 22:18-19 in his claim that misinterpretation of the Apocalypse “is a corruption equipollent to the adding or taking from it, since it equally deprives men of the use & benefit thereof.”270 However, the early Church, realizing that the Apocalyptic prophecies did not concern them “did not so much as pretend to understand them ... but with one universall consent delivered down to posterity the famous Tradition [concerning] the Antichrist.”271 And, even as his suspicion of the trustworthiness of the current version of the New Testament text grew in the 1680s and 1690s, Newton still considered the Apocalypse to be the best preserved and transmitted of biblical texts, guarded by divine providence.

269 Newton, Yahuda Ms. 1.1, fol. 4r.

270 Newton, Yahuda Ms. 1.1, fol. 9r. Rev. 22:18-19 states: “For I testify unto every man that heareth the words of the prophecy of this book, if any man shall add unto these things, God shall add unto him the plagues that are written in this book: and if any man shall take away from the words of the book of this prophecy, God shall take away his part out of the book of life, and out of the holy city, and from the things which are written in this book.”

271 Newton, Yahuda Ms. 1.1, fol. 9r.
In a document written after 1700, likely the draft that became the posthumously published *Observations*, Newton continued to hold high esteem for John’s prophecy:

> This Prophesy being of the highest consequence required to be well attested[.] It is of consequence not for enabling us to foreknow things to come, but for satisfying them that study it & compare it with things past, that it is a true prophesy, & by consequence that the world is governed by providence, that there is a revealed religion, what that religion is, who they are that profess it & who err from the truth[.]²⁷²

The great importance of the Apocalypse—the means of recognizing the true religion from the false (that of the Antichrist)—means that it needed to be manifestly trustworthy. For Newton, its trustworthiness was assured by the way in which unfolding events in history matched specific predictions in the book. A careful study of the Apocalypse and the events of church history—in which he had extensively engaged by this time—revealed its status as true prophecy. Thus Scripture as God’s revelation, indeed God’s providential activity in general, could be externally proven in the events of history predicted by the Apocalyptic text. This implies, therefore, that what the Apocalypse says about the tenets of the Christian faith should have priority, and guide the interpretation of the rest of Scripture, the current accuracy of which there was greater doubt. After quoting Rev. 22:18-19, Newton stated that “there is no book in all the Scriptures so much recommended & guarded by providence as this.”²⁷³

Just as with his earlier untitled treatise, Newton considered the strong curse at the end of the Apocalypse to be part of God’s providential protection of the integrity of the prophetic text.

The posthumously published text of Newton’s *Observations* furthered these claims for the attestation of the Apocalypse. Newton argued for an early date of composition, before the

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²⁷² Newton, Yahuda Ms. 7.2i, fol. 6v.

²⁷³ Newton, Yahuda Ms. 7.2i, fol. 6v.
destruction of the temple in Jerusalem (70 A.D.) due to the recurrence of certain Apocalyptic terms and phrases in other New Testament books such as the Epistle to the Hebrews and Peter’s first Epistle. This early date, and the use of its language in other New Testament books, gave credence to its veracity: “Having determined the time of writing the Apocalypse, I need not say much about the truth of it, since it was in such request with the first ages, that many endeavoured to imitate it.” Moreover, key terms for Christ in John’s Gospel (written after the Apocalypse by Newton’s reckoning), had their origin in this prophetic text:

I do not apprehend that Christ was called the word of God in any book of the New Testament written before the Apocalypse; and therefore am of opinion, the language was taken from this Prophecy, as were also many other phrases in this Gospel, such as those of Christ’s being the light which enlightens the world, the lamb of God which taketh away the sins of the world, the bridegroom, he that testifieth, he that came down from heaven, the Son of God, &c.

While Newton did not directly state it, the priority of the Apocalypse thus gave it precedence when interpreting the theological meaning of these terms. And Newton would have considered the Apocalypse to have directed that interpretation in a non-Trinitarian direction, which he alluded to in his subsequent comments on the purpose of the Apocalypse being to establish the true religion. Beyond New Testament use of the language of the Apocalypse, the earliest Christian commentators also referred to its key concepts—the millennial reign of Christ, the restoration of Jerusalem and the number of the beast (666)—without

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274 Newton, *Observations*, 246. Newton goes on to describe the prophecies of the Apocalypse being misunderstood after the first centuries and falling into disrepute, which is a slight change from his earlier position, in Yahuda Ms. 1.1, that claimed they were merely preserved and guarded for later use by the early church.

contradiction. Thus Newton concluded, “I do not indeed find any other book of the New Testament so strongly attested, or commented upon so early as this.”

In his efforts to establish the trustworthy nature of the Apocalypse in his own mind Newton had applied his method of cross-comparison—by which he had earlier cast doubt on the New Testament texts—to a comprehensive analysis of all the variant readings of the Apocalypse in a document written in 1693: “Variantes Lectiones Apocalypticae” (Yahuda Ms. 4), prepared for the English textual critic, John Mill. This document essentially represents a text critical edition of every known manuscript variant of the Greek text of the Apocalypse, drawn from multiple scholarly sources, including Erasmas, Beza, the Complutensian edition and the Alexandrian codex. Only the Apocalypse receives this level of biblical scholarship in Newton’s theological manuscripts, attesting to the relative importance the book held for him. The numerous minor differences between texts were necessary to compile such that interpretation of the prophetic images would not be jeopardized by a poorly attested reading. It is important to recognize that for Newton even the Apocalypse was subject to basic historical variations in the transmission process. However, it was remarkably free from deliberate Trinitarian corruptions, with only one mention of a passage from the Apocalypse in Newton’s letter to Locke (Apoc. 1:11), and that from the non-prophetic prologue material in the first chapter. Newton’s “Variantes Lectiones Apocalypticae,” reveals more of Newton’s method of establishing accuracy and reliability

276 Newton, Observations, 249.

277 Newton, “Variantes Lectiones Apocalypticae,” Yahuda Ms. 4, National Library of Israel, Jerusalem. See Iliffe, “Apocalyptic Hermeneutics,” 85, n. 29 for a discussion of this manuscript, its date and context.

278 Newton, Yahuda Ms. 4.1, fol. 1r.
through a rigorous cross-examination of texts, and provided further proof for the trustworthiness of the Apocalypse advocated in the *Observations*.

Newton claimed, in the *Observations*, that the Apocalypse was written for the current day, quoting from Daniel: “In the time of the end the wise shall understand, but none of the wicked shall understand.”

The end times had not yet arrived, and he was reticent to set any dates or make future predictions based on biblical prophecy. Nonetheless, “the last age, the age of opening these things,” was finally approaching. And this was evident “by the great successes of late Interpreters,” by which he likely meant Joseph Mede’s *Clavis Apocalyptica*. The day was approaching, Newton believed, in which the free and uncorrupted message of the Gospel would spread throughout the world and, out of the current darkness in which few are converted, “the Prophecy should be so far interpreted as to convince many.”

This was the meaning of Daniel’s prophecy, “Then, saith Daniel, many shall run to and fro, and knowledge shall be increased.” And thus, as the prophetic texts of Scripture finally begin to make sense, God’s providential guidance over world events will become evident—as it was already to the privileged few in Newton’s position. The result of all this would be the final establishment and recovery of true religion:

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280 See Snobelen, “Newton, the Apocalypse and 2060 A.D.,” 537-51, for a discussion of Newton’s caution regarding predictions of the end times, and his understanding of the future fulfillment of prophecy.

281 Newton, *Observations*, 251. Newton made it clear that Joseph Mede was his main interpretive source in Yahuda Ms. 1.1, fol. 8r: “It was the judiciously learned & conscientious M’ Mede who first made way into these interpretations, & him I have for the most part followed. for what I found true in him it was not lawful for me to recede from, & I rather wonder that he erred so little then that he erred in some things.”


[T]he many and clear Prophecies concerning the things to be done at Christ’s second coming, are ... for effecting a recovery and re-establishment of the long-lost truth.... The event will prove the Apocalypse; and this Prophecy, thus proved and understood, will open the old Prophets, and all together will make known the true religion, and establish it.  

Thus, the importance of all of Newton’s scholarship regarding the corruption of the New Testament and establishing the trustworthiness of the Apocalypse becomes evident. This book alone contained the seeds and enciphered truths about the true worship and belief of the early church and the original religion, to be fully established at the end times. Within its symbolic language, while not yet fully understood, lay hidden the details of the specific historical pattern of the corruption of the true Christian religion, revealing the immoral behaviour of the Trinitarians and showing the falsity of the modern Church, subject to the Antichrist. As Newton argued, the figurative language was necessary: “‘Tis therefore a part of this Prophecy, that it should not be understood before the last age of the world; and therefore it makes for the credit of the Prophecy, that it is not yet understood.” Rather, these truths were protected in figurative language and saved from the Trinitarian corruptions which befall the rest of the New Testament. They were faithfully transmitted because their truths were shielded in symbolic and mystical language.

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284 Newton, *Observations*, 252.

285 Newton gave the specifics of this true belief in the draft, Yahuda Ms. 7.2i, fol. 6v: “particularly that Christ is the Messiah the Prince of the Kings of the Earth, the King of Kings & Lord of Lords, that the Lamb alone is worthy to whom God reveals himself immediately & by whom he reveals himself to us, & is therefore called the Word of God & the faithful & true Witness whose testimony is the spirit of prophesy; that he is the great High Priest who offers up the prayers of the saints to God & by the sacrifice of himself hath washed us from our sins in his own blood that we are to give glory to God for our creation & to the Lamb for our redemption; that Jesus is the first & the last, the beginning of the creation of God & the first begotten from the dead & is alive for evermore & shall come to reward every man according to his works.”

Newton’s textual criticism did not abandon the Protestant method and reliance on providentially guided Scripture, it merely narrowed its evidential authority to the well-attested and uncorrupted prophecies of the Apocalypse. This explains the importance of prophecy in Newton’s mind and demonstrates his interest in truths hidden in symbolic language, the key to more trustworthy foundational truth, and his belief in the need to rightly interpret symbolic language to access the truth it contained. Newton determined the trustworthy nature of the Apocalypse—and the corruption of the rest of the New Testament—through a process of vigorous cross-comparison of biblical manuscripts. In this regard his humanist approach to chronology and the ancient historical sources—discussed by Buchwald and Feingold—employed the exact same methods as his investigation of the texts of Scripture. Moreover, in the untitled treatise on Revelation, Newton had earlier employed the same pattern of cross-comparison in his investigation of the symbols of the prophetic language used throughout Scripture to reconstruct the plain meaning of the text of this most reliably preserved book of the New Testament.

4. The Language of Biblical Prophecy

Newton devoted considerable effort to developing a methodical scheme for the interpretation of the symbolic language of prophecy, both in his comprehensive approach to the entirety of the prophetic Scriptures, his compilation of lists of terms and definitions, and his search for ancient figurative and symbolic ways of speech. Newton first developed his intricate interpretive scheme for biblical prophecy in his early analysis of the Apocalypse, in the
untitled treatise on Revelation, Yahuda Ms. 1 (mid-late 1670s).\textsuperscript{287} In this document Newton provided a list of sixteen hermeneutical rules followed by two versions of a list of specific definitions of prophetic figures and his reasons for choosing these definitions.\textsuperscript{288} The rules describe a detailed rubric for how to approach each passage of prophetic Scripture. Later manuscripts such as Keynes Ms. 5 (1680s) and Yahuda Ms. 7.1d (after 1700) continued the discussion of how to interpret the prophetic figures, but lacked Newton’s detailed discussion of hermeneutical rules.\textsuperscript{289}

\textsuperscript{287} The catalog record for this work on The Newton Project Website gives the 1670s-1680s as the dates of composition, based on its content and the nature of its Newtonian hand; additionally, the presence of watermarks in the folio sheets used for this manuscript match the watermarks of folios Newton used for letters composed in the mid-1670s. Richard Westfall claims that the document was begun in the mid-1670s, composed at the beginning of his serious theological study, and later added to, see Westfall, \textit{Never at Rest}, 319-20. Feingold disputes this date, arguing the exact dating of Newton’s mid-life handwriting is inconclusive and that there is no firm evidence for Newton’s serious theological work prior to the 1680s, see Feingold, “Honor Thy Newton,” 227-8; and Buchwald and Feingold, \textit{Newton and the Origin of Civilization}, 128-34. The majority of Newton scholars engaging with Newton’s theological writings tend to side more with a mid-1670s or early-to-mid-1680s origin for his earliest theological manuscripts, prior to the publication of the \textit{Principia}. See Iliffe, “Apocalyptic Hermeneutics,” 63, n. 29 for a discussion of the dating of this and other theological manuscripts. The lack of firm evidence does not discount the strong possibility for this earlier dating, particularly given Newton’s aborted preparations for the priesthood and his resulting theological research, in addition to his zealous response to More’s 1680 draft of his new treatment of the Apocalypse, see Henry More, letter to Sharp dated August 16, 1680, in M. H. Nicolson, ed. \textit{Conway Letters: The Correspondence of Anne, Viscountess Conway, Henry More, and their Friends}, 1642-1684 (London: Oxford University Press, 1930), 478-9.

Moreover, I think additional evidence can be seen in the content of Yahuda Ms. 1 for a composition date prior to 1680 based on a comparison with Henry More’s work on biblical prophecy. Yahuda Ms. 1, as I demonstrate in this section, draws heavily from More’s 1664 publication, \textit{A Modest Enquiry into the Mystery of Iniquity} (London: J. Flesher for W. Morden, 1664) (not in Harrison’s \textit{Library}), particularly in Newton’s discussion of hermeneutical methods, but does not appear to interact with his 1681 publication, More, \textit{A Plain and Continued Exposition …} (London, 1681) (HL 1115). To my knowledge the importance of the extensive influence of this earlier work of More on Newton’s composition of Yahuda Ms. 1.1 to understanding its date of composition has not been emphasized in contemporary accounts of this manuscript (perhaps because it was not recorded as being a part of Newton’s library). For previous analyses of Yahuda Ms. 1.1, its context and implications for Newton’s hermeneutics see Hutton, “Language of Biblical Prophecy,” 39-53 and Iliffe, “Apocalyptic Hermeneutics,” 55-88. The following discussion draws on and furthers the analysis provided by these works.

\textsuperscript{288} Newton, Yahuda Ms. 1.1, fol. 12r-19r. Although Newton’s numbering only goes up to fifteen, his Rule 5 is followed by a completely new Rule 5B, giving a total of sixteen rules.

\textsuperscript{289} See Newton, Keynes Ms. 5, King’s College Library, Cambridge, fols. 1r-5r, Yahuda Ms. 7.1d, fols. 1r-7r as well as chapter 2 of the \textit{Observations}, 16-23, which contains most of the same material as Keynes Ms. 7.1d.
4.1 Newton’s rules for the interpretation of (prophetic) Scripture

Newton’s initial sixteen hermeneutical rules are further divided into three sections, 1) “Rules for interpreting the words & language in Scripture” (Rules 1-5), 2) “Rules for methodising construed the Apocryphal” (Rules 5B-11), and 3) “Rules for interpreting the Apocalyptic” (Rules 12-15). The first section contains five rules for the general interpretation of Scripture which demonstrate a broadly Protestant hermeneutic. Newton’s first rule is “to observe diligently the consent of Scriptures & analogy of the prophetique stile,” arguing that if a certain symbol (such as a Beast) is interpreted consistently in “all other Prophetic Scriptures” (as “a body politique [or] single person which heads that body”) then it should never be given an alternative meaning. Likewise Rule 5 is “to acquiesce in that sense of any portion of Scripture as the true one which results most freely & naturally from the use & propriety of the Language & tenor of the context in that & all other places of Scripture to that sense.” In other words there is only one true interpretation of a given portion of Scripture, that which best fits the immediate context and the most natural understanding of the language used, as well as fitting the more general context of the rest of Scripture. Newton opposed turning “Scripture from the plain meaning to an Allegory or to any less naturall sense,” since “this hath been the door through which all Heresies have crept.

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290 Newton, Yahuda Ms. 1.1, fols. 12r, 13r, 15r.

291 Newton, Yahuda Ms. 1.1, fol. 12r. By “the analogy of the prophetique stile,” Newton is referring to the natural-political analogy by which symbols and figures of nature where used in the prophetic language to indicate political events. The prophetic analogy is discussed in detail below.

292 Newton, Yahuda Ms. 1.1, fols. 12r-13r. Newton expressed a similar sentiment regarding the plain meaning of Scripture in Rule 4 in which the interpreter is instructed “to chose those interpretations which are most according to the litteral meaning of the Scriptures unles where the tenour & circumstances of the place plainly require an Allegory,” Newton, Yahuda Ms. 1.1, fol. 12r.
in & turned out the ancient faith.” 293 In these principles of relating a given passage to other parts of Scripture, of holding to only one true sense for any given passage and of insisting on the plain meaning of the text, Newton echoed the foundation of Protestant hermeneutics: let Scripture interpret Scripture and proceed from the clearly understood passages to the more obscure. 294

The context of the rest of Scripture was not, however, the entirety of Newton’s hermeneutical principles for prophecy. His hermeneutical rules emphasize rhetorical devices such as consistency of interpretation and the avoidance of tautology (Rules 1-3), following the narrative flow of the text (Rule 6), simplicity (Rule 9), and harmonizing different sections (Rules 7-8). Additionally, Newton followed clear guidelines when matching the prophecies to specific historical events. When an image could refer equally to an individual or a whole kingdom or Church, the latter, more considerable, option should be preferred (Rules 5B, 13-14). The overall scheme, the flow of events predicted in the prophecy, should not be altered to fit historical events, rather “the construction of the Apocalyps” must first be determined, after which it can be interpreted and matched to events in history (Rules 10-12). 295 Finally, Rule 15 is “to chose those interpretations which without straining do most respect the church & argue the greatest wisdom & providence of God for preserving her in the truth.” 296 This rule reflects the sentiment that Newton would express decades later in his Observations.

293 Newton, Yahuda Ms. 1.1, fol. 13r.

294 The Westminster Confession states that: “The infallible rule of interpretation of Scripture is the Scripture itself: and therefore, when there is a question about the true and full sense of any Scripture (which is not manifold, but one), it must be searched and known by other places that speak more clearly,” see Westminster Confession of Faith, I. 12.

295 Newton, Yahuda Ms. 1.1, fol. 15r-16r.

296 Newton, Yahuda Ms. 1.1, fol. 17r.
(1733) that the prophetic texts of Scripture preserved the most reliable source of the true faith. In Yahuda Ms. 1.1, Newton stated that the purpose of the prophecies “is the benefit of the Church to guide her & preserve her in the truth. For to this end are all the sacred prophecies in both the old and new Testament directed.”

Thus, even in his earliest reading of prophecy, Newton understood the Apocalypse to preserve the true knowledge of the ancient faith. In his textual-critical writing of the 1690s and 1700s, he would detail how that true knowledge, contained in the rest of the New Testament, had been distorted at the hands of allegorical interpreters and claim the correct interpretation of the Apocalypse as the means for the restoration of the true Church. However, even in Yahuda Ms. 1.1, we can see the beginning of his choice to interpret the biblical prophecies according to an understanding of their preserving function for the true Church. Newton considered the purpose of the prophecies—the preservation and restoration of the truth—to be “easily perceive[d]” by “they that will consider them.” He elaborated by stating that he did not mean “that these Prophecies were intended to convert the whole world to the truth.” Rather, “the designe of them is to try men & convert the best, so that the church may be purer & less mixed with Hypocrites & luke-warm persons.” This is why prophecies “are wrapt up in obscurity,” so that the unworthy, “the inconsiderate, the proud, the self-conceited, the presumptuous, the scholist, the sceptic, they whose judgments are ruled by their lusts, their interest, the fashions of the world, their esteem of men, the outward shew of thing[s]” may not understand them. That even though they may have great knowledge, they could nonetheless not “discern the wisdom of God in the contrivance of the creation.”

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297 Newton, Yahuda Ms. 1.1, fol. 17r.

298 Newton, Yahuda Ms. 1.1, fol. 17r.
Newton, the easy perception of the intention of prophecy to preserve the truth of the church was only possible to the pure of heart, to those who were worthy to receive it, of whom Newton was one. Yet that privileged position was necessary before starting the interpretive process: Rule 15 and the correct understanding of the biblical prophecy resulting from an understanding of its true purpose depended on one’s intellectual and moral purity.

4.2 Newton’s use of ancient interpretative insight in the list of prophetic figures

Following the rules for interpreting Scripture, Newton provided two draft versions of a list of seventy numbered definitions or prophetic figures and what they symbolized, followed by a detailed description or proof for the signification chosen for each. Newton sought to establish these proofs by showing “their consent with the Scriptures, & also with the interpretations of the Chalde Paraphrast, & with the ancient doctrin of the Eastern Interpreters as it is recorded by Achmet an Arabian out of the ancient monuments of Egypt Persia & India.” Here Newton gives the details of how the interpretive principle of letting Scripture interpret Scripture determined the meaning assigned to various prophetic symbols. For each definition, he comprehensively explores multiple locations in Scripture for that symbol or prophetic figure, demonstrating the scriptural basis for his interpretation. However, he also moves beyond a strict adherence to the text of Scripture, relying on the interpretations of the “Chalde Paraphrast” and ancient Egyptian, Persian and Indian sources compiled by “Achmet an Arabian.”

299 Yahuda Ms. 1.1, fols. 17r-18r. Newton’s discussion of those readers worthy to understand the text and to believe appears to be influenced by a Calvinist concept of the Elect. However, in Greenham, “Newton’s Doctrine of God,” (forthcoming), I argue that Newton’s theology is not at all Calvinist, even though his views of God’s sovereignty are similar. Newton bases the choice of this select group in Yahuda Ms. 1.1 on their own worthiness and not God’s incomprehensible will. Moral and intellectual purity appear to come before their apprehension of the truth and conversion to genuine faith, not as a result thereof.
The “Chalde Paraphrast” refers to the Aramaic Targums, paraphrases of the Hebrew Bible into Aramaic which were composed at times in the post-exilic history of the Jewish people to allow the common people (who by this point spoke Aramaic instead of Hebrew) to understand the Hebrew text. The earliest paraphrases stuck closely to the original text, functioning more as a translation than paraphrase, yet only covered the Pentateuch. The Aramaic Targum that paraphrased the “prophetic Scriptures” (Joshua, Judges, Samuel, Kings, Isaiah, Jeremiah, Ezekiel and the “minor” prophets) is traditionally ascribed to Jonathan ben Uzziel and tended to provide more commentary and additional interpretive material. Thus when Newton used the “interpretations of the Chalde Paraphrast” he relied on early Jewish interpretations of the prophetic symbols. For example, his fifth definition states that waters represent an inferior people, and his proof states that “the Chalde Paraphrast for waters substitutes people in Jer. 47.2 & Ezek 26.19 &c.” In other words, the Aramaic Targum glosses “waters” with “people” in Jer. 47:2 and Ezek. 26:19. For Newton—as well as many early modern biblical commentators—these Targums represented the closest understanding of the original text available and were a resource for understanding the true meaning of obscure passages of Scripture such as the prophetic literature. Making use of this resource represented the humanist tendency to find the most original versions of texts and to dig deeply into the origins of linguistic meaning. Newton considered the figurative language of prophecy to have once functioned as an actual language, “a dialect then commonly known

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300 See B.M. Metzger, “Versions, Ancient,” in George A. Buttrick et al. eds., *The Interpreter’s Dictionary of the Bible*, vol. 4 (New York: Abingdon Press, 1962), 749-50, for a discussion of the Aramaic Targums. While no paraphrase was made of the book of Daniel, Newton was still able to use the paraphrasing of symbolic language in other parts of Scripture to enhance his interpretive principle of using the general context of Scripture to determine the meaning of the symbolic words used in Daniel and Revelation.

301 Yahuda Ms. 1.1, fol. 20r and 29r.
to the more understanding sort of men.” The definitions, therefore, of the figures and symbols used in this language, should draw on the first interpretations or translations made by those who were closest to the original speakers, the first Jewish interpreters of Scripture.

Nonetheless, Newton sought a broader context for understanding the types and figures of the prophetic “dialect.” As he saw it, “many of their types & figures which are unusual & difficult to us, appear by these records of Achmet to have been very familiar to those eastern nations; at least among their interpreters.” Here he refers to the ancient Egyptians, Persians, and Indians, “since these nations anciently bordering upon the Hebrews, had great affinity with them both in language & manners.” Achmet the Arabian refers to Achmet, son of Seirem, whose Oneirocriticon was a compendium of dream-symbols and their various meanings to aid in the prognostic interpretation of a ruler or official’s dreams.\(^{302}\) Newton’s use of this work derives from his belief that the figurative language of biblical prophecy reflected an ancient dialect that was common to all the dream-interpreters and wise men of the East. Newton alluded to the passages of the Old Testament that deal with the interpretation of dreams by official wise men (Gen. 41 and Dan. 1), perceiving, in the culture of visions and attempts to interpret them, a system of symbols and their meanings that, while not elaborated in the biblical accounts, was nonetheless encapsulated in Achmet’s compendium. And, just as Newton’s contemporaries used the languages and customs of the people surrounding the Hebrews to understand certain words and phrases in Scripture, “so

wee need not scruple to have from them the use of figurative expressions wherein they were perhaps better agreed then in their popular languages.”303 In other words, the figurative expressions of the surrounding nations’ wise men were more similar to the figurative language of Hebrew prophecy than their ordinary linguistic expressions and thus should have as much if not more weight in the interpretation of prophecy as studies of ancient near eastern cultural practices and languages did to the interpretation of Scripture in general.304

In an earlier draft of Yahuda Ms. 1.1, Newton gave additional reason for the trustworthiness of Achmet’s compendium for the interpretation of biblical prophecy: the text was trustworthy because Achmet had engaged in cross-comparison of dream-symbol interpretation across multiple and varying nations. Newton described Achmet’s text as “the established doctrine of the ancient Interpreters” arguing,

I call it established, ffor such the exact consent of the afforesaid three Nations in these records argue it to be, since there uses not to happen any such consent in doctrines which severall nations or severall men in the same nation frame according to their privat imaginations. To which consideration may their consent with such interpretations as are to be collected out of Scripture may be added as a pledge of their certainty|legitimatenes in the rest.305

One of Newton’s general principles was to consider the consent of many textual witnesses to establish the authority and reliability of a text and thus he engaged in copious compilations of sources and references which could then be compared with one another. Given this

303 Newton, Yahuda Ms. 1.1, fol. 28r.

304 In the later Keynes Ms. 5, Newton expresses a similar justification, “And as Criticks for understanding the Hebrew consult also other Oriental Languages of the same root, so I have not feared sometimes to call in to my assistance the eastern expositors of their mystical writers (I mean the Chalde Paraphrast & the Interpreters of dreams [i.e. Achmet]) following herein the Example of M’ Mede & other late writers,” Newton, Keynes Ms. 5, fol. Ir.

305 Yahuda Ms. 1.1a, fols. 1r-2r. This text has been crossed out in the manuscript.
practice, Newton considered Achmet’s *Oneirocriticon* to be just such a compilation of multiple sources, such that when it appeared that the record of a given symbolic interpretation was the same in Egypt, Persia, and India then it likely represented the original translation of that symbol from the original symbolic language. Moreover, Achmet’s sources frequently agreed with the meaning of symbolic terms in Scripture, demonstrating universal consent and the “legitimateness” of Achmet’s compilation as an interpretive source.

Newton’s attraction to Achmet and justification thereof demonstrates yet again his thoroughly text-conscious and Humanist approach to scholarship and his tendency to compile comprehensive and cross-comparative lists of sources to establish accurate translations of symbolic representations.

### 4.3 The interpretive community: Newton’s reliance on Henry More and Joseph Mede

Newton was not alone in making use of this resource: his discussion of Achmet and the “ancient monuments of Egypt Persia & India” drew directly from Joseph Mede’s *Clavis Apocalyptica* (1632) and Henry More’s *Modest Enquiry into the Mystery of Iniquity* (1664).\(^\text{306}\) In his justification for his use of the ancient figurative prophetic language in addition to Scripture, Newton mentioned Mede, Hugo Grotius and Henry More as other modern interpreters who made use of Achmet’s *Oneirocriticon*: “after the authority of the Scriptures I choose with modern interpreters to rely rather upon the traditions of those ancient Sages then upon the suggestions of private fancy.”\(^\text{307}\)

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\(^{307}\) Newton, Yahuda Ms. 1.1, fol. 28r. Newton footnotes “modern interpreters” with: “H. Grotius, M’ Mede, D’ Moor.” Grotius references “Achmetes” in his annotations on the Apocalypse (Rev. 6:2 and 8:12), see
discussion of the affinity of the language of dreams to that of prophetic visions, attempting to create a rational system for the interpretation of prophecy to oppose the excesses of revolutionary enthusiasm, common in the Commonwealth period (1649-59). More discussed the “Collection of the most ancient Writings ... such as Achmetes the son of Seirim has provided us” and the usefulness of “these Onirocritical Writers,” together with Scripture and Reason, “for the interpreting of such Symbols or Iconisms as we shall comprise in our Prophetick Alphabet.” More then provided an extensive list of prophetic symbols and their possible significations, similarly structured to Achmet’s list of dream-symbols in the *Oneirocriticon*. More’s concern to counter misuse of biblical prophecy by religious radicals likely affected Newton’s repeated statements regarding the dangers of allowing private fancy or imagination to dictate the interpretations of prophecy.

Both Henry More and Joseph Mede made extensive use of references to Achmet in their interpretations of specific prophetic symbols and it appears that Newton derived his own references to Achmet from those works. Moreover, Newton’s list of definitions of

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310 More, *Mystery of Iniquity*, 227-59. More also mentions Grotius and Mede as interpreters who used Achmetes to interpret biblical prophecy, naming Mede as having “the honour of first breaking ice in this business,” *Mystery of Iniquity*, 227. It is possible that Newton only included Grotius as an additional modern interpreter because More did.

311 Newton’s references to Achmet, “ex Ind. Pers. & Ägypt” are an abbreviated form of the Latin title: *Apomasaris Apotelesmata, sive de significatis et eventis somniiorum, ex Indorum, Persarum, Ägyptiorumque disciplina* (Frankfurt, 1577), which Mede correctly suggests was authored by Achmet and not Apomazar. More, on the other hand, quotes from the Greek version, “Onirocrit.,” most likely N. Rigault, ed., *Artemidori Daldiani* Opera Omnia Theologica...*, Pieter de Groot, ed., vol. 3 (Amsterdam: Joannis Blaeu, 1679), 1179, 1187; and in his annotations on Daniel (7:5, 7:6 and 8:3), see Grotius, *Opera*, vol. 1, 446, 469.
prophetic figures and their proofs appears to be based on More’s compendious Alphabet of Prophetick Iconisms. Newton’s seventy listed prophetic figures and their proofs match most of the “iconisms” that More records, often using the same references to Achmet and the same scriptural examples. Newton’s entries, however, also show his own synthetic work, as they use a mixture of scriptural examples and references from Achmet and the “Chalde Paraphrast” that are additional to or different from More or Mede. Both men’s work nonetheless shows the source for Newton’s conception of an original ancient language of figures and symbols with its own unique vocabulary. As More wrote, “it is as easie a thing

& Achmetis Sereimi F. Oneirocritica (Paris, 1603). Newton’s personal library contained neither of these texts, although it is likely that he had access to one or both editions through the resources of the Trinity College library. Most of Newton’s references to the source in Achmet for a given interpretation of a prophetic figure can additionally be found referenced in either Mede’s Clavis or More’s Mystery of Iniquity. Newton’s use of the Latin form suggests greater reliance on Mede, but he also draws from More’s lexical list. Newton’s heavy reliance on these texts in this manuscript further demonstrates his tendency to use the compiled source texts of other scholars that characterizes much of his scholarship, which Scott Mandelbrot discusses in “Newton and Eighteenth-Century Christianity,” 416.

Unlike More and Newton, Mede does not draw up a list of prophetic figures and their definitions. For some examples of the “Chaldee Paraphrast” in Mede’s Clavis, see Mede, Key of the Revelation..., 41, 50, 57, 85. See also Iliiffe, “Apocalyptic Hermeneutics,” 55-88 and Hutton, “Language of Biblical Prophecy,” 42-43 for a discussion of the influence of Mede on More and of both on Newton. This chapter’s discussion of Newton’s extensive dependence on Mede and More in his citation of Achmet and the Aramaic Targums furthers the study of Mede and More’s influence on Newton’s work with biblical prophecy, but also reveals the need for future in depth analysis of the connections between Yahuda Ms. 1, Mede’s Clavis, and More’s Mystery of Iniquity. In some ways Yahuda Ms. 1.1, particularly the list of figures, appears to be a summary and reworking of More’s Mystery of Iniquity. Newton’s personal library did not contain the Mystery of Iniquity, however, it was present in Isaac Barrow’s library, to which Newton had access up until Barrow’s death in 1677 and the dispersal of his library. Newton’s obvious use of the Mystery of Iniquity in Yahuda Ms. 1 and its absence in his later library may point to an initial date of composition pre-1677. For the contents of Barrow’s library, see Feingold, Before Newton, 358-72. Hutton stresses the differences between More and Newton’s hermeneutics in More’s interest in the allegorical and emblematic nature of the prophetic symbolic language and Newton’s more literal interpretation. Hutton compares the difference in approaches to the differences between “higher criticism” (More) and “lower” or “textual” criticism. While I generally agree with Hutton’s interpretation of the relationship, I would add that Newton’s discussion of the prophetic language, particularly in his arrangement of definitions of prophetic figures (most of which have been borrowed directly from More’s list), his use of Achmet’s Oneirocriticon, and his sense of Revelation as future history revealed in a comprehensive and decipherable symbolic language, show a greater dependence on More than Hutton’s discussion implies.

More demonstrates more interest than Newton in the connection between dreams and prophetic visions, and the how they function physiologically, considering them both to be “Phantasms impressed on the Imagination, not by any free act or excitation of our selves, but in a way merely passive, the external Senses also being in a manner consopite in both,” see More, Mystery of Iniquity, 227. Newton expressed an interest in
to render a Prophecy or Vision out of this Prophetick style into ordinary language, as it is to interpret one language by another.”

4.4 The prophetic dialect

More’s conception of the “Prophetick style” as an easily translatable language with its own vocabulary lies behind Newton’s own construction of his list of prophetic figures. Newton included this symbolic language of biblical prophecy in his earlier sentiment regarding the plain meaning of the text, expressed in Rule 4 that interpreters are “to chose those interpretations which are most according to the litteral meaning of the Scripture.” This literal sense includes the direct “translation” of prophetic figures from the ancient “dialect” that his list of definitions provides, in the same manner as a Greek or Hebrew lexicon would provide definitions of non-figurative words. As he states in his explanation of Rule 4, “note

the operation of dreams and the imagination in his early Trinity College Notebook, fols. 108r-109r. His notes on dreams derived from More’s Immortality of the Soul (London, 1659); HL 1113. However, Newton does not discuss the nature of dreams and makes no mention of the centrality of dreams to Achmet’s interpretive compendium. Unlike More, he appears to carefully avoid the oneiric nature of this source for ancient symbolic interpretations and certainly disparages the role of the imagination in the interpretation of biblical prophecy. The only oneiric links to prophecy for Newton is Achmet’s nature as a source for an ancient original language, rather than any link to modern dreaming or seeing of visions. This is closer to the way Mede treats Achmet’s sources, although Mede does not give a list of definitions as More and Newton do. Newton’s list is thus inspired by More’s list, but is based more on Mede’s hermeneutics than More’s. See also Hutton, “Language of Biblical Prophecy,” 55-88. Mamiani’s “Newton on Prophecy,” develops an elaborate argument for the sympathy of Newton’s hermeneutics of biblical prophecy with the Baroque metaphor, based on the link between the imagination and human creativity in the emblematic literature of the seventeenth century. Mamiani considers Newton’s use of Achmet’s oneiric interpreters to demonstrate his conception of the biblical prophetic language as an expression of the sublime creative powers bestowed on humanity as being made in the image of God and thus the proper context for his symbolic interpretation. While the emblematic literature is certainly an important context for Newton’s discussion of symbolic languages, in this specific context, Newton’s use of Mede and More should be given more weight. As such his departure from More’s oneiric interests and his focus on the linguistic hermeneutic to understand the symbolic terms of the prophetic dialect reveals his interpretation of the prophetic language to be more translational, and Achmet’s oneiric compilations to be merely a reliable source for the vocabulary of the language used by the ancient prophets of Israel. See section 5.2 below.

More, Mystery of Iniquity, 259. More continues, “the difficulty of understanding Prophecies is in a manner no greater, when once a man has taken notice of the settled meaning of the peculiar Icasms therein, then if they had been penn’d down in the vulgar speech, in which there are as frequent Homonymies of words as here there are of Iconisms.”
that the usuall signification of a prophetic figure is[,] in the application of this Rule[,] to be accounted equipollent to the literall meaning of a word when ever it appears that the Prophets speak in their figurative language.” For example, rather than “a hail-storm with other meteors” being interpreted as a “spiritual Battel,”

if they describe the overthrow of nations by a tempest of Hail, thunder, lightning and shaking of the world, the usuall signification of this figure is to be esteemed the proper & direct sense of the place as much as if it had been the litterall meaning, this being a language as common amongst them [the Prophets] as any national language is amongst the people of that nation.  

In Newton’s list of definitions, number 52 provides a literal meaning for hailstorms: “The more sudden & violent tempests of hail & thunder” describe “battels therein with loss to that side on which the tempest falls.” This image always describes an actual battle in history, not a spiritual contest. Newton’s proof, in addition to scriptural passages relating thunder and hail to battle (Eccles. 46; Isa. 30:30; 1 Sam. 7:10), comes directly from Achmet: “If one dream that hail falls on a place he may expect a violent incursion of the enemy; & if he dream that the hail hurt the stalks of corn there shal be slaughter of men in that place proportional to the breaking of the stalks. Achm. c 191. ex Ind. Pers & Ægypt.” Thus when reading a figurative description of a hail-storm, the biblical interpreter should directly translate it as a description of a future battle (with the nation on which the hail falls being the losing side) and treat it as a literal description of this future event in the same manner as non-figurative descriptions of past battles in the Bible (such as those in the accounts of the books

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315 Newton, Yahuda Ms. 1.1, fols. 12r-12v.
316 Newton, Yahuda Ms. 1.1, fol. 22r.
317 Newton, Yahuda Ms. 1.1, fol. 46r-47r.
of Kings and Chronicles) are taken to refer to actual historical events. This pattern is exemplary of all of Newton’s seventy prophetic figures and represents his attempt to comprehensively organize a multitude of scriptural passages together with ancient Jewish and Eastern interpretations into a workable list of prophetic symbols and their locations throughout Scripture. This list could then be used for the interpretation—the straightforward reading of prophesied history—of the books of Daniel and the Apocalypse, which Newton proceeded to do.

For Newton, this symbolic prophetic language, the “Prophetic dialect” was the key to understanding the prophetic texts of Scripture, which were themselves keys to the rest of Scripture. In his later discussion of the “Prophetic figures,” in Keynes Ms. 5 (1680s), Newton stated that “John did not write in one language, Daniel in another, Isaiah in third, & the rest in others peculiar to them selves; but they all wrote in one & the same mystical language as well known without doubt to the sons of the Prophets as the Hieroglyphic language of the Egyptians to their Priests.” Thus, “He that would understand a book written in a strange language must first learn the language & if he would understand it well he must learn the language perfectly.” Understanding this language was the key (“Clavis”) to the Apocalypse that Mede had first discovered and which Newton had mastered. Newton, following Mede and More, had investigated the ancient expositors of the mystical writers

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318 Newton viewed prophecy as a record of history yet to come, but only able to be interpreted after the things predicted had passed, see Newton, Observations, 251-3. More states much the same: “and That therefore it need be no reproach to any one that he endeavours to understand the Prophecies of Scripture, more then the Histories thereof; Prophecy being nothing else but an Anticipatory History, and when once fulfilled, as plain an History as that which was never prophesied of.” More, Mystery of Iniquity, 259. Newton, however, would go on to derive additional meaning from prophecy being future history written in symbolic language in its unique status as proof of God’s providence and its power to restore true religion, Newton, Observations, 251-2.

319 Newton, Keynes Ms. 5, fol. Ir.
(Achmet and the Aramaic Targums) and comparatively analysed passages throughout the Bible, seeking the original knowledge of prophetic symbols, an aspect of the *prisca sapientia* or *theologia*, and organizing them into a systematic index. One can see similarities between this index of symbolic prophetic terms and his “Index Chemicus” of symbolic chymical terms in Newton’s comprehensive formulation and organization of these lists from multiple sources and in their translational functions, as will be explored in the following chapter. Nonetheless, in Newton’s writing on prophetic hermeneutics, he expressed his belief that the key to understanding the system of prophetic symbols and their plain meaning—which unlocked the overall interpretation of the biblical prophecies—lay in the analogy between the natural and political worlds, the original source of the prophetic dialect.

4.5 *Newton's natural-political analogy and the “parable of the world”*

Newton believed that at heart the symbolic language of prophecy functioned by using images from the natural world to symbolize political affairs. For Newton, this was the key principle behind how the operation of symbols and their meanings functioned in the prophetic dialect: “I received also much light in this search by the analogy between the world natural & the wor[l]d politique. ffor the mystical language was founded on this analogy & will be best understood by considering its original.”\(^{320}\) This principle, the correspondence of the natural world to the political in the system of prophetic symbolism grounded the entirety of Newton’s interpretations of biblical prophecy. Newton introduced his list of definitions of prophetic figures in Yahuda 1.1 with this principle: “The original of the figurative Language of the Prophets was the Comparison of a Kingdom to the \(^1\)World & the parts of the one to the

\(^{320}\) Newton, Keynes Ms. 5, fols. Ir-IIr.
like parts of the other.” Just as the natural world was divided into lesser and greater parts, those divisions were used to represent proportional hierarchies within the political realm:

“And accordingly the Sun signifies the King and Kingly power. The Moon the next in dignity (that is the priestly power with the person or persons it resides in). The greater stars the rest of the Princes or inferior Kings." The list of definitions itself follows the descending order of the natural world, from heavenly bodies and heaven to the earth and its parts (seas and rivers, mountains and dens) to the creatures living on the earth (trees, swarms of insects, beasts, and birds). The world and “its parts are compared to the parts of a Kingdom in a due proportion to the whole,” since “this was the original of the figurative language of the Prophets & therefore must be the rule to understand it.”

While Newton’s list of hermeneutic rules and his numbered list of definitions and their proofs did not continue in later discussions of the prophetic language, the principle of the analogy of the natural and political worlds remained the basis for Newton’s interpretation of the prophetic symbolism. Keynes Ms. 5 asserted this principle, as cited above, as did the later Yahuda Ms. 7.1d: “For understanding these descriptions we are in the first place to acquaint ourselves with the figurative language of the Prophets. And this language is taken from the analogy between the world natural & an Empire or Kingdom considered as a world

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321 Newton, Yahuda Ms. 1.1, fol. 20r. Newton’s superscript numbers denote his numbered definitions, corresponding to the numbered list of proofs for each definition given in the “Proofs” section further on in the document.

322 Newton, Yahuda Ms. 1.1, fol. 20r. The list also includes human objects such as ships, buildings and fountains. See also Hutton’s discussion of the ordering of Newton’s list of definitions, in Hutton, “Language of biblical Prophecy,” 49.

323 Newton, Yahuda Ms. 1.1, fol. 21r.
This principle surfaces throughout Newton’s writings on prophecy, even when he was not specifically discussing how to read the prophetic language. For example Yahuda Ms. 9.2 (mid-late 1680s) uses the principle to refute the interpretation of the day of judgment as a literal conflagration of the earth in a ball of fire:

The original of it seems to be thus, that they to whom the day of judgment was first revealed deciphered it to the common people in the prophetick language, representing the world politic of the nations by the world natural of the heaven & earth & that the common people & some of the heathen Philosophers who understood not the prophetick language took it in the litteral sence.

Newton’s later accounts of the prophetic language (Keynes Ms. 5 and Yahuda Ms. 7.1d) list the interpretive meanings for various natural symbols, drawing on the list of definitions in Yahuda Ms. 1.1, but do not give the complex set of proofs—comparing various passages of Scripture and drawing on the Chalde Paraphrast and Achmet’s Eastern interpreters—which he had set forth in his first discussion of biblical prophecy. Nonetheless, the original principle endured. And that principle itself—the analogy of natural and political worlds that informed Newton’s earliest comparisons and research of the ancient symbolic language—derived, like most of Newton’s interpretive scheme, from Joseph Mede.

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324 Newton, Yahuda Ms. 7.1d, fol. 1r. The published Observations opens the second chapter, “Of the Prophetic Language,” verbatim, see Newton, Observations, 16.

325 Newton, Yahuda Ms. 9.2, National Library of Israel, Jerusalem, fol. 140r. In this instance Newton uses the principle of the natural-political analogy to prove that the day of judgment does not involve a literal consumption of the “globe of the earth” in fire, but a destruction of the political powers (represented by the Whore, the Beast and the false prophet), just as Noah’s flood destroyed not the earth, but the “world politic.” The new heavens and new earth, Newton implies, are a new and righteous government that shall never end; “the coming of Christ to judgment” is “not the conflagration & final destruction of the world, but on the contrary the refreshing & restitution of all things.” Newton, Yahuda Ms. 9.2, 141r. The interpretive mistake, as Newton understands it, comes from not reading the symbolic representation as a symbol and taking its meaning from a literal understanding of the figurative form, rather than translating or deciphering it from the prophetic dialect and only then taking its plain descriptive meaning. For more on Newton’s vision of the prophesied future as a political and religious renewal see Snobelen, “Newton, the Apocalypse and 2060 A.D.,” 550-1.
In his *Clavis Apocalyptica* (1632), Mede had stated that, “In the prophets ... every kingdom, and body of government, resembleth the world: as the parts also, the heaven, the earth, the stars, serve for that representation.” Mede supports this comparison with a quotation from Isaiah (51:16) arguing that the prophet’s declaration that the Lord will plant the heavens and lay the foundation of the earth is set in the context of Israel’s deliverance from Egypt and therefore refers to God’s founding of Israel as a political nation. Likewise Isaiah’s references to a new heaven and a new earth actually indicate a political transformation of both the “lofty” (heaven) and “inferior” (earth) parts of the kingdom. Mede also cites the “Chaldee Paraphrast” who “often times for the Sun and Moon doth put Kingdom, and glory.” Newton’s proof for the “comparison of a Kingdom to the world” also quotes “Isay 51.16, where the new founding of the political world or kingdom of the Jews is exprest by planting the heavens & laying the foundations of the earth.” To which Newton adds, “see the Chalde Paraphrast.” The rest of Newton’s proof reveals his independent scholarship, as he adds multiple scriptural passages not cited by Mede and a reference to a similar practice by the ancient Egyptians recorded by Sextus Empirius. Nonetheless, Mede’s *Clavis* clearly formed Newton’s source for this principle.

Therefore it is all the more intriguing that Mede footnoted his statement of the natural-political analogy with a claim that this central principle had the same root as the basic

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326 Mede, *Key of the Revelation...*, 56-57.

327 Mede, *Key of the Revelation...*, 57.

328 Newton, Yahuda Ms. 1.1, 28r.

329 Newton, Yahuda Ms. 1.1, 28v. “Sextus Empirius saith that the Egyptians assimilate the Sun to the King & the right eye and the moon to the Queen & to the left eye & the five Planets to Lictors or staff-bearers & the fixt stars to the rest of the people. Sex. Empir. adv. mathem. 1. 5. p 114. e.”
premise of chymical philosophy, the concord of the microcosm to the macrocosm: “That it was common with the Eastern nations to use the parable of the world to [figure things: may appear by the chymical philosophy proceeding from the Arabians and Egyptians, wherein almost every worldly body likened to the world, is said to be compact of heaven, Earth, and stars.”

Here Mede referenced the chymical philosophy that fit the interrelations of lesser bodies (the microcosm) to the overall structure of the world (the macrocosm), whereby gold, silver, iron and copper, for example, were represented by the sun, moon, Mars and Venus and were seen to have an affinity for those heavenly objects. Newton clearly read this passage, given his reliance on Mede’s argument for his basic interpretive principle for the prophetic language, and, as will be explored in the following chapter, appears to have explored the concord between the chymical analogy and the prophetic. The common root for both chymical philosophy and the prophetic natural-political analogy—which Newton believed governed the entire structure of the prophetic dialect—was the common practice of “the Eastern nations to use the parable of the world to figure things.”

Newton believed that this practice lay behind the complex system of Egyptian hieroglyphics and had an affinity to the figurative prophetic dialect. As he writes, “the

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330 Mede, Key of the Revelation..., 57. This note was present in the original Latin (Clavis Apocalyptica) as can be seen in the edition of Mede’s works that Newton owned, see Mede, Works, 448. The Latin reads: “Fuisse gentibus Orientis solenne Mundi parabolam rebus pingentis adhibere, vel ex Chymica Philosophia ab Arabibus & Ægyptiis profecta constare potest; in qua quodlibet fere corpus mundanum, mundo assimulatum, ex ccelo, terra & astris conflatum perhibetur.”

331 Newton, as will be discussed in Chapter 3, did not appear to follow a strong view of the connection between microcosm and macrocosm, although the degree to which this principle in chymistry affected his concept of action at a distance has been the subject of much speculation. See Westfall, “Alchemy in Newton’s Career,” 189-231 and John Henry, “Isaac Newton and the Problem of Action at a Distance,” KRISIS Philosophical Review 8:9 (1999), 30-46.

332 Hutton argues that Newton had earlier rejected “non-Jewish figurative traditions such as Egyptian hieroglyphs,” citing Newton’s insistence in Yahuda Ms. 1.1 that “we are to regard chiefly the Jewish way of speaking,” see Hutton, “Language of biblical Prophecy,” 48 and n.63. Closer inspection of this quotation reveals that Newton is merely stating the need to give preference to Hebrew usage of a symbol—especially
language of the Prophets being hieroglyphical had affinity with that of the Egyptian Priests & eastern wise men." Hieroglyphics, like the prophetic dialect, was composed of figures or symbols, yet functioned as a full language with a grammar and vocabulary that could be deciphered into plain speech, and it was only a lack of skilled interpreters that kept its meaning obscure. Egyptian hieroglyphics formed an ancient symbolic language that fascinated Newton’s contemporaries, who considered it to be a special enciphered language of occult (hidden or secret) symbols. Chymical authors considered Egyptian hieroglyphics

when it is well attested throughout the Bible—above its signification in Egyptian hieroglyphics. In this case Newton states that “34. Eyes denote a Seer, that is, according to the Jewish language, a Prophet.” And thus in Scripture a vision is frequently used to denote a prophecy. He continues, “A seer may be more generally expounded, not of any understanding & politick person according to that Egyptian hieroglyphick of a Scepter with an eye on the top to signify the understanding foresight & policy requisite in a king.” Then he states, not as emphatically as Hutton implies, “But I suppose in sacred prophesies we are to regard chiefly the Jewish way of speaking.” The very next sentence is: “Yet with this difference that when there is only an occasional mention of eyes as common & natural to animals (as for instance the Goats Eyes Dan. 8.5, 21) they signify only that policy & counsel which is naturally to be met with in all kingdoms.” I.e. the way that eyes would be interpreted according to the Egyptian hieroglyphic understanding. He then explains how to know when to use the Jewish interpretation: “But when their description is emphatical & not according to the course of nature they signify a Seer in the extraordinary & supernatural sense,” a supernaturally inspired prophet—the Jewish interpretation. This entire discussion forms his proof for his definition 34: “the eyes [signify] a politician & more emphatically a prophet.” See Yahuda Ms. 1.1, fols. 38v-39v and 21r. In this instance Newton actually uses the hieroglyphic analogy positively, as an aid to understanding the symbolic meaning of eyes, but one which must be subordinate to the consensus of Scripture. Newton’s direct use of hieroglyphics may show more of Henry More’s influence than Mede’s, as this passage directly borrows More’s description of the eye as an emblem of foresight in statecraft, which More supports with the Egyptian hieroglyph of “a Scepter with an Eye on the top of it,” see More, Mystery of Iniquity, 236. However, the passage adds Newton’s own scriptural study to develop his unique double interpretation.

Newton, Keynes Ms. 5, Ir. Mede’s earlier note regarding the nature-analogy in chymical philosophy hinted at the hieroglyphic affinity of this way of speech in his choice to describe its use among the Eastern nations as their tendency “to figure things,” or in the Latin “pingentis adhibere” (to use [the parable of the world] for painting, or depicting [things]).

Newton’s understanding of Egyptian hieroglyphics, and that of his contemporaries, predated François Champollion’s (1790-1832) famous solution of the hieroglyphic symbols, based on the Rosetta Stone, by more than a century.

See Athanasius Kircher’s attempt at translation, Kircher, Ædipus Ægypticus, (Rome, 1653). Newton would have had access to Kircher’s work through the Trinity College Library and Isaac Barrow’s personal library, which contained Kircher’s Prodomus Coptus sive Ægyptiacus (1636), see Feingold, Before Newton, 356. For more on Kircher and early modern scholarship on Egyptian hieroglyphics, see Daniel Stolzenberg, Egyptian Oedipus: Athanasius Kircher and the Secrets of Antiquity (Chicago: University of Chicago Press, 2013). Early modern approaches to Egyptian hieroglyphics tended to either focus on the putative symbolic meaning hidden in the imagery of the pictograms, drawing on Hermetic associations, or declined to
to provide evidence of an even more ancient form of symbolic speech, known to the
Egyptian priesthood, which had enciphered elements of plain speech using symbols from
nature and myth to hide their truths from the unworthy.\[^{336}\] The renowned antiquarian,
Athanasius Kircher, advanced the idea that hieroglyphics preserved the remnant of the
original wisdom of Adam, transmitted and saved by Noah but corrupted by his son Ham, and
that the first chymical philosopher, Hermes Trismegistus, had invented hieroglyphic writing
to protect this original knowledge (*prisca sapientia*) from further corruption.\[^{337}\] Newton’s
developing understanding that the purpose behind the figurative symbolism of the
Apocalypse was to preserve the truth of the original Christian belief and practice from
corruption—for later enlightened readers to discern—followed a similar pattern.

Newton did not overtly investigate the affinity of the prophetic dialect with Egyptian
hieroglyphics and its chymical associations. Nonetheless, his hermeneutical research into the
origins of the symbolic language of biblical prophecy unearthed their common heritage in the
“parable of the world” and reveals the extension of his search for ancient knowledge as a
linguistic and textual endeavour to both theological and chymical topics. Moreover, his
understanding of the preserving role of the Apocalypse, preventing corruption by enciphering
truth in the symbolic prophetic language, reflects common early modern approaches to
Hermetic and chymical texts. Regarding the language of biblical prophecy, Newton

\[^{336}\] This ancient symbolic language of the Egyptian priesthood was the source, according to the
alchemical literature (or the symbolic literature of chymistry), of the range of chymical symbols by which the
secrets of the chymists (the production of the philosopher’s stone) had been hidden from the unworthy. An
example of this can be found in the “Aquarium Sapientum,” in the *Musaeum Hermeticum...* (1625), Trinity
NQ.16.115, 103-7; HL 1130.

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maintained the principle of the natural-political analogy as the key to reading the complex figurative representations of prophetic texts. This analogy allowed him to construct a comprehensive lexicon of prophetic symbols and their meanings assembled from a thorough cross-examination of Scripture and ancient interpretations of dream-symbols. Newton’s research into the vocabulary of the symbolic prophetic language was thoroughly textual in this regard, and his attempt to understand the figurative prophetic dialect according to the ancient analogy between symbols of the natural world and political events reveals the translational motivation behind his search for original knowledge.

5. Newton, the *prisca sapientia*, and the Natural Analogy

5.1 Newton’s pursuit of ancient knowledge

As both Newton’s concern for the uncorrupted purity of the biblical text and his research of the ancient figurative language indicate, Newton’s approach to the prophetic Scriptures involved the search for original religious knowledge, or the *prisca theologia*. J. E. McGuire and P. M. Rattansi demonstrate the importance for Newton of the “*prisca* tradition”, connecting his search for original religious knowledge and its corruption to his investigation of the corruption of the knowledge of the natural world that ancient people had possessed.\(^{338}\)

Newton believed that this ancient knowledge, the *prisca sapientia*, once reflected the truths of the natural world and was only recently being rediscovered by the new natural and experimental philosophy. Moreover, beginning in the late 1680s, Newton became more and more convinced that the corruption of natural knowledge and religious knowledge went hand

Newton’s Query 31 to the *Opticks* ends with a discussion of the effects the right method in natural philosophy (the experimental method) has on moral philosophy, implicating the descendants of Noah for having corrupted themselves and turning from true worship of God to a false worship of nature, a corruption of the original knowledge of both.\(^{340}\) Newton saw his work in the *Principia* as a recovery of the *prisca sapientia*. As David Gregory wrote in 1694 of Newton’s anticipated second edition of the *Principia*, “He will spread himself in exhibiting the agreement of this philosophy with that of the ancients, and principally with that of Thales. The philosophy of Epicurus and Lucretius [atomism] is true and old, but was wrongly interpreted by the ancients as atheism.”\(^ {341}\) This effort resulted in what is known as the “Classical Scholia”, which Newton did not end up publishing, yet the ideas of which informed his later writing. Newton’s pursuit of the *prisca sapientia* formed an enduring presence throughout his subsequent work.

A primary aspect of the search for *prisca*, however, involved determining the correct interpretation of the symbolic forms by which such knowledge had been disguised. This attitude was firmly present in interpreters of the Hermetic texts—such as Athanasius Kircher—and characterized Newton’s reading of ancient symbolic texts.\(^ {342}\) As Niccolo Guicciardini argues, in an article re-evaluating Newton’s use of Neo-Pythagorean harmonies in his natural philosophy, Newton’s interest in the *prisca* tradition had an explicitly

\(^{339}\) Scott Mandelbrote, “Newton reads the Fathers,” 284.

\(^{340}\) Newton, *Opticks* (London: William and John Innys, 1721), 382.


\(^{342}\) Stolzenberg describes the ‘archeological’ motivations to correctly decipher ancient iconography behind seventeenth-century investigations of ancient texts and monuments in addition to philosophical or Neo-Platonic motivations to uncover the original wisdom. Stolzenberg, *Egyptian Oedipus*, 56-67.
deciphering motivation. While the ultimate goal of the correct interpretation of the *prisca* tradition may have been to find ancient support for his natural philosophy, a significant driving force for Newton’s interest was the form by which that knowledge had been transmitted. Newton’s conceptual linking of the *prisca theologia* and the *prisca sapientia* followed from his perception of the passive and deliberate corruption of knowledge over time. This corruption could be circumvented by accessing the original knowledge hidden within the symbolic forms. Regarding his theological writings, Newton pursued an intensive investigation into the corruption of Scripture in the 1690s and 1700s, as discussed in section three of this chapter, and expressed the belief, even in his earliest interpretation of the Apocalypse (Yahuda Ms. 1.1), that the prophetic writings contained a preserving function. Thus, Newton had turned to the Aramaic Targums and the ancient Eastern dream-interpreters to reconstruct the vocabulary of the prophetic dialect. Newton’s desire to understand the translational operation of the symbolic representations of the ancients’ original knowledge can thus be seen in a variety of his interests in the *prisca* tradition.

Newton’s attempt to find plain meaning behind symbolic forms extended to his analysis of certain ancient practices as symbols of religious and natural knowledge. In a manuscript written after 1690 (and possibly much later), Newton discussed the use of the Jewish temple rituals as types in the symbolic language of biblical prophecy. He wrote,

> It is accepted by all that in the constitutions of the [Jewish] law the future is foreshadowed & this the Apostle Paul testifies abundantly Colos 2.17 & Heb. 8.5 & 9.23. Whence it is that those constitutions were better suited to the system of things than the natural World, from which the Prophets selected types.\(^\text{344}\)

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\(^{344}\) Newton, “Prolegomena ad Lexici Prophetici partem secondam [Prolegomena to the second part of the Prophetic Lexicon]” Babson Ms. 434, Huntington Library, San Marino, CA, fol. 1r. The original Latin reads: “Constitutionibus legalibus futura adumbrata esse in confesso est apud omnes & id Paulus Apostolus
In Col. 2:17 Paul labeled the Jewish dietary restrictions and the observation of Sabbaths and Jewish festivals, “shadows of things to come” and the author of the Hebrews (believed to be Paul by early modern scholars) presented the sacrificial rituals as a representative foreshadowing or type of Christ’s sacrifice. Operating on the same principle that the former prophecies (of Christ’s first coming) were as momentous as the latter, Newton applied the method by which the Jewish ceremonial law prefigured Christ to interpret the Apocalyptic prophecies. The visions of worship before the throne of God in the Apocalypse, for example, could be understood according to the prescribed forms in the Pentateuch, as an earlier passage from Yahuda Ms. 9.2 (late 1680s) demonstrates:

For as the Beasts & Elders allude to the Jewish Church and signify the Christian so under the type of the Jewish daily worship is the Christian delineated. And hence we may understand that the blaspheming synagogue of Sathan [represented by “the Gentiles in the outward Court of the Temple (Apoc 11)’’] who say they are Jews & are not but do lye (apoc 2.9 & 3.9) are a Synagogue or Church of men who say they are Christians & are not but do lye.

Jewish daily worship and the structure of the temple were a type of the future state of the Christian church that the Apocalypse predicts, in which there was a true and false church.

abundesatis testatur Colos 2.17 & Heb. 8.5 & 9.23. Inde fit ut constitutiones illæ fuerint aptius rerum systema quàm Mundus naturalis, a quo Prophetæ typos desumerent.” In this passage Newton considered the ancient practices of Jewish worship, seen as biblical types, to have even greater value in the interpretation of the Apocalyptic scenes than the analogy from nature that had informed the ancient prophetic dialect. This argument thus formed justification for his extensive investigation of the structure of the temple and the ancient forms of Jewish worship.

A biblical type, in this sense, was a representative event or practice that had original historical meaning in its context yet also pointed forward to future events or aspects of salvation history. As an example, a common biblical type was the story surrounding Abraham’s sacrifice of Isaac, which was considered to have actually happened—and to have been a formative event in the Patriarchal history of Israel—but also foreshadowed Christ’s sacrifice on the cross.

Newton, Yahuda Ms. 9.2, fol. 14r.

The purpose of this prophecy was “to describe & distinguish from one another the true Church & the Synagogue of Satan that the elect by considering these things might emerge out of the universal idolatry of the last times & be saved.” Newton, Yahuda Ms. 9.2, fol. 14r. Thus, for Newton, the structure of the Jewish
For Newton, the structure of the Jewish temple and the pattern of worship around it provided insight into the knowledge of the true meaning of the Apocalypse, and furthered the principle of letting Scripture interpret Scripture.

The structure and worship of the temple, however, also demonstrated an aspect of the *prisca sapientia* that had been embedded in the worship structure of the original Noahic religion and revealed to the Jewish people through Moses (the pattern of the tabernacle) and the prophets (the first and second temples and Ezekiel’s vision of the temple). This original worship revolved around a central fire or prytaneum, which represented the true knowledge of the structure of the solar system. As Newton explained in a draft chapter on the origin of religion and its corruption from the 1690s, “The placing the fire in the common center of the Priests Court & the outward court ... in the Tabernacle & in Solomons Temple ... is a part also of the religion which the nations received from Noach. ffor they placed the fire in the middle of the Prytanea.” And, both Tabernacle and Temple had been “[framed] so as to make it a symbol of the world.” Likewise,

as the Tabernacle was contrived by Moses to be a symbol of the heavens (as Saint Paul & Josephus teach,) so were the Prytanæa amongst the nations. ... The whole heavens they reconed to be the true & real Temple of God & therefore ... they framed [the Prytanæum] so as in the fittest manner to represent the whole systeme of the heavens. A point of religion then which nothing can be more rational.  

Thus rational knowledge of the natural world had been embedded in the symbolic structure of the original worship, “the fire in the middle of Prytaneum was taken for a symbol of the

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348 Newton, Yahuda Ms. 41, National Library of Israel, Jerusalem, fols. 5v-6r.
center of the world,” and “those who placed the Sun in the center ... made this fire a symbol of the Sun.” Moreover, “He who worships, by turning about, becomes a symbol of the earth. Whence the Greeks called a man microcosmus.”\(^{349}\) Recovering the worship practices of the original Noahic religion not only provided the source for the Jewish rituals—which assisted in the interpretation of biblical prophecy—but also revealed the original natural-philosophical knowledge of the first peoples, the \textit{prisca sapientia}. And Newton believed Noah’s descendants to have had a Copernican understanding of the universe, which had only recently been rediscovered.

In the ancient structure of the prytaneum, and its derivations in the Jewish temple, the “parable of the world” had been inverted, such that the symbolism of human worship became a microcosm of the true structure of nature, rather than symbols drawn from the macrocosm of nature being used to construct a prophetic dialect that detailed coming historical events and the future form of true worship. Nonetheless, in both cases Newton understood a visible symbolic form to express a specific truth. Newton’s discussion of the ancient prytaneum demonstrates the degree to which his search for the original religion, the \textit{prisca theologia}, was related to his natural philosophy and his search for the \textit{prisca sapientia}. Newton’s hermeneutics of biblical prophecy reveal their connection to this aspect of his natural philosophy in their mutual concern for uncovering ancient belief and reversing the corruption of knowledge that had persisted following the time of Noah. However, Newton’s understanding of the original knowledge that had been enciphered in symbolic texts and representative worship forms was more descriptive than allegorical. Man was not a microcosm by containing within himself a special connection to the larger scale universe, or

\(^{349}\) Newton, Yahuda Ms. 41, fols. 6r-7r.
the motions of heavenly bodies, rather, he merely represented heliocentric heavenly motion when he rotated around the central fire. In this, Newton’s search for the *prisca* tradition reveals his expectation of a plain descriptive meaning behind the symbolic forms of worship and texts. The application of this descriptive and translational understanding of symbolic texts to Newton’s chymical textual research will be detailed in Chapter 3. Furthermore, Newton’s translational approach to symbolic texts and forms can inform our own understanding of his allusion to the analogy between the natural and political world in the prophetic dialect.

5.2 Newton’s use of analogy

As detailed in section four of this chapter, Newton’s interpretation of the symbolic language of biblical prophecy depended on the analogy between the natural and political worlds which Newton believed to be at the heart of the ancient symbolic language. Maurizio Mamiani, in his article, “Newton on Prophecy and the Apocalypse,” compares Newton’s reference to the analogy between natural and political entities to his use of analogy in his rules of reasoning (the *Regulæ Philosophandi*) in natural philosophy discussed in the *Principia*. He additionally argues that Newton’s treatment of the significations involved in prophetic symbols related to the Baroque emblem, which embodied human imaginative expression and united several significations into a single symbol that became a representative type.\(^{350}\) I find Mamiani’s analysis to be somewhat problematic, and consider Newton’s treatment of the ancient symbolic forms to be better understood translationally than according to the natural analogy of the *Principia* or to Baroque metaphor. Mamiani’s argument for the similarities between

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\(^{350}\) Mamiani, “Newton on Prophecy,” 401-3.
Newton’s use of the ancient dream interpreters (Achmet) to understand the prophetic symbolism and the imaginative power of the Baroque metaphor relies on a tenuous connection. Mamiani refers to Newton’s possession of a book by Emanuele Tesauro on the genealogy of the Patristic fathers. Tesauro also wrote about the similarities between human imaginative faculties and the divine, which Mamiani compares to Newton’s discussion in “De Gravitatione” of the analogy between the human and divine cognitive faculties. However, not only did Newton not own this second Tesauro source, but it was written in Italian, which Newton did not read. Furthermore, Newton consistently pointed to the dangers of the use of imagination in the interpretation of biblical prophecy. Mamiani argues for Newton’s support of a collective imagination rather than private imagination, yet fails to justify the emphasis he puts on the creative power of the human imaginative faculties from Newton’s writings. Nonetheless, Newton’s comparison of the human and divine faculties in “De Gravitatione” does have an interesting relationship to his investigation of the human soul (in both its sensory and motive powers) and is likely connected to his later comparison (made in the Queries to the *Opticks* and the General Scholium to the *Principia*) between God’s relationship to space and the human sensorium. This connection, and its further relationship to some of Newton’s chymical ideas will be discussed in Chapter 4.

Nonetheless, Mamiani’s claim that the analogy central to Newton’s prophetic emblems corresponds to the analogy of nature at the heart of his scientific rules (the *Regulæ Philosophandi*) bears further consideration. Frank Manuel suggests in the *Religion of Isaac*.

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351 Compare Yahuda Ms. 1.1, fols. 28r-54r, which makes no use of the word “emblem,” to Yahuda Ms. 1.1a, which uses “emblem” to describe the prophetic symbols eight times.

352 See Newton, Yahuda Ms. 1.1, fols. 7r, 10r, 12r, 13r, and 28r. See also n. 122 of this chapter for the difference between Newton’s use of the dream literature and imagination and that of Henry More.
Newton that Newton’s interpretive rules for biblical prophecy were a replica of the *Regulæ Philosophandii*, guided by the same principle of simplicity. Mamiani counters that the *Regulæ Philosophandii* were written after Newton wrote Yahuda Ms. 1.1 and its hermeneutical rules and therefore that any perceived influence should flow the other way. Mamiani argues that Newton’s hermeneutical rules are representative of the kind of reasoning advocated in Robert Sanderson’s *Logicae Artis Compendium*, one of Newton’s early textbook purchases at Cambridge, which likely formed a mutual source of the methodological structure of both his hermeneutical and natural-philosophical rules. Newton’s attempt to “methodize” or “construct” the Apocalypse draws on the grammatical and rhetorical tradition that Sanderson’s manual had taught him. In this regard Mamiani demonstrates an important insight into the methodological connections between Newton’s theology and natural philosophy, in that they have a common source in his training in the methods of scholarship and the organizational and argumentative styles inherited from Renaissance Humanism. However, Mamiani goes on to claim that the analogy at the heart of Newton’s scientific rules—“the key for reading the book of nature”—corresponds to the analogy used in the prophetical style.

Newton’s third Rule of Reasoning in (Natural) Philosophy in the *Principia* advocates the use of the analogy of Nature, “which is wont to be simple, and always consonant to

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itself.” By this analogy experiences of the natural world, such as the extension in space of bodies, their hardness, impenetrability and inertia, can be applied universally, even to aspects of the natural world beyond our empirical grasp. Mamiani argues that Newton’s *use* of analogy in his natural philosophy differed functionally from the *inductive* explanation stated in this Rule. Rather, according to Mamiani, it operated at the level of types, such as Newton’s comparison of the colour spectrum to the tonal scale, finding numerical proportionalities, or his conviction that the ancients’ harmonization of celestial spheres reflected their comprehension of the law of gravitation. Newton’s stated explanation of “the analogy of Nature” in the third Rule, however, did not indicate this understanding of analogy in his natural philosophy, and should be read in the context of how Newton used it in the physics of the *Principia*. In the *Principia*, analogy was the extension of the known into the unknown, the universal application of the empirically accessible to the inaccessible.

There are intriguing connections between this principle and some of Newton’s metaphysical discussions of God and nature, as will be explored in Chapter 4. However, the natural-political analogy at the heart of the Prophetic dialect was neither Baroque type nor inductive principle, it was merely a linguistic device, a means of translating a symbolic figure into plain language.

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358 Mamiani, “Newton on prophecy,” 404. In each case, one area of nature is a type of another, the notes on the musical scale are a type of the colours on the spectrum; the relationship between the celestial spheres is a type of the relationship between gravitating bodies.

359 Newton did use the language of types to discuss the prophetic analogy in his later writing, see Newton, Babson Ms. 434, fol. 1r. However, the Baroque emphasis on the imagination, which Mamiani stresses, does not accompany his typological characterization.
When Newton described the analogy between natural world and political entities or events, it was very much within a linguistic context. He stated that “the mystical language was founded on this analogy & will be best understood by considering its original.”

For Newton, the insight he gained from an understanding of the natural-political analogy enabled him to determine the exact descriptive meaning for the symbolic significations of the prophetic dialect. The form of the signification—the sun or a hailstorm—had no continuing relationship to the object signified, beyond providing a clue as to its literal meaning as a political entity or event. Newton sought out the ancient knowledge of the original forms (the *prisca sapientia*) in order to translate them back into the direct speech by which the prophets had originally comprehended them. I label this linguistic approach to symbolic significations Newton’s direct-translational method and consider, in the subsequent chapter, how this translational approach united his research of all symbolic texts, the overwhelming majority of which were either chymical or prophetic.

6. Newton’s Translational and Cross-referential Prophetic Hermeneutics

Newton’s theological writings reveal his concern for texts: their reliability as sources and their correct interpretation. This textual focus has been demonstrated in a number of his interests, including his chronology and, as Chapter 1 of this dissertation has shown, his chymistry. This “bookish” interest or, more specifically, the humanist impulse in his scholarship, reveals itself clearly in his approach to biblical prophecy. Newton’s textual scholarship is characterized by the desire to achieve the most original and uncorrupted

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360 Newton, Keynes Ms. 5, fols. Ir-IIr
reading of a text, and to access the least corrupted version of ancient knowledge. In his natural philosophy this manifested itself in his attempts to recover the *prisca sapientia*, which was related to original worship practices. In his hermeneutics, Newton’s *prisca* impulse resulted in a nuanced criticism of the books of the Bible that detailed both natural corruption as texts were transmitted over time and the deliberate corruption of the New Testament by orthodox Trinitarians. The result for Newton was a greater reliance on those texts that were better protected—through the providence of God—in their symbolic nature: biblical prophecy. The obscurity and symbolic nature of the prophetic writings were in fact a deliberate and providential act to preserve knowledge of the true faith and to detail—in enciphered future history—the precise pattern by which the corruption that did befall the church and the rest of the New Testament would unfold. However, in the latter times in which Newton lived, from the vantage point of prophesied history fulfilled, the meaning of biblical prophecy was finally gaining clarity. This was aided by new interpretive principles and schemes, in the linguistic approach to the symbols used in the prophetic visions, which Newton had learned from his predecessors, Henry More and Joseph Mede. Moreover, in his use of ancient Eastern dream-interpreters to determine the meaning of specific symbols or figures used in the prophetic language, or dialect, Newton yet again demonstrated his characteristic impulse to discover and use ancient and uncorrupted knowledge to recover truth.

Newton’s textual scholarship in his interpretation of biblical prophecy was characterized by his quest for the true meaning of the original prophetic dialect, embodying a humanist concern for linguistic origins and development over time. Newton relied heavily on the natural-political analogy that he believed was at the root of the prophetic dialect. This
analogy simplified the system of prophetic symbolism and enabled him to construct a list of definitions for the prophetic symbols that could be used as a direct lexicon when reading through the prophetic books. Moreover, Newton’s conception that the natural-political analogy lay at the root of the prophetic dialect reveals his understanding of this kind of analogy, the “parable of nature,” as the source method by which ancient symbolic systems enciphered true knowledge. Hence the means to decipher such systems—the prophetic dialect in the present case—consisted of a basic reversal of the analogy and a translation or deciphering of a given symbol back into its plain meaning, after which it should be interpreted literally. This followed the same pattern by which non-symbolic biblical (and other) texts, after being translated out of their original languages (Hebrew or Greek), should then be interpreted according to their plain meaning. Newton’s use of the natural-political analogy in this linguistic and translational way constitutes a specific textual understanding of the symbolic language of biblical prophecy.

Throughout Newton’s work with the symbolic texts of the Bible, his textual scholarship is evident in his rigorous cross-examination of texts. This is true of his investigation of the corruption of the biblical text, as he compares Old Testament scriptural passages to each other to determine the disjointed nature of the current text and its inevitable corruption over time. It is also true of his listing of multiple manuscript variations of New Testament passages to painstakingly reveal what he perceives to be an elaborate pattern of Trinitarian corruption. It is even evident in his extensive investigation of all the manuscript variations of the Apocalypse, as he worked to ensure the trustworthiness of the current text. Newton’s cross-comparison of texts extended to his work with the prophetic dialect, as his primary method for determining the meaning of a given symbol entailed an investigation of
all the passages of Scripture that used the symbol, correlating how it was used in each passage. Moreover, Newton added interpretive sources from the Aramaic Targum and Achmet’s *Oneirocriton* to his comparisons to derive a more accurate definition of the prophetic symbols. And, as he stated, one of his primary motivations for using Achmet was his perception of that author’s own reliability based on his method of comparing the interpretive meanings for dream-symbols across the three ancient Eastern authorities.

Buchwald and Feingold have demonstrated Newton’s cross-analysis of texts in his approach to the chronological sources and this chapter has demonstrated Newton’s ubiquitous use of the method in his interpretation of Scripture—and biblical prophecy in specific. Moreover, Buchwald and Feingold compare Newton’s cross-analysis in texts to his method of gathering, analysing and averaging data in his experimental practice, prompting further investigation of this method in his other fields of interest. \footnote{Buchwald and Feingold, *Newton and the Origin of Civilization*, 243.} The previous chapter demonstrated Newton’s cross-comparison of chymical texts in his compilation of the “Index Chemicus” and his patterns of dog-earing personal books. This chapter has shown a similar method in his critical comparison of biblical manuscripts and his analysis of the symbolic prophetic terms throughout Scripture and ancient interpreters. This method may in fact demonstrate a universal practice throughout Newton’s writings and a specifically textual aspect to his work, grounded in humanist methods for organizing knowledge, as will be analysed in the following chapter. Finally, in Newton’s hermeneutics of biblical prophecy, he displayed not only the potentially universal textual practice of cross-comparison, but also a specifically interpretive and translational practice directed towards the deciphering of a symbolic language, which, in the context of his writing on Scripture, entailed the translation

\footnote{Buchwald and Feingold, *Newton and the Origin of Civilization*, 243.}
of the prophetic dialect. And, it is a central argument of this dissertation that this translational practice, focused on the deciphering of symbolic language into a plain literal meaning, equally informed Newton’s reading of the symbolic texts of chymistry and thus comprises a common method in Newton’s chymistry and theology, which we will now explore.
Chapter 3: Newton’s Descriptive-Translational Method in Chymistry and Theology

1. Connecting Newton’s Hermeneutics in Chymistry and Prophecy

The preceding chapters have considered the essential role of Newton’s textual methodologies in his chymical research (Chapter 1) and his hermeneutical approach to biblical prophecy (Chapter 2). Both chapters reveal Newton’s textual methods in a dominant area of interest in his life and detail the manner in which Newton approached symbolic texts in those fields. Specifically, Newton’s work with both chymistry and theology involved, to an extensive degree, interpreting figurative ways of speech, in the symbolic and mythological texts of chymistry and the prophetic images of Daniel and the Apocalypse. And, while the similarities between Newton’s interpretations of the figurative expressions central to each field have been noted, their explicit connection remains to be demonstrated. This chapter then considers how Newton’s textual methods in these separate fields are indeed connected. I argue that the connection between Newton’s chymistry and theology lies not as much in the specific content of his disparate sources, but in his common methodological approach to them. In Newton’s drive to decipher—and to learn the language by which knowledge was and is signified—a common method can be found that, due to the inherently symbolic nature both of seventeenth-century chymistry and of biblical prophecy, reveals a methodological connection in Newton’s work. I argue that this method is best categorized as translational, as Newton viewed all symbolic writing as a kind of cipher that could be directly translated into a simple descriptive meaning. I label this approach Newton’s descriptive-translational
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method, tracing it to his earliest study of the nature of language in 1661. Additionally, I argue that Newton’s cross-comparative method—discussed in Chapters 1 and 2—derives from his textual training in seventeenth-century scholarship and fits into the pattern of commonplace and indexing techniques that developed in early modern natural philosophy from humanist methods of scholarship.

The connections between Newton’s approach to texts and to experiment remain of grave importance to the history of science, particularly to considerations of the role of textual interpretation in scientific method. The overlap between textual and experimental methods for understanding the natural world in the early modern period has formed a significant topic in recent historical considerations of the origins of modern science.362 This chapter contributes a specific analysis of this overlap in Newton’s work to the current discussion. Hence, in this chapter I detail Newton’s use of the descriptive-translational method in his reading of symbolic history, prophecy, and chymistry, concluding that Newton’s translational approach forms a unifying feature in of all of Newton’s work with figurative texts that incorporates a central and non-trivial connection between his chymistry and theology. Moreover, Newton’s chymical work demonstrates the overlap between textual and experimental method in its confluence of translational and practical-experimental searches for natural knowledge.

2. Newton and the ‘Scientific Mindset’

Newton studies have progressed remarkably in the past few decades. The discovery of the “other” Newton resulting from public access to Newton’s private papers—following the Sotheby’s sale of 1936—has led to numerous attempts to reconcile the scientific giant of the Enlightenment with the chronologer, alchemist, and apocalyptic interpreter. More recently, Newton’s theological and alchemical interests have begun to dominate historical discourse. Mordechai Feingold laments this trend in a 2007 review of current Newtonian studies: “rather than excluding theology and alchemy by virtue of their inconsequentiality, mathematics and physics are excluded for much the same reason; they are inconsequential for what really mattered to Newton, religion.”

Feingold argues that faulty evidence for Newton’s early interest in theology renders insupportable certain claims that his religious interests were foundational to his other pursuits, particularly his scientific work. In his 2013 joint work with Jed Buchwald, Newton and the Origin of Civilization, Feingold develops this sentiment further, essentially arguing the inverse: that key aspects of Newton’s way of reasoning with ancient texts—both Biblical and pagan—derived from experimental scientific methods developed early in his career.

Buchwald and Feingold are not alone in this perspective. The idea that Newton’s non-scientific work reveals the special stamp of his experimental and rational genius pervades the earlier literature on Newton. Frank Manuel’s Isaac Newton, Historian, predecessor to Buchwald and Feingold’s analysis of Newton’s chronology, makes a similar claim. Manuel highlights Newton’s “comparative method of analysing disparate texts,” his “critical attitude towards sources,” his dispensing with

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364 Buchwald and Feingold, Newton and the Origin of Civilization.
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allegorical interpretation of myth, and his literal exegesis of the Bible. All of this, Manuel claims, is a result of “the new scientific spirit” that “pervaded Newton’s most recondite antiquarian investigations.”

Richard Westfall probes Newton’s ‘non-scientific’ writing under the same assumption. Newton’s writing of history “produced indigestible catenae of quotations instead of readable narrative.” The reason for this lack of literary style lay in Newton’s relentless pursuit of empirical evidence: “He brought the standards of scientific demonstration to historical research.” Similarly, even though Westfall strongly advocates the impact of alchemical ideas—which he considers separate from Newton’s ‘real’ science—on Newton’s support for action-at-a-distance in physics, he still describes Newton’s research of alchemical texts as affected by the quantitative spirit characteristic of his experimental notes. The original source for Newton’s textual methods in both chronology and alchemy was a unidirectional carry-over from his science. This sentiment was an assumed principle in the work of the ‘other Newton’ and is not hard to understand. Newton has until only recently been perceived as first-and-foremost a scientist and thus any rigor of organization or manipulation of texts reminiscent of his scientific endeavours would naturally be assumed to stem from his

365 Manuel, Isaac Newton, Historian (Cambridge: Cambridge University Press, 1963), 9-10

366 Manuel, Newton, Historian, 9.

367 Westfall Never at Rest, 329.

368 Westfall, Never at Rest, 329.

369 See “Westfall, “Alchemy in Newton’s Career,” 226, “One of the characteristics that has caught the eye of everyone who has looked at his experimental notes is their quantitative precision. The same spirit affected his study of alchemical texts.” Westfall thus indicates a similar relationship to the one advocated in this chapter, but he argues for the direction of causality to flow from Newton’s experimentalism to his textual research. This chapter does not advocate a unidirectional causal mechanism in either direction, but a mutual influence as these processes developed.
scientific mindset. To state otherwise requires clear evidence. It is an argument of this chapter that such evidence is manifestly to be had.

As seen in the previous chapter, the assumption of Newton’s prior scientific mindset within all of his work has been challenged in the last few decades. Maurizio Mamiani inversely argues that Newton’s Rules of Reasoning in experimental philosophy and his hermeneutical rules for reading the Apocalypse had a mutual source in Robert Sanderson’s *Logicae artis compendium*. Recent studies of Newton’s theology emphasize its context within seventeenth- and eighteenth-century biblical scholarship. Nonetheless, Feingold’s criticism remains valid. He argues that when comparing the centrality to Newton of theological studies with his natural philosophy it is difficult to explain “just how a specific religious belief influences computation or experimentation beyond providing a vague, inchoate source of motivation.” A number of studies have attempted just this explanation, such as Andrew Janiak’s thesis that Newton’s *a priori* belief in God motivated a kind of divine metaphysics that effected key elements of his natural philosophy. Similarly, Stephen Snobelen’s works on the theology of the *Principia* address the extensive subtexts to Newton’s statements about the Deity in his scientific publications. All the same, Feingold would likely respond that an essential connection remains to be proven, particularly in the area of *doing* science.

While the main approaches to this problem have either taken the form of Rob Iliffe’s disciplinary boundaries or Betty Dobbs’ unified pursuit of divine activity, I propose an

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370 See Introduction, n. 5.
372 Janiak, *Newton as Philosopher*.
alternative approach that sees a unity to Newton’s work. The unity lies in Newton’s same underlying methodological approach to texts and the manifestation of that approach in his synthesis of experimental and textual chymistry. This is not to state that Newton’s experimental and mathematical methods came out of his work with texts (although their mutual influences should be considered, as Buchwald and Feingold pursue in their comparison of Newton’s manipulation of data and texts). Rather, a non-trivial connection can be seen between one of Newton’s explicitly experimental, or ‘scientific’, endeavours—his chymistry—and his theological writing. This connection has its roots in the humanist methods of scholarship common to all of Newton’s contemporaries and arises from his intellectual training. Newton’s careful manipulation of texts, his comprehensive lists of definitions, rules of reasoning and symbolic comparisons are not the product of Newton’s uniquely “scientific” rational genius extended to his “non-scientific” interests. They are in many ways an unsurprising method of organizing and distilling textual knowledge in the age of print. Nonetheless, even seen as a humanist, Newton had a characteristic approach to the symbolic texts of chymistry and theology, which I categorize as descriptive-translational. Before exploring this more individual aspect of his textual methodology, however, further consideration of humanist methods in early modern natural philosophy is called for.

3. Isaac Newton, Humanist

In the previous chapter I discussed Newton’s humanist methods of scholarship, particularly as applied to his cross-comparison of historic texts and his scepticism regarding the

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374 For the dichotomy of positions offered by Rob Iliffe and Betty Dobbs, see Introduction, Section 1. See specifically, Iliffe, “Abstract Considerations,” 427-54; and Dobbs, Janus Faces.
reliability of written sources. Newton’s reading program at Cambridge introduced him to the Aristotelian textbook tradition of early modern scholasticism. Stephen Ducheyne argues that this tradition deeply influenced his approach to natural philosophy and should be considered equally with the effect of Newton’s mathematical training on his style of reasoning in the Principia. Ducheyne argues that contrary to the probabilistic accounts of many in the Royal Society, Newton favoured certain knowledge in natural philosophy and framed his arguments in Aristotelian causal language, even as he reformed the notion of causation. Newton’s Trinity College Notebook contains notes from his early reading, revealing the most influential authors to be Johannes Magirus and Daniel Stahl. Magirus and Stahl provide a fair example of the state of mid-seventeenth-century scholastic scholarship. Magirus’ Physiologiae peripateticae (1642) goes through the Aristotelian natural philosophical corpus, summarizing the principle teachings from the Physics to the De anima. Magirus frequently refers to how difficulties have been resolved by the major Aristotelian commentators. While medieval commentators such as Avicenna, Averroës, and Aquinas receive mention, Magirus’s main sources are the more recent Zabarella,

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375 See Chapter 2, Section 3.1.
378 For Newton’s “Trinity College Notebook,” see Newton, CUL, Add. Ms. 3996. The second half of the Trinity College Notebook contains Newton’s well-known “Quaestiones quaedam philosophicae” or “Certain Philosophical Questions,” published by McGuire and Tamny as Certain Philosophical Questions. McGuire and Tamny’s choice not to publish Newton’s earlier reading notes from his scholastic and Aristotelian education has likely contributed to the obscuring of the importance of early modern scholasticism to Newton’s scholarship.
Likewise, Stahl’s *Axiomata philosophica* (1645) summarizes scholastic philosophy, organized according to scholastic axioms, each with its own set of rules. Stahl draws on an even wider range of commentators, particularly the scholastic theologians of the Counter-Reformation (such as Cajetanus, Bellarminus, Suarez, and Vasquez). Ducheyne is right to call attention to the scholastic origins of Newton’s philosophical style of reasoning. More specifically, however, Newton’s Trinity Notebook provides further insight into the intellectual development of the young Newton in its evidence of his reading practices and his use of commonplace lists.

Newton approached his assigned texts as a typical pupil of a seventeenth-century university. His Trinity Notebook contains neatly ordered pages of extracted notes listed under the given subject titles in each work. Newton extracted the basic concepts and listed them for easy future reference and use. He did not take particular notes from the more in-depth commentary sections, and rarely took down quotations or references to other authors. In this regard his early reading differed from his later work—particularly in chymistry—where quotations and references to other authors comprised a significant portion of the annotation and dog-eared referencing. Likely, at this stage in his career, Newton was only beginning to encounter the world of scholarship and, not yet aware of the organizational challenges associated with an abundance of printed books, found it unnecessary to record more than the basics of the Aristotelian system. Perhaps also, scholastic natural philosophy and metaphysics, though influential, did not capture his attention as did his subsequent reading of the mechanical philosophers. Regardless, the notebook takes a marked turn that appears to coincide with Newton’s discovery of Boyle and Descartes. As discussed in

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Chapter 1, the second half of Newton’s Trinity Notebook, titled, “Quæstiones quædam philosophicæ,” sets out a series of topics in natural philosophy. Each page has its own heading, such as “Of Motion,” “Of the Celestiall matter & orbes,” and “Of heate & cold.” Under each heading Newton lists a series of questions or statements related to the topics that he has gleaned from his reading. As noted in Chapter 1, this style of organizing his reading and natural-philosophical knowledge continued into later books that revealed an increasing immersion into the chymical literature. Additionally, Newton’s “Theological Notebook” (Keynes Ms. 2, 1680s) uses the same method, organizing quotations from Scripture according to various theological headings. And, as with the earlier Trinity Notebook, some headings have full pages of quotations and statements, and others have few or no notes. This style of organizing knowledge, which Newton continued throughout his career, has numerous parallels to the commonplace tradition of Renaissance Humanism and provides insight into Newton’s place in the context of early modern reading practices.

Ann Blair has emphasized the interaction between Humanism and science in the use among natural philosophers of the commonplace book. In this “quintessentially humanist method,” as Blair describes it, 

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382 Chapter 1, Section 2.1.


384 Ann Blair, “Humanist Methods in Natural Philosophy,” 541-51; see also Blair’s discussion in, “An Early Modernist’s Perspective,” 420-30. Blair is not the only author to apply developments in the history of the reader to scientific methods and progress. Some other examples include: Michael Hunter, ed., Archives of the
[O]ne selects passages of interest for the rhetorical turns of phrase, the dialectical arguments or the factual information they contain; one then copies them out in a notebook, the commonplace book, kept handy for the purpose, grouping them under appropriate headings to facilitate later retrieval and use, notably in composing prose of one’s own.\textsuperscript{385}

Humanist pedagogy formalized this method of commonplaces as an aid to memory for schoolboys. Adults were encouraged to continue the practice in their reading, and to add notes from their own experiences—usually from travel and conversation—for later use.\textsuperscript{386} Blair argues that for those with an additional interest in natural philosophy, the commonplace book became a location for the organization of natural knowledge derived from reading and from empirical experiences (observation and experiment). Moreover, commonplace techniques were used in print to make natural knowledge more accessible. Jean Bodin’s \textit{Universae naturae theatrum} may appear to the modern reader to have contradictory statements and to lack a logical and narrative flow, but as Blair points out, perceived as a printed commonplace book, it makes sense.\textsuperscript{387} Bodin’s work organized information gleaned from reading and observation for other readers to make easy use of, analogous to the fairly frequent books of quotations and references that enabled the beleaguered humanist to appear more erudite than the new overabundance of printed material would ordinarily allow.\textsuperscript{388}


\textsuperscript{385} Blair, “Humanist Methods,” 541.

\textsuperscript{386} Blair, “Annotating and Indexing Natural Philosophy,” in Frasca-Spada and Jardine, \textit{Books and the Sciences in History}, 71.

\textsuperscript{387} See Blair, \textit{The Theater of Nature}.

\textsuperscript{388} Blair, \textit{Theater of Nature}, 30-40.
I suggest that the structure of the commonplace book is the best way to interpret Newton’s notebooks, as they are organized according to specific topics and contain lists of reading notes or observations and experiences related to the given topics that were added over time. As Blair argues, the commonplace book developed in response to the explosion of textual sources that had become available in a developing culture of print. The invention of print had a dramatic effect on learning, leading to innovations in reading and associated practices for organizing information. Newton’s notebooks represent a planned structure of reading and storing information for later use. The undergraduate notebooks reveal Newton’s reliance on these techniques as his interests transitioned towards natural philosophy. Newton’s subsequent chymically-oriented notebooks thus become intermediaries between the undergraduate reading notes on natural philosophy and the laboratory notebooks of chymical experiments from the 1670s and 1680s. Locations for Newton’s organization of natural knowledge from his reading became natural places to record insights derived from experimentation, particularly when that experimentation was inspired by his reading of the chymical literature or enabled him to understand it further. The pattern that thus emerges fits into the structure described by Blair, whereby commonplace books of reading notes evolved into sites for the recording of natural information gained from observation and experiment.

The structure of Newton’s undergraduate notebooks is not that unusual in his context, nor is his continuation of the commonplace method into his more mature notes. The reason such structured reading techniques have not always been associated with the “greats” of the

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389 I have been assisted in this insight by Scott Mandelbrote, whose presentation, “Newton the Scholar” on 11 Oct. 2014, discussed the influence of the commonplace method on Newton’s reading practices.

390 See Johns, *The Nature of the Book*, for the development of a print culture and especially the effect of that culture on natural philosophy.
“Scientific Revolution” is more likely due to the tendency of manuscript commonplaces to be lost over time than that the historical figures actually avoided the method.\(^{391}\) Anthony Grafton details Johannes Kepler’s Protestant humanist training at Tübingen, which developed into a distinctively erudite yet empirical style.\(^{392}\) Kepler was well-read in classical and humanist texts, employing an art of reading developed by sixteenth-century scholars such as François Baudouin, Bodin, and J. H. Alsted that enabled readers to select correct texts and extract their true contents.\(^{393}\) Kepler organized such content in the same manner as his humanist contemporaries, Joseph Scaliger and Isaac Casaubon. Reading Plutarch’s *De facie in orbe lunæ*, for example, he gave a cursory reading that summarized general arguments in the margins after which he composed an index of the text to allow a more detailed secondary reading.\(^{394}\) Conrad Gesner’s bibliographic *Pandectæ* offers another example of the organization of natural knowledge through commonplace and indexing methods: in this case alphabetical indexes of available books and a topical guide to aid the reader in selecting appropriate texts.\(^{395}\) Adrian Johns draws the connection between the Royal Society’s organization of experimental “matters of fact” and Renaissance commonplace methods. Discrete “matter of fact” observations or experimental results were to be collected in large registers, the construction of which Robert Hooke explained using the technique of

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\(^{391}\) Another likely reason is the Enlightenment disdain for Renaissance Humanism captured in the concept of a Scientific Revolution that emerged in opposition to its dominant culture.


\(^{393}\) Grafton, *Commerce with the Classics*, 202.

\(^{394}\) Grafton, *Commerce with the Classics*, 210.

the commonplace. These new lists contained the “epistemic foundation-stones” for
generating civilized conversation in natural philosophy. As Johns describes it: “The
commonplacing of words was supplanted by the commonplacing of facts.”

Blair details the decrease in printed commonplace books towards the end of the
seventeenth century—in spite of the continued use of the practice in private into the
nineteenth—as a result of improved indexing techniques. Commonplaces were organized
topically and allowed for conflicting explanations to be listed under separate headings,
whereas indexes became strictly alphabetical and located discordant facts alongside one
another, forcing greater consistency. Often indexing coincided with commonplacing, as the
examples of Kepler and Gesner show. John Locke is another example of this phenomenon, as
he published “a new method of commonplaces” in 1686 describing how to use an
alphabetical index at the beginning of one’s personal notebook to keep track of the ensuing
topical entries. Johns lists John Locke as the last great producer of commonplace books.
However, Isaac Newton, a contemporary and friend of Locke and participant in English
experimental culture appears to use similar techniques, even if he never published a book in
the commonplace or index form.

As seen earlier, Newton’s organization of first his scholastic reading and then his
reading and observational notes on mechanical philosophy in his Trinity Notebook reveal his

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396 See Johns, “Reading and Experiment in the Early Royal Society,” in Kevin Sharpe and Steven
Zwicker, eds., *Reading, Society and Politics in Early Modern England* (Cambridge: Cambridge University
Press, 2003), 247. Johns points out, however, that experiment collecting practices differed in a significant way
from commonplace techniques in that they were specifically collective actions, rather than the individual acts
inherent in reading and constructing commonplace lists.

397 Blair, “Annotating and Indexing,” 74, 75-85.

use of commonplace techniques. In fact, the two pages prior to Newton’s “Quæstiones quædam philosophicæ” section of his Trinity Notebook are “A Table of the things following,” listing topics alphabetically along with page numbers.399 This is essentially an index of his ensuing commonplace organization of reading notes and ideas from the mechanical philosophy. This pattern, recorded in Newton’s undergraduate notebook of circa 1664, appears to draw on the same sort of method advocated by Locke in 1686. This index demonstrates Newton’s use of humanist methods of organizing knowledge in his earliest study of natural philosophy. Twenty years later, Newton would embark on his greatest work of indexing, however, in his attempt to organize the extensive figurative literature of chymistry.

Newton’s “Index Chemicus” appears to be preparation for a publication in the indexing style that was never realized.400 Its alphabetical lists of mythical and figurative symbols detail the occurrence of specific words throughout the chymical literature. Yet it also draws on some of Newton’s topically arranged manuscript notes from his earlier reading.401 It is bibliographic and intended to facilitate the use of the symbolic chymical literature. The composition of the Index was the culmination of a long practice very much within the

399 See Newton, CUL Add. Ms. 3996, fol. 87r-87v.

400 For more on Newton’s intentions for the “Index Chemicus” see Chapter 1, Section 5. See also Westfall, “Isaac Newton’s Index Chemicus,” 174-85.

401 These commonplace-style chymical notes are not limited to Newton’s chymical notebooks, they are present throughout his chymical manuscripts. In fact most of Newton’s chymical manuscripts are either direct transcriptions or specific notes extracted for later use in the composition of such documents as “Praxis” (Babson Ms. 420) and the “Index Chemicus” (Keynes Ms. 30). See Chapter 1, Section 5. A clear example can be seen in Newton’s notes, “Ex Lumine de Tenebris,” Babson Ms. 414, Huntington Library, San Marino, CA, in which he has compiled a series of summaries and translations from his reading of the French, La Lumière sortant par soi même des tenebres. The page references on this manuscript correlate directly with dog-eared pages in the original work in Newton’s library (Trinity NQ.16.117). Frequently the dog-ear points straight to the beginning of the quotation that Newton translates in the manuscript.
humanist style. Newton’s dog-ears in his chymical books might be evidence of his initial read-through of a given book, and his indication of where to return for a more detailed investigation, in a similar vein to Kepler’s reading of Plutarch. In fact Newton’s dog-ears may represent an evolution for him in the commonplace technique as the dog-ears were used to organize his initial reading of a text. Newton’s copious pages of chymical manuscripts—so many of which are indeed quotations or summaries—would then indicate the commonplace level of reading and his recording of useful information for later use. Finally these notes and sources were compiled, in the 1680s, into a single useful index for coping with the confusing array of images used by different chymical authors, as a reference for his own prior commonplace-style reading, and possibly as a preliminary work for publication in the indexing style.

When Newton’s chymical notes and dog-ears, together with the Index Chemicus of the 1680s, are considered alongside his laboratory notes, composed in the 1670s and 1680s, it becomes clear that he engaged in commonplacing and data gathering simultaneously. Additionally, this was the same period in which he constructed his lexicon of prophetic figures and their literal meanings, drawn from Scripture, the Aramaic Targums, and the oneirocritical writings of Achmet the Arabian. The list of prophetic figures also represents a topical organization of knowledge with multiple sources or distinct quotations gathered under a single prophetic figure. Given Newton’s use of commonplace and indexing techniques throughout his life, any claim that Newton’s scientific methods informed and prefigured his textual scholarship stands to be revisited. At the very least the methods were employed simultaneously. More likely, Newton’s approach to texts reflected that of his predecessors and his own humanist training.
Nonetheless, when considering a figure like Newton in context, one must ask the question of what remains the same and what actually does differ in his approach to texts. This section has demonstrated Newton’s similarities to the commonplace tradition in his indexing and organization of knowledge. In fact, Newton’s cross-comparative method, discussed in Chapter 2, appears to be a natural outgrowth of the need for consistency resulting in an index-conscious commonplace approach. Buchwald and Feingold’s argument for the similarities between Newton’s cross-comparison and his method of averaging in working with scientific data could thus be seen in a new light. Their comparison of Newton’s unique method of averaging measurement data with his contemporaries’ search for the best single measurement is a compelling example of Newton’s methodological innovation in experimental natural philosophy. However, the influence from this method on Newton’s cross-comparison of texts that they deduce must be tempered by the stronger connection Newton’s cross-comparison has to reading practices that he began to develop at the earliest stages of his education. There is still a connection, in his drive for consistency and the assumption of an accessible truth within both textual and empirical data. But rather than Newton’s experimental method driving his rigorous cross-comparison of texts to find an emergent general truth (an average of sorts), this drive for consistency and assumption of accessible underlying truth is logically prior to both. It reflects a realist attitude towards both natural and historical truth and is embodied in his descriptive-translational approach to texts. This is particularly evident in Newton’s strong interest in the nature of the figurative language used in symbolic texts. Newton’s lists are not just aide-memoires, they are lexicographic. Rather than his rigorous search for true statements about reality embedded in

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linguistic forms deriving from a scientific mindset that he later applied to texts, Newton developed an interest in how language conveyed true information about the world from the beginning of his time in Cambridge.

4. Newton and Language

In an early notebook now at the Pierpont Morgan Library, Newton recorded the rudiments of a linguistic study as part of his investigation into a universal language. This notebook, begun in 1659 before his arrival in Cambridge and added to through his first year at Trinity (1661) contains an intriguing record of Newton’s early interests, arranged as a rudimental commonplace. These include chymical recipes for paints, medical remedies, and animal bait mixed together with pages containing tables of astronomical observations, astronomical charts and even a calculation of the Copernican system. After an extensive astronomical table and six pages of complex algebraic equations, the notebook starts a new topic of study, phonetics, which fills the second half and was almost certainly composed in 1661. Newton copied a letter, presumably recently written, to a “Loving Friend” who had become sick on account of drinking too much. After strongly encouraging this friend’s repentance, he expressed his hope that God would grant him a long, healthy, and sober life. While the particulars give us intriguing insight into the personal piety of the teenage Newton, what matters to the discussion at hand is that Newton proceeded to transliterate the letter into the phonetic symbolism he had begun to describe on the previous page. He followed the example


404 The opening pages of the notebook indicate, in Newton’s hand, that he purchased it from Edward Secker in 1659 for two shillings. See Turnbull, ed., Correspondence, vol. 1, 1; and Ralph Elliott, “Isaac Newton as Phonetician,” Modern Language Review 44 (1954), 5-12, for the dating of this section of the notebook.
letter with lists of symbols, example words, and some descriptions of how to make various sounds. The remaining forty pages of the notebook are filled with a series of lists of alphabetically arranged words, each list fitting into one of fifteen categories. The category headings include: “Artes, Trades, & Sciences,” “Cloathes,” “Of a Church,” “Of Diseases,” “Of the Elements,” and “Of Man, his Affections, & Sences.” Beside each alphabetized word listed under these headings, Newton had left space to fill in either their phonetic transliteration, or more likely, their final form in a still-to-be-developed scheme for a universal language.405

In a separate manuscript written at the same time, titled, “Of An Universall Language,” Newton described a scheme for creating a general language. He discussed how the diversity and arbitrary nature of the dialects of existent languages necessitated a universal language derived from “the natures of things themselves which is the same to all Nations & by which all Language was at the first composed.”406 Newton sought the underlying operation of language itself: how “one man may signify to another in what state any substance is.”407 At its heart, language was the translation of things into verbal or phonetic symbolism based on the nature of the things in order to communicate between people. Each phonetic piece of a given word or series of words signified meaning regarding the nature and state of something. Newton then proceeded to give a list of rules governing how this process can be generalized

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405 Newton, “Pierpont Morgan Notebook,” fol. 27v-52v.

406 Ralph Elliott, “Isaac Newton’s ‘Of an Universall Language’,” Modern Language Review 52:1 (1957), 7. Elliott dates the manuscript to 1661 due to its similarity of content to the Pierpont Morgan Notebook, and its similarity of handwriting to Newton’s earliest script.

407 The full quotation is: “And the use of Language is that one man may signify to another in what state any substance is, hath beene, shall bee, may bee, should bee, is wished to bee, is commaundd to bee &c.” Elliot, “Newton’s ‘Of an Universall Language’,,” 7.
to create a universal language. This appears to be the first of many such lists of rules, lists that would later include his rules for the interpretation of Scripture and rules for reasoning in experimental philosophy.

Newton’s linguistic rules to determine the universal language are unsurprisingly comprehensive. His opening task is to “Gather in each Language an Alphabeticall Table of all substances (as of Angell, House, Man, I, thou, hee) or affections (as glorious thing, beautiful thing, loving thing, hot thing, my thing: this, that,) against which set the word designed to signifie the same thing in the universall language.” This provides a rather obvious explanation for the forty-page list of alphabetized English words according to their general categories in the Pierpont Morgan Notebook. Newton, having determined the rules for making a universal language, had composed his initial list in English and only waited the completion of the by-no-means simple task of actually creating that language to fill in the translations in his notebook. Other rules included the operations of conjugations, comparisons, cases, mood, time and number, and finished with a list of letters and diphthongs to govern pronunciation.

There is a possibility that these lists—particularly the initial phonetic lists in the Pierpont Morgan Notebook—are merely reading notes from works on language that Newton had become newly exposed to at Trinity. Attempts to create a universal language were certainly prevalent in seventeenth-century scholarship. Ralph Elliot suggests that Newton’s brief foray into the field drew upon George Dalgarno’s *Ars signorum vulgo character universalis et lingua philosophica* (1661) as well as earlier English publications on the

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408 Elliott, “Newton’s ‘Of an Universall Language’,” 7, 12.
topic. Nonetheless, Newton’s list of rules fits later patterns of his own writing and his forty-page list of English words appears to be a preparation to create his own list of universal vocabulary according to those predetermined linguistic rules. Moreover, his phonetically transliterated letter is clearly his own work and indicates that the whole set of manuscripts were more than a casual record of his reading, but a topic that engaged him intellectually and that he at one point intended to pursue further. This was one of Newton’s earliest systematic studies, and it involved the nature of language.

No further Newtonian autographs related to linguistics and the foundation of a universal language have been found and it is safe to say Newton did not formally pursue this early study, even though his interest in the topic remained. However, evidence of his ongoing interest in linguistic signifiers remains. The Pierpont Morgan Notebook itself contains a brief instance of Newton’s use of Thomas Shelton’s shorthand notation as a kind of cipher, disguising, perhaps, a fairly dubious folk remedy for ague. Newton used the same shorthand to encipher his list of confessions before and after Whitsunday 1662, in his Fitzwilliam Notebook, and in his description of the creation of souls in the “Quæstiones

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409 Elliott, “Newton’s ‘Of an Universall Language’,” 4. These include Rev. Cave Beck’s *Universal Character* (1657), Thomas Urquhart’s *Logopandecteision* (1653) and Francis Lodwick’s *A Common Writing* (1647) and *The Ground-Work, or Foundation Laid (or so intended) For the Framing of a New Perfect Language: And an Universall or Common Writing* (1652).

410 Epistolary evidence suggests that Newton continued to read the literature on universal languages well into his adulthood. An undated letter (possibly from as late at 1679), indicates that he had at one point borrowed John Wilkin’s *Essay towards a real Character and a Philosophical Language* (1668) from an unknown friend. See Turnbull, ed., *Correspondence*, vol. 2, 296-7 for this letter and its tentative composition date.

411 Newton, “Pierpont Morgan Notebook,” fol. 13r. The remedy entails carrying around on a piece of paper the following text: “When Iesus saw ye Crosse he trembled and he shooke, then saide the Iews what hast thou an ague or a fever or dost thou feare. No saide Iesus I have neither ague nor fever neither do I fear, but whosoever shall carry these words shall neither be troubled with ague nor fever. So be it. Amen, amen.”
quædam philosophicæ” section of his Trinity Notebook. Newton’s use of this cipher was short-lived, but it indicates one avenue for the expression of his early study of the system of how languages signify meaning. Newton’s use of Shelton’s shorthand demonstrates at least a cursory investigation into forms by which words can be alternately represented, and a youthful dalliance with restricted text that had a literal meaning accessible to a select enlightened group. And, while Newton abandoned ciphers in his own writing, he would soon find an abundance of enciphered language in the symbolic writings of chymistry and biblical prophecy.

5. Translation of the Prophetic Figures

Chapter 2 discussed Newton’s conception of the language of biblical prophecy. For Newton, the figurative imagery used in prophecy represented a kind of dialect used by “the more understanding sort of men.” He understood there to have been a kind of prophetic class of wise men in ancient Near-Eastern societies for whom the figurative language functioned as an actual language with accompanying vocabulary and syntax. Newton took a literal approach to the translation of this figurative language, such that once the exact meaning of a symbol or image had been determined—the sun representing the king or head of state, for example—that meaning was applied to each instance of its use in multiple locations within the Bible. After this initial process of direct translation the prophetic texts

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413 Chapter 2, Section 4.2 and 4.4

414 Newton, Yahuda Ms. 1.1, fol. 28r.
could then be read as plain accounts of events to come. As Chapter 2 demonstrated, Newton composed a lexicon of symbols and their plain meaning using a rigorous cross-comparison of scriptural texts, interpretations from the Aramaic Targums, and the alleged dream-symbol interpretations of ancient Persian, Indian and Egyptian wise men recorded by “Achmet the Arabian”. Echoing his earlier interest in the mechanics of language, Newton asserted in the mid-1680s, “He that would understand a book written in a strange language must first learn the language & if he would understand it well he must learn the language perfectly.” The prophets all wrote in “one & the same mystical language as well known without doubt to the sons of the Prophets as the Hieroglyphic language of the Egyptians to their Priests.” Before being able to “understand the old Prophets (as all Divines ought to do) [one] must fix the significations of their types & phrases in the beginning of his studies.”415 Just as one of the first steps in creating a universal language involved determining the relationship between things and their linguistic signifiers, so the theologian (Divine) must first determine the system of signification between prophetic figure and literal meaning. For Newton the prophetic language was no different from Egyptian hieroglyphics, and indeed had a similar relationship, both in its use of figurative signifiers and its corruption at the hands of those who misunderstood the literal nature of its imagery.

Newton understood the symbolic language of biblical prophecy to consist of figurative signifiers whose basic literal meaning was all-too-easily obscured by the imposition of “fansy” when accurate knowledge of its translation was neglected. Describing the prophetic language he stated,

And this language so far as I can find, was as certain & definite in its signification as is the vulgar language of any nation whatsoever: so that it is only

415 Newton, Keynes Ms. 5, fol. Ir.
for want of skill therein that Interpreters so frequently turn the prophetic types & phrases to signify what ever their fantasies & Hypotheses lead them to.\footnote{Newton, Keynes Ms. 5, fol. Ir.}

In a document written about a decade later, after 1693, related to his work on the origin of Gentile religion (New College Ms. 361(3)), Newton explained the symbolic meaning of Egyptian hieroglyphics in a very similar way to what he had written earlier concerning the prophetic figures:

“The Egyptians in those days writing by hieroglyphics affected \textit{sic} represented all by symbols... a flood \textit{the symbol} for an invasion, Deucalions flood for the invasion of Greece by ther \textit{sic} armies of Sesostris in the reign of Deucalion.... A man or Beast with two or more faces or heads for a king with as many kingdoms. A man with the tail of a fish for a mariner. ... A Dragon for an army. And such symbols being rightly understood may give light into the history of the fabulous ages.”\footnote{Newton, New College Ms. 361(3), fol. 163r. The originally deleted “the symbol” has been retained in this quotation to highlight Newton’s awareness of the symbolic nature of his source material. I am grateful to Mordechai Feingold for making me aware of this passage.}

Some of these images, such as a flood symbolizing an invasion or multiple heads the divisions of a kingdom, have the same literal meaning as those found in Newton’s lexicon from his early treatise on Revelation (Yahuda Ms. 1.1).\footnote{See Newton, Yahuda Ms. 1.1, fol. 20r, 21r.} And, just as the images of the prophetic dialect could be distorted in their interpretation, Newton believed that the plain meaning of the Egyptian symbolic language had become twisted towards idolatry.

In the New College Ms. 361(3) manuscript, Newton perceived the original figures behind the gods of Saturn and Jupiter to have been conquering heroes whose legacies were later distorted, making them into gods. While this Euhemerist interpretation of history was not a Newtonian innovation, his description of how the corruption to idolatry progressed

\footnote{Newton, Keynes Ms. 5, fol. Ir.}
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shows a specific focus on the misinterpretation of symbolic language that is characteristic of his approach to ancient texts. Originally, the first of the Egyptian kings (the father of Amon) was represented as “a man with a scythe the symbol of for Saturn in memory of his conquering the lower Egypt a fertile corn country,” and the second (Amon) as “a man with rams horns the symbol of for Jupiter Ammon in memory of his conquering Libya a country abounding with sheep.” This second king was also represented as “a man riding on an eagle with a thunderbolt in his hand the symbol of for Jupiter Belus a king soaring high in dominion & making great wars.” These historical figures became mythological gods associated with specific symbols: Saturn’s scythe and Jupiter’s ram horns or eagle with lightning bolt. The Egyptians then spread their pagan religion to the Greeks and the rest of the ancient peoples. What had originally been a mere pictorial representation to signify an historical figure or event had been distorted into a religious symbol related to a pagan god. This was the dangerous outcome of not understanding figurative language in a translational manner. Any approach to texts, and particularly symbolic texts, required careful determination of the relationship between signifier and real object or event, a concept central to Newton’s understanding of language expressed in his early rules on creating a universal language. Newton applied this understanding of the relationship between linguistic signifier and object to Egyptian hieroglyphics:

The writing of the Egyptians in those ages was by hieroglyphicks & this made them put hieroglyphic figures for their Gods. (And the oldest histories of those

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419 Euhemerism is the theory—first advocated by Euhemerus of Messina (c. 300 BC)—that suggests all ancient gods were notable heroes who had been deified after their deaths, see Buchwald and Feingold, *Newton and the Origin of Civilization*, 146.

420 Newton, New College Ms. 361(3), fol. 163r. Select deletions retained, see n. 417.

421 Newton, New College Ms. 361(3), fol. 163r.
times being written in such figure characters, (are scarce better to be understood then by knowing the signification of those characters.) & therefore we are to look upon those characters not as fabulous, but as words of an ancient language in which the histories were originally written signifying things by their properties) (the interpretation of which is a sort of criticism which may be usefull for understanding the histories originally written in the language[.)]

The figurative nature of the hieroglyphic language contributed to Egyptian idolatry as the original and literal signification of the figurative characters was distorted.

Newton found similar examples of misunderstanding leading to idolatry in the figurative language of biblical texts. In another treatise on Revelation from the mid-late 1680s (Yahuda Ms. 9.1), Newton described a recurring prophetic figure, “the world natural with its severall parts,” whose plain meaning was “a world politick or great kingdom.” As Newton stated, “its very proper to represent the end of such a kingdom by the end of the world.” In fact, when the New Testament spoke of the end of the world at Christ’s second coming, it was actually referring to “that great body politick represented in Daniel by the four Monarchies [themselves represented by four beasts],” a real political entity coming in the future. However, this “figurative way of speaking not being understood by the common people, they have framed a notion as if the world natural should then be at an end.” This misunderstanding of how the figurative language of prophecy functioned led people falsely to believe in a physical end of the natural order at Christ’s second coming, rather than a millennial reign of peace and prosperity. In Newton’s more mature theological writing, his concern for the dangers of misinterpreted figurative language resurfaced as he examined the language used in the Apostles Creed. In a crossed-out section of a draft on the history of the

422 Newton, New College Ms. 361(3), fol. 163r.

423 Newton, Yahuda Ms. 9.1, fol. 1r.
church from the 1710s (Yahuda Ms. 15.3), Newton takes issue with requiring creedal belief that Christ “Sitteth at the right hand of God the father Almighty.” This statement had originally been written “in the figurative language of the Prop[hets] & interrupts the sense of the Latin Creeds.” Rather, “the [language] of the Creed should be plaine.”\textsuperscript{424} At this point in his life and his theological studies, Newton was concerned to recover the plain original Creed used by the uncorrupted original church. Since the Creed was intended to encapsulate only the necessary beliefs required for initiates to the faith, figurative language would have been excluded to avoid the perils of misinterpretation. Newton would have interpreted the image of Christ sitting at the right hand of the Father as a statement of Christ’s sharing in the dominion of God, not that he was physically seated in a mysterious location next to a physically manifested God.\textsuperscript{425}

In these examples, Newton’s concern for the misreading of figurative language seems to indicate an opposition to a literal approach to symbolic language. This is not the case, however. Newton was opposed to an untranslated literal approach. As discussed in Chapter 2, he criticized “the common people & some of the heathen Philosophers who understood not the prophetick language [and] took it in the litteral sence.”\textsuperscript{426} The problem was not that prophetic figures shouldn’t be allegorized. Newton was opposed to allegory in the reading of prophetic symbols.\textsuperscript{427} Rather, the figurative language needed to be translated first and then

\textsuperscript{424} Newton, Yahuda Ms. 15.3, National Library of Israel, Jerusalem, fol. 43r.

\textsuperscript{425} See my discussion of Newton’s doctrine of God and Christ as focused on dominion in Greenham, “Newton’s Doctrine of God,” (forthcoming).

\textsuperscript{426} Newton, Yahuda Ms. 9.2, fol. 140r. See chapter 2, section 3.5.

\textsuperscript{427} See Newton’s Rules for interpreting the language of Scripture, particularly Rule 5: “He that without better grounds then his private opinion or the opinion of any human authority whatsoever shall turn Scripture from the plain meaning to an Allegory or to any other less naturall sense declares thereby that he reposes more
taken at its plain or literal meaning. The translational element was the key to understanding the prophecies. Improper translation was at the heart of Egyptian idolatry and the transmission of that idolatry to the other nations. Newton approached figurative languages, both in the 1680s and 1690s, and even in his later work, with the linguistic concern he had begun to cultivate in his earliest writing on the universal language. Language consisted of a combination of complex signifiers that needed to be deciphered—usually through the use of extensive alphabetized vocabulary lists—and once deciphered revealed a basic structure and plain representation of an objective world of things. This objective world, lying behind the linguistic signifiers, such as the prophetic symbols, was epistemologically accessible, containing true statements with plain meaning once deciphered. Thus ancient history recorded in hieroglyphic signs could be read as a straightforward record of events that occurred in the past. Likewise prophetic images could be translated into plain descriptions of future history, events that were going to unfold. In neither of these instances should a literal meaning be applied to the direct appearance of the figurative descriptions prior to their translation, nor should an allegorical meaning—seeking a metaphysical or moral truth as the real meaning of the image—be applied. Rather, the true and straightforward meaning arises from a descriptive-translational approach.

trust in his own imaginations or in that human authority then in the Scripture & by consequence that he is no true believer”, Yahuda Ms. 1.1, fol. 13r. See also chapter 2, section 4.1.

This is not that different from non-figurative language, as a degree of translation from verbal or written signifiers to underlying meaning lay, for Newton, at the heart of all language.

In many ways Newton’s translational hermeneutics reflects the Protestant emphasis on the literal translation of Scripture from the biblical texts in their original languages. One of the central components of the new way of reading the Bible proposed by the Reformers was an excision of the allegorical sense of the text and a focus on the plain meaning of the words of Scripture, in their grammatical and historical senses. Peter Harrison argues that the de-allegorical and literal focus in Protestant hermeneutics influenced the movement away from perceiving natural forms as symbols or emblems of deeper moral or ideal truths within approaches to the study of the natural world. Harrison claims that the literalist mentality of the Reformers gave a direct meaning to the words of Scripture and precluded giving natural objects referential meaning, allowing new
6. Newton’s Translational Principle in the Symbolic Texts of Chymistry

Thus far we have considered the application of Newton’s concern for the nature of language and his descriptive-translational approach to the language of biblical prophecy and ancient history. However, what of his other textual interests, particularly the symbolic texts of chymistry? I argue that Newton’s linguistic interest and his descriptive-translational approach to texts—and symbolic texts in particular—was very much present in his work with chymical texts. Chapter 1 demonstrated Newton’s unusual method of dog-ears in his reading of texts. His books contain many traces of this method at work, whereby he would fold the corner of a page such that the point of the corner rested directly on a given word or quotation of interest.430 As discussed in Chapter 1, some of the prevalent areas of interest in Newton’s chymical library included references to the actual product or substance behind a symbolic name and the chymical or procedural meaning of a given mythological symbol or story. Additionally, a few dog-ears actually pointed to Newton’s reading of the origins of idolatry approaches to the organization of nature. See Peter Harrison, The Bible, Protestantism. My discussion of Newton’s direct-translational use of the symbolic expression of natural knowledge in chymistry provides a new perspective on Harrison’s thesis. Harrison characterizes Newton’s obsession with alchemy and biblical prophecy as an unconscious reluctance to let go of the old way of looking at the world and a failed attempt to unify science and biblical exegesis, Harrison, Bible, Protestantism, 263, 270-71. However, Newton’s translational approach to the symbolic literature, of both chymistry and prophecy, indicates his extension of the generally literal Protestant hermeneutics into the symbolic literatures, identifying them as a specific language—similar to Hebrew or Greek—with grammatical rules and a plain historical or natural sense. In this regard Newton’s overall translational approach has direct affinity to Protestant hermeneutics even as it applies similar hermeneutics to non-biblical symbolic texts. While it is beyond the scope of this dissertation to explore these affinities in detail, this affinity raises a number of intriguing questions for future study. I suggest that to a large degree Newton’s direct-translational approach and his cross-comparative organization of knowledge have the same source as the Reformers’ literalism in biblical hermeneutics: humanist approaches to texts. Nonetheless, given Newton’s great concern for the corruption into idolatry of incorrectly interpreted symbolism—in both word and world—and his source for his biblical prophetic interpretation in the Puritan Joseph Mede, Newton’s particular development of these methods—at least of his direct-translational approach—was likely affected by his exposure to Protestant hermeneutics.

430 Chapter 1, Section 4.2.
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in the misreading of the figurative chymical language. Newton’s chymical writings, particularly his experimental notes and the “Index Chemicus”, exhibit these same patterns of seeking the plain substantive and procedural meaning of the chymical symbolism and the origins of idolatry in its misinterpretation. In these works, therefore, the translational nature of his chymical research can be seen.

For Newton, as for most chymical authors and practitioners, the mythological language and symbols of chymistry referred to specific procedures that had been disguised in symbolic forms. Usually the stated intention for these symbolic forms was to keep knowledge of the Art from the unworthy. Newton read and deciphered these forms, translating them into tangible experiments that he then performed in his chymical laboratory. Newton also used his laboratory experimentation to determine the signification of unknown symbols. In a notebook containing entries of various experiments throughout the 1660s to 1690s—including his investigations of colour and optics—and reading notes from Boyle’s chymical writings (CUL, Add. Ms. 3975), Newton wrote down a dated entry in Latin that was subsequently crossed out. The translation is as follows:

May 10 1681 I understood the luciferous ♀ [Venus] and the daughter of ♂ [Saturn] to be the same, and I understood one of the doves. May 14 I understood the trident. May 15 I understood There are certain Sublimations of ♂ [mercury] etc. as also the other dove: to be sure the Sublimate that is only feculent ascends white from its own bodies, and a black residue is left behind in the bottom, which is washed away by solution, and ♂ [the mercury] is sublimed again from the cleansed bodies until the residue no longer remains in the bottom. Would not this most purified sublimate be the caduceus?

431 For some examples of this understanding in early modern chymistry, see Nummedal, “Words and Works,” 330-37; Newman and Principe, Alchemy Tried in the Fire; and Newman, Gehennical Fire.

432 See Chapter 1, Section 6.

This passage is remarkable in the present context because it actually records Newton’s developing understanding of the meaning of different chymical symbols. Such figurative and mythological expressions as the daughter of Saturn or the doves of Dianna (one of which Newton believed he understood on May 10, 1681) referred to specific chymical products or intermediary results of a given procedure. Through personal experimentation in the laboratory, Newton was uncovering the true meaning behind these symbols. Repeated washing of mercury sublimate from its residue eventually yielded a sublimate that had no residue that Newton speculated may be the actual product behind the caduceus symbol (a rod entwined by two serpents traditionally wielded by the god Mercury).

Newton appears to have recorded the exact details of his new understanding for these symbols in a parallel set of chymical notes (CUL, Add. Ms. 3973). Between descriptions of experiments under the heading, “Experiments Feb 1679/80” and another set labelled, “Experiments Aug. 1682,” Newton recorded on an empty page some notes on the meaning of certain chymical imagery. The location of these descriptions within this notebook indicates that Newton likely wrote them down around the same time as his dated entries from 1681 in the first notebook (CUL, Add. Ms. 3975). It is thus highly likely that these notes indicate his specific understanding of the plain substantive meaning of symbols for the trident, doves, and the caduceus. Newton wrote that “the Babylonian dragon killing all things with its...
venom, but conquered by the soothing of Diana’s doves, the Bond of mercury” referred to
the “spirit” (vapour) produced when “the green lion” (a specific chymical product, possibly
sal ammoniac) was added to “the central salt of venus” (a copper solution, possibly the
“luciferous ♂”).\(^{434}\) This “central salt of venus” (possibly a solution of copper and mercury)
was another specific chymical substance that Newton referred to regularly in his
experimental notes (measuring its weight and using it to react with other substances) and the
plain meaning of “Diana’s doves.”\(^{435}\) Newton then recorded his understanding of the trident
and its relationship to the doves and Mercury’s caduceus:

Neptune with his trident leads the philosophers into the garden of the wise.
Neptune therefore is the watery, mineral menstruum and the trident the ferment
of water similar to the caduceus of mercury, with which mercury is fermented,
namely the two dry doves with dry, martial venus.\(^{436}\)

Thus Neptune referred to a mineral menstruum (a solution of water and dissolved
substances), and his trident to a specific reaction, or substance causing a reaction, involving
that menstruum (solution). This reaction was likely a step on the “wet way” to produce the
Philosopher’s Stone, discussed in Newton’s chymical sources, and thus the meaning of

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\(^{434}\) Newton, CUL, Add. Ms. 3973, fol. 12v, Newman trans. See n. 83 for the possible meaning of the
green lion as sal ammoniac.

\(^{435}\) In my descriptions of Newton’s plain understanding of certain chymical symbols, I attempt to
provide some idea of the substance Newton describes in early-modern chymical terms according to modern
chemicals in brackets. This is intended as an aide to the reader to see how Newton uses descriptions such as
“the green lion” or “the central salt of venus” as direct references to specific chymical compounds. Many of
these terms or alchemical symbols have discernable analogues in modern chemicals, “venus” or ♂ as copper and
“chaos” or ♀ as antimony. Our understanding of exactly what chemical substances (according to modern
chemistry) Newton used in his experimentation when he describes them using these early modern chymical
referents is still a little uncertain, but what does become clear as we work through his chymical experimental
notes is that these descriptions have direct meaning as specific substances or products that Newton actively
manipulated in the laboratory.

\(^{436}\) Newton, CUL Add. Ms. 3973, fol. 12v, Newman, trans. The original reads: “Neptunus cum tridente
induit Phōs in hort. soph. Ergo Neptunus est menstruum aqueum minerale ac tridens fermentum aquae simile
caduceo ♂ quocum ♂ fermentatur. vizt Columbae duæ aridae, cum venere arida martiali.”
Neptune leading the philosophers into the garden of the wise. In a similar way, the caduceus of mercury represented a reaction or reactive substance and involved the aforementioned doves of Diana (possibly involved in the “dry way” to the Philosopher’s Stone).\(^437\) Newton then gave a more direct translation of the caduceus image into descriptive chymical meaning:

> The caduceus of ♂ [Mercury] is certainly a double Θ [vitriol] fermenting crude white ♀ [antimony]. For these tender metallic principles are not fused, and have an affinity both among themselves... as well as with ♂ [mercury]....\(^438\)

Here, the twin serpents referred to a double vitriol (possibly two dissolved sulphates) reacting with white antimony (some antimonial product), while at same time demonstrating deeper internal properties of the chymical materials. The two serpents twining about a central rod in the caduceus image also indicated the metallic principles of the vitriol (sulphates) that have an affinity to each other—hence their interconnectedness in the symbol—and to mercury, the rod that-upholds them, while yet remaining distinct. In this instance Newton actually interpreted the caduceus image to contain specific knowledge of the material composition of the reagents involved in the reaction, essentially stating that the figurative image encapsulated a specific understanding of the reaction according to chymical matter theory.

Newton interpreted an ancient symbol—Mercury’s distinctive rod—as containing truths of natural philosophy available to those who could properly translate the figurative language. In the same way, he understood the figurative descriptions of the Apocalypse to...

\(^{437}\) See for example, Newton, Keynes Ms. 30.1, fol. 25r.

\(^{438}\) Newton, CUL Add. Ms. 3973, fol. 12v, Newman trans. The original reads: “Certe ♂ Caduceus est Θduplex fermentans ♀ crudum album. Hæc enim principia metallica tenera non fusa sunt, et affinia tam sibi ipsis (ut ex reg ♂ & reti patet) quam ♂ (ut ex fermentatione Reg cum ♂ patet.)”
contain specific future historical truths available to the adept translator. These chymical images were not allegorical. They did not contain general moral or idealistic concepts vaguely related to the chymical procedures. They did not indicate a combination of spiritual awareness or transformation occurring in conjunction with the physical chymical reactions. Nor did they imply a mystical connection between the natural world and metaphysical principles. Instead they had a plain descriptive meaning in chymical procedures and products. And some symbols contained specific truths of natural knowledge. Newton believed that the alchemical authors, either the ancients or more recent authors, had enciphered these truths within the chymical symbols. In biblical interpretation, the plain meaning of the symbolic language could be discovered through cross-comparison of texts and consultation of ancient translational sources. In chymistry, yet again cross-comparison yielded the literal meaning of the figurative language, yet this time it was the synthesis of textual research and experimentation that gave access to the original meaning.\(^{439}\)

As discussed in Chapter 1, Newton’s “Index Chemicus” reveals the incredible extent to which he attempted a cross-comparison of the alchemical literature, locating the instances of chymical symbols and words across a vast array of chymical books at his disposal. This *magnum opus* of organizational chymistry places Newton in the ranks of seventeenth-century literary scholarship, in its use of indexing to keep track of an overabundance of printed chymical texts. However, the “Index Chemicus” also reveals Newton’s specifically translational interest in the figurative language of chymistry. Most of the alphabetized entries begin with the specific figurative word or phrase and a list of alternative associated symbols.

\(^{439}\) See Chapter 1, Section 6 for a discussion of the synthesis of experimentation and textual research in Newton’s chymistry.
or images, followed by a brief elaboration of the initial word. The entry then gives specific quotations and the references to the given figurative word or phrase in multiple chymical books. For example, the entry for “Columbæ [Doves]” begins as follows:

The Doves of Venus are the Doves of Diana[,] Added to Venus [copper] or to the green Lion which they conquer. Introit. apert. p. 6, 16, 52, and therefore they are the crescent-shaped Diana[,] ib p. 54, 63. & Arcan. Hermet. p. 17, 32, 38. & more simply Diana. Philal. in experimentis. p. 1, 4, 5. Their preparation is very tedious and difficult[,] Marrow of Alk. part. 2. pag. 16. and therefore they are the salt of metals and the salt of nature & Chaos [antimony] [illeg.] & their preparation is the dry way. Grassæus in Arca p. 355 & Epist p. 541.

Newton begins by grouping all the figurative names for the same object together—the Doves of Venus and the Doves of Diana refer to the same thing—and gives a brief description of the image accompanying their reference. He explores how their basic nature (duality) resulted in the specific moon or crescent-shaped imagery for Diana (described as the Moon in an independent entry further on in the Index). As seen in his earlier entry in his laboratory notebook, the image of the doves involves them conquering the green Lion. Newton also refers to the “dry way” to the Philosopher’s stone that the preparation of the Doves accompanies, and the general agreement of the chymical literature that this is the more difficult method. Each statement is a quotation or summary from a specific source, grouped together to form a coherent entry. However, in the midst of this description, Newton also details what the two Doves actually are: metallic salt and natural salt respectively, combined with “Chaos” (antimony). Newton gives a full description of the individual symbol or

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figurative phrase, its location in the literature, how its true meaning might explain its symbolic associations, and its plain meaning as a chymical product or procedure.

The pattern repeats across other entries. Under “Caduceus,” Newton lists a number of associated symbols, “Vegetative Saturn [lead], dry foliated water, the third fire, the bird of Hermes,” and a more specific ‘translation,’ “a bath [solution] of gold and silver.” While it appears that his understanding of the caduceus has diverged from his earlier notebook entries, he nonetheless gives a specific meaning and relates that meaning to the maze of related figures. Similarly, other images receive extensive matching to their counterparts in the world of chymical symbols and often have objective meanings listed. “Latona” has figurative counterparts as the daughter of Jupiter, Venus, Juno, or the Egyptian goddess Isis, a woman dark and swarthy, but has literal meaning as copper or bronze, or an imperfect composition of gold and silver. In reaction it whitens things perfectly and makes lead white. Likewise the entry for “Quintessence” gives its figurative meaning as “the perfect Elixir … our gold … red virginal milk most fragrant and healthy,” while also describing it as “vegetative mercury with which one makes dissolution and potable gold.” This “vegetative mercury” results from a sevenfold sublimation of mercury which had been extracted from vulgar mercury and also goes under the figurative names of “Vegetative Saturn” and

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441 Newton, Keynes Ms. 30.1, fol. 19r. The original reads: “Caduceus, Saturnia vegetabilis, aqua sicca foliata, ignis tertius, Avis Hermetis, balneum ☉ et ☽ ....”

442 Newton, Keynes Ms. 30.1, fol. 51r. “Latona Iovis filia, ex sole et Luna compositum corpus imperfectum, æs, Venus, Iuno, Isis, femina fusca et subnigra, ex vili loco extracta in digniorem sublimanda, & si ex digniore in viliorem submergenda nempe in fimum. Ibi enim albescit perfecte et fit plumbum album quo habito fac opus mulierum. Maier. Embl. p. 31, 33, 131.”
“Mercury’s Caduceus.”[^443] This description thus relates the Quintessence to Newton’s earlier laboratory notebook entry on the possibility that his most pure result of repeatedly subliming mercury may be the caduceus. At this point it appears that Newton believed his earlier experimental product from repeated washing of mercury sublimate was the Quintessence, although he still notes its symbolic association to the caduceus. Often a single entry in the “Index Chemicus” listed a number of differing possible associated symbols and plain descriptive meanings. The goal of the Index, after all, was to gather all the information in a clearly organized format. Newton did not actually give his own opinion as to which literal meaning was the true one.[^444] Nonetheless, the presence of literal translations from multiple sources in the “Index Chemicus” reveals how Newton’s translational principle informed his indexing of the chymical literature. The index would allow him to determine the literal meaning of the chymical imagery in a given text and to properly read the chymical procedures through comparison with other statements of meaning and other instances of the symbols and their contexts. This reading could then be correlated with his experimental results to add further information regarding how the symbols should be translated. And as seen with his laboratory notebooks, Newton certainly did interpret the chymical symbolism

[^443]: Newton, Keynes Ms. 30.1, fol. 70r. Chymists tended to view pure mercury as a different substance from the vulgar mercury (quicksilver) extracted from ores.

[^444]: This may actually indicate a subtle difference between Newton’s array of chymical symbols and the list of prophetic figures in the language of the ancient prophets. The figurative language of chymistry was still being generated, and experiments and results that had happened in the past centuries leading up to Newton’s investigation of the symbolic literature of chymistry were still being assigned figurative representation. See Rampling, “Transmuting Sericon,” 19-34. The prophetic language had long since died out, and thus was set in stone and certain. Newton needed to set forth all of the possible options for a plain substantial or procedural meaning behind given chymical symbols as there was not the same consistency in chymistry. Moreover, chymistry lacked the certainty of divine inspiration that the prophetic Scriptures could provide, meaning that the consistency of chymical symbols was not hermeneutically guaranteed in the way prophetic symbols were. Nonetheless, Newton’s provision of the multiple possible plain meanings for chymical symbols in the “Index Chemicus” yet reveals his descriptive-translational approach to figurative representation in field of chymistry.
in the “Index Chemicus” as having a plain translatable meaning. Moreover, in the majority of Newton’s symbolic chymical manuscripts—most of them transcriptions or extracted notes for later chymical composition—his descriptive-translational approach can be discerned in his personal straightforward interpretive additions.

As one reads through Newton’s chymical manuscripts, a fairly common feature becomes manifest: Newton habitually added brackets after quotations or in the midst of a transcribed manuscript after a given chymical symbol or figurative description. These bracketed comments usually either provided alternative symbolic representations of the same underlying substance—or procedure—described or actually provided the specific translation of the symbol into its plain meaning. An example of this pattern can be found in a compilation of abbreviated symbolic chymical texts, titled, “Of the first Gate” (King’s College Library, Keynes Ms. 53), which Newton transcribed at some unknown point in his chymical career. Newton added his commentary and translation of figurative expressions in square brackets (rendered as curly brackets in my quotation).\textsuperscript{445} In one instance he copied and commented on some of the goals of the (chymical) Artist:

\begin{quote}
Learn which Dianas Doves are which do vanquish the Green Lyon by aswaging him, \{that is, learn to sublime this oak by the central salt of Venus, (as he elsewhere expressess it) to infold Diana in the arms of Venus, by which means the activity & dissolving faculty of the salt is asswaged.\}\textsuperscript{446}
\end{quote}

Here he gives his translation of the elusive image of the twin doves conquering the green lion—it is the now familiar procedure he had described in his laboratory notebook (CUL

\textsuperscript{445} I render Newton’s square brackets as curly brackets, \{\}, in quotation to distinguish them from the standard editorial use of the square bracket.

\textsuperscript{446} Newton, Keynes Ms. 53, King’s College Library, Cambridge, fol. 2v, curly brackets used in place of the original square brackets.
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Add. Ms. 3973): dissolving the “Green Lyon” in “the central salt of Venus.” However, Newton gives a more detailed insight into the nature of the process: “the activity & dissolving faculty of the salt is asswaged.” The image of the twin doves pacifying the green lion thus actually carries additional information about the internal material operation of the chymical reaction. Similarly to how the caduceus image contained knowledge of the metallic affinities of the figuratively represented double vitriol (sulphates), the twin doves assuaging the green lion reveal an internal dampening of the reagent’s innate activity and dissolving power.

In the CUL Add Ms. 3975 laboratory notebook Newton describes a reaction he performed on a substance known as “the oak.” The entry begins as follows: “Monday The oak (i.e. Reg ♂ ♀ ♁) imbibed with 1/(7 1/3) of vinegre of δ [antimony] 6gr ....” Here Newton adds the literal meaning for the chymical symbol of an oak: regulus of iron, copper and antimony. Later in the notebook, Newton describes another experiment: “1 part of ♂ [iron ore] + 2 of δ [antimony] blended by liquefaction and sublimed and precipitated, 7 grains. 3 grains of the Green Lion (or our ⚫ [sal ammoniac]) ground and sublimed left behind 3 1/3 grains in the bottom [italics mine].” Here Newton gives, in a throw-away line, a possible translation for the literal meaning of the Green Lion. This reference definitively

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447 Newton, CUL Add. Ms. 3975, fol. 68r.

448 Regulus actually refers to the metallic product (today’s antimony) of the reduction of antimony ore (which early modern chymists labelled antimony). Different metals could be used in the reduction process, yielding regulus of copper or regulus of iron, etc. See Dobbs, Foundations, 147.

449 Newton, CUL Add. Ms. 3975, 78r, Newman trans. The original reads: “♂ 1 + δ 2 confusa per liquefactionem et sublimata et præcip 7gr. L.e. vir (seu ⚫ nost) 3gr contrita et sublimata linquebant 3 1/3gr in fundo.”

450 It is possible that Newton is referring to a different substance by “our ⚫” that would work as well as “the Green Lion” in the listed chymical reaction. Nonetheless, his use of “the Green Lion” as a specific substance to be measured and to operate within a specific experiment reveals his understanding of this symbol
shows Newton’s use of the figurative label in a plain and literal sense. He refers to the Green Lion throughout this entry as a specific chymical substance that he weighs out and adds to chymical reactions. He has straightforwardly taken the symbolic figure of the green lion and is using it as a literal chymical substance. For Newton, all of the chymical symbols in the mythological figurative language function in this manner—they are merely ciphers, linguistic signifiers in a symbolic language for objective things that can be empirically accessed. Even symbols such as the caduceus and Diana’s pacifying doves, which have deeper natural knowledge embedded in their forms, nonetheless describe true aspects of the natural world that can be assessed empirically, through experimentation. These symbols had a plain descriptive meaning that referred not only to objectively accessible chymical products and procedures, but also to empirically accessible truths of nature.

Not only did Newton seek a literal understanding of the mythological figures and images in symbolic chymical writings, but his reading indicates a concern for the possible misinterpretation of that figurative language. Just as Newton pondered the descent into idolatry associated with figurative characters given to describe historical events in Egyptian hieroglyphics, so in his chymical reading, he ear-marked discussions of the distortion of mythological imagery, used to represent chymical reactions, into belief in pagan gods. As seen in chapter one, a dog-ear of Newton’s copy of Michael Maier’s *Secretioris Naturæ Secretorum*, points to a discussion of the twelve gods of the Egyptian hieroglyphics and the subsequent misunderstanding of the original allegorical intention behind chymical as a plain description of a specific chymical substance. Moreover, Newton’s use of a bracketed description in this quotation matches his use of bracketed descriptions elsewhere in the document and appears to indicate a translation as a specific substance. And, even if this “🜹” or sal ammoniac was not the same exact substance as the modern chemical, it nonetheless represents Newton’s translation of the image of the green lion into a more direct referential meaning.
symbolism. This passage came as an insertion into Maier’s description of “Latona”, the mother of Apollo and Diana, as a chymical product, an impure combination of gold and silver, and one of the steps to the Philosopher’s Stone. Maier digresses into the origins of the use of Latona to describe this substance:

Latona, moreover, is one of the 12 gods of the Egyptian Hieroglyphics by whom this and other allegories were propagated to the rest of the peoples. Since only very few of the Egyptian priests understood the true intention and sense of these things, all the rest interpreted them according to a similar changed [sense], which in the nature of things they were not, namely various Gods and Goddesses, and things of this sort.

Maier’s connection between Laton, a raw chymical substance containing the seeds of silver and gold, and Latona the mother of Diana and Apollos is an example of a process described in much of the symbolic chymical literature. Essentially the chymical authors believed that ancient myths contained allegorized truths about the natural world and had originally been created as a means of disguising these truths from the unworthy—particularly knowledge

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451 Maier, Secretioris, Trinity NQ.16.88, 33. See Chapter 1, Section 4.2. Karen Figala provides an excellent study of the impact of Newton’s study of Maier’s works on his connections between Egyptian gods and chymical substances, see Figala, “Newton’s Alchemy,” Cohen and Smith, eds., Cambridge Companion, 370-86. While Figala places more emphasis on Maier’s role in Newton’s developing matter theory, she uses the table of gods, planets, elements, and chymical substances in Babson Ms. 420 to reveal the similarities between their systems. In many ways, my discussion of Newton’s dog-eared references to Maier’s exploration of the origins of Gentile religion adds new evidence to Figala’s work. Similar examples can be found in Newton’s dog-earing of other works of Maier, such as his “Silentium post Clamores,” in Maier, Tractatus de volucris arborea (Frankfort: Nicolai Hoffmann, 1629), Trinity NQ.10.148, 38-39, and “Themis Aurea,” in Maier, Tractatus, 41.

452 Maier, Secretioris, Trinity NQ.16.88, 33. The Latin reads: “Est autem Latona una ex 12 diis Hieroglyphicis Ægyptiorum, à quibus hac aliœque allegoriae ad reliquas gentes propagatæ sunt, solis pacissimis sacerdotibus Ægyptiis harum veram mentem & sententiam intelligentibus, caeteris omnibus ad alia subjecta, quæ in rerum natura non essent, nempe varios Deos Deasque, eiusmodi interpretantibus.”

453 Another example is the “Aquarium Sapientum,” in the Museum hermeticum (1625), Trinity NQ.16.115, 103-7, which was in Newton’s library (HL 1130) and contains marginal summary annotations, although likely not in Newton’s hand. Similarly, the “Prefatio ad lectorem: Panchymici seu anatomiæ totius universi” to the works of Peter Fabre, see Petri Joannis Fabri, Operum (Frankfort: Johann Beyer, 1652), Trinity NQ.9.174, vol. 2; HL 598.
about how to produce the Philosopher’s Stone. In many ways this reflected a tradition of Renaissance allegorical interpretation of classical pagan religion.

Newton’s particular interest in this passage from Maier, however, was non-allegorical, in keeping with his descriptive-translational approach to the rest of the chymical symbolism. On an octavo sheet included at the beginning of a set of papers containing his own work of symbolic chymistry, “Praxis” (Huntington Library, Babson Ms. 420), Newton set out an accessible table of the twelve gods and their de-allegorized meaning as chymical substances. Newton lists the seven planets and their symbols (Saturn: ⪔, Jupiter: ☉, Mars: ♂, Venus: ♀, Mercury: ♀, the Sun: ☉, and the Moon: ☾), the four elements (Fire: ⬠, Air: ⬦, Water: ⬤, and Earth: ⬢) and the Quintessence (“or chaos, the elemental principle”: ⬦), see Figure 3.

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454 Newton, Babson Ms. 420, fol. 1r-1v. This document exhibits a fairly common pattern of Newton’s whereby he would fold the folio twice and cut a line between one of the folds to produce a form of booklet in octavo when the folios are folded and assembled. William Newman has pointed out that this table and Newton’s discussion of the connections between Greek and Egyptian gods and their associated elements is not specifically related to the chymical subject matter of the main treatise (personal conversation 11 Oct. 2014). However, this octavo sheet appears to be a mixture of notes on various topics inspired by Newton’s reading of chymical literature, and it is likely that his reading of the aforementioned dog-eared section in Maier’s Secretioris contributed to this table. Another possible contribution comes from later in Maier’s Secretioris, page 131, where Newton dog-eared Maier’s list of names of mythical and historical figures associated with the chymical symbols: “A sole mundi sol Philosophorum denominatinonem habet, quia proprietates naturæ ab illo sole celesti descendentes, aut ei convenientes, continet. Sol itaque Osyris est, Dionysus, Bachus, Jupiter, Mars, Adonis, Oedypus, Perseus, Achillies, Triptolemus, Pelops, Hippomenes, Pollux. Luna vero Isis, Juno, Venus, mater Oeypi, Danaë, Deidamia, Atalanta, Helena: Item Latona, Semele, Europa, Leda, Antiope, Thalia. Atque hae sunt compositi partes, quod ante operationem lapis dicitur, & nomine omnis metalli, Magnesia: post operationem, Orcus, Pyrrhus, Apollo, Æsculapius. [Sol has been called the worldly sol (gold) by the Philosophers since it contains its natural properties descending, or converging to it, from that heavenly Sol (the sun). Therefore Sol is Osyris, Dionysus, Bachus, Jupiter, Mars, Adonis, Oedypus, Perseus, Achillies, Triptolemus, Pelops, Hippomenes, Pollux. Truly Luna (the moon or silver) is Isis, Juno, Venus, mater Oeypi, Danaë, Deidamia, Atalanta, Helena: and again Latona, Semele, Europa, Leda, Antiope, Thalia. And these are the composite parts, which before the work of the stone is called, and by the name of every metal, Magnesia: after the work, Orcus, Pyrrhus, Apollo, Æsculapius.]” Maier, Secretioris, Trinity NQ.16.88, 131.
The table goes through three iterations: the first version, now crossed out, lists the chymical or astronomical symbols first, followed by names of gods, names of the planets and elements and finally associated chymical substances. It appears to be a preliminary working out of the table. The second version is better organized. It begins with names of Egyptian and Greek heroes, followed by the Greek and Latin gods, symbols, and then finally the chymical substances. Similarly the third version begins with biblical figures (such as Noah, Ham and Canaan) and individuals from Egyptian history (Thoth, Phul, Mizraim) and their counterparts in the Egyptian pantheon. It then lists the same gods and goddesses in the Greek and Latin pantheon, then the associated symbols, and finally the chymical substances. Newton’s assignment of chymical substances goes through a number of corrections. The planets are, in order, the seven metals: lead, tin, iron, copper, quicksilver (common mercury), gold and
silver. The four elements are vitriol or sulphuric acid (fire); bismuth, arsenic or “spirit of mercury” (air); zinc, “the Tutia of Geber,” or sea water (water); and fixed salt (earth). The quintessence or “chaos” is antimony or “the magnesium of Geber.”

Figure 4 - The third iteration of Newton’s table of gods, symbols and chymical substances. From “Praxis”, Babson Ms. 420, fol. 1v. Courtesy of the Huntington Library, San Marino, CA.

These tables show Newton’s organization of his euhemeristic understanding of the deification of ancient patriarchs and heroic figures into the ancient gods. However, the tables also show his association of that process with symbolic representations of nature. These tables represent his understanding of the ancient confusion of historical individuals and enciphered natural knowledge that lay within the symbolic language. These individuals became associated allegorically with the seven planets and the elements through their symbolic representations. As Maier stated, the original use of allegory to describe the secret knowledge of nature was known only to a few, after which the allegorical stories began to be interpreted as true statements of gods and goddesses and no longer to describe the natural world. Newton goes a step further to conflate this process, by which natural allegory became deified, with the process by which historical allegory became deified. In these tables, one can
see Newton’s attempts to sort through the confusion of matching figurative representations, determining both original historical figures and actual chymical products related to the same symbols. Newton was not content with the allegorical associations with planets and original elements. He sought to find the descriptive and original meaning behind the symbols such that the allegorical associations could be dispensed with. In this process he reveals yet again his descriptive-translational approach to symbolic language. Moreover, these tables demonstrate how Newton’s concern for the abuse of figurative representation of historical individuals into pagan myth extended to his awareness of the plain descriptive chymical meaning of the same symbolic forms.

Newton’s approach to the figurative language encapsulated in the symbolic texts of chymistry reveals the same descriptive-translational approach that characterized his reading of biblical prophecy. Newton’s access to chymical experimentation in the laboratory allowed him to objectively test his literal reading of the symbolic chymical forms in ways that he could not test his biblical interpretation. In this manner Newton’s biblical hermeneutics and his experimental science—in this case his experimental chymistry—are necessarily different. However, in the areas in which they overlap, Newton’s textual chymistry and

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455 Newton specifically ruled against using historical data to determine the meaning of prophetic figures prior to their literal translation. See Newton, Yahuda Ms. 1.1, fol. 14r: “[Rule] 10. In construing the Apocalypse to have little or no regard to arguments drawn from events of things; because there can scarce be any certainty in historical interpretations unless the construction be first determined.”

456 One could see overlap even in the area of empirical verification in that Newton could, to a certain extent, test his general prophetic interpretation against the evidence of history. However, in his rules for interpreting the Apocalypse, Newton specifically stated that history was not to be a source for the translational meaning of the specific symbols used, as that may cause the interpreter to create meanings for symbols in order to fit an overall interpretive hypothesis rather than only creating the overall interpretation once the meaning of the specific symbols had been determined, see Chapter 2, Section 4.1. There is still an empirical aspect to this approach, as the general interpretive theory is built up from the ground unit phenomena of the individual symbolic descriptions. Moreover, Newton’s insistence on not forming an overall interpretive theory that then determined the meaning of the individual descriptions reflects his published disdain for forming hypotheses and for a deductive style of reasoning that interpreted natural phenomena according to a rationally deduced theory grounded in first principles (Descartes), rather than starting inductively from established natural phenomena.
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biblical hermeneutics, Newton employs a specifically descriptive-translational approach to both sources of symbolic texts. The dog-ears in his reading that he made of instances of direct interpretation reveal his desire to discover the plain substantive or procedural meaning behind the figurative chymical language. In his own experimentation and notes he records his developing understanding of the substances and procedures behind recurring symbols and figurative representations—such as the twin doves of Diana or Mercury’s caduceus. He then includes these descriptive translations in his extensive “Index Chemicus”, a table of words with their possible meanings and the locations in which to find them that is highly reminiscent of his lexicon of prophetic figures, their literal meaning and their locations in the Bible and in ancient interpretive guides. That both of these documents were composed within the same decade and followed similar forms is itself indicative of the overlap of Newton’s descriptive-translational method across his theological and chymical labours. In Newton’s chymical writing and transcription from other symbolic works, he frequently adds his own literal translation in brackets next to symbolic forms and figurative descriptions. This indicates the high degree to which this descriptive-translational process had been internalized in Newton, such that chymical images automatically received their resulting plain descriptive meaning in transcription. Finally, Newton’s attempts to trace the origins of pagan myth in the mistranslation of the ancient symbolic languages—such as hieroglyphics and the prophetic speech—extended to his chymical writing. His addition of literal chymical substances into

Nonetheless, the sources for the literal or plain meaning of the basic symbolic descriptions were entirely textual, as Newton compared Scripture to Scripture and consulted ancient translations of oneirocritical imagery. The direct-translational meaning of the figurative language—rather than the overall interpretive scheme of the prophetic books—was not subject to change based on historical events. Rather, the meaning was first to be determined via an analysis of symbolic texts according to his translational hermeneutics and only then matched to the specific events of history. In contrast, in chymistry the specific meaning of the symbolic forms themselves were subject to both textual and experimental analysis and could be falsified by the results of laboratory investigation.
his table of gods and their planetary or elemental analogs reveals his association of the processes of enciphering natural (chymical) knowledge into symbolic form and the descent into idolatry. Newton’s understanding of language as a system of objective things and their linguistic signifiers extended as much to the system of chymical images signifying actual substances as it did to his understanding of the biblical prophetic images having specific literal meaning. Chymical images translated into specific substances and knowledge of internal natural processes. Likewise prophetic images translated into specific political entities and future historic events.

7. Newton’s Translational Principle: the Unity of Newton’s Figurative Hermeneutics

Newton’s tendency to de-allegorize and to seek a literal translation of symbolic and mythical imagery was not limited to symbolic chymistry and biblical prophecy. It can be found wherever Newton encountered what he considered to be figurative or allegorical language. Niccolo Guicciardini has recently explored this same principle at work in his reappraisal of Newton’s use of the *prisca* tradition. In his article, “The Role of Musical Analogies in Newton’s Optical and Cosmological Work,” Guicciardini considers the degree to which Newton followed Neo-Pythagorean concepts of celestial harmonies.457 This connection had first been proposed in McGuire and Rattansi’s influential “Newton and the ‘Pipes of Pan’” article, and subsequently elaborated in a number of scholarly works.458 As Guicciardini

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details, arguments for Newton’s Neo-Pythagorean proclivities are founded on his analogy between the seven colours of the spectrum and the musical scale as well as his reference in the “Classical Scholia” to Pythagoras’ true knowledge of nature, including universal gravitation, which had been described in musical terms. Guicciardini reveals the dangers of taking Newton’s statements regarding Pythagoras’ musical harmonies at face value, showing that contrary to previous approaches, Newton’s use of the Pythagorean harmonies indicate not a return to Platonic celestial harmonies, but an interest in the mythological symbolism and language by which Pythagoras had hidden true knowledge of nature from the vulgar. As Guicciardini states, “according to Newton, Pythagoras concealed his knowledge through ciphered language by adopting the [musical analogy between Apollo’s lyre and the planetary system] so as to enable the wise to grasp a coded message conveying a truth about the planetary system.”459 This is the exact sort of enciphered natural truth that emerged in the previous section whereby Newton perceived internal chymical properties to be encoded in the caduceus symbol and the twin doves of Diana.

Guicciardini concludes his article with a reference to Newton’s similar interpretation of alchemic mythology and apocalyptic allegory as ciphered messages.460 However, Guicciardini’s article does not explore Newton’s work with chymistry and biblical prophecy, remaining focused on Newton’s interpretation of the Pythagorean harmonies. This chapter has demonstrated in Newton’s textual chymistry and biblical hermeneutics the ubiquity of the pattern that Guicciardini identifies, labelling it his descriptive-translational method. Considering the exact principle at work in Newton’s reading of the Pythagoreans that

Guicciardini details, and the brief look at his descriptive historical understanding of the nature of Egyptian hieroglyphics in Section 5, Newton’s descriptive-translational method appears as a universal feature of his scholarship. It is precisely in this area that Newton diverges from his humanist forebears and reveals his individual scholarship. As Guicciardini puts it:

Newton was guided by the idea that the ancient texts needed to be deciphered according to rules known to the interpreters and ultimately decoded as statements concerning plain historical or scientific facts, rather than to be approached, as in the Renaissance Philonic tradition, as allegories of a mystical nature. ... [T]he ancients possessed superior scientific knowledge; and ... they adumbrated factual truths in a symbolical language for which an interpretative key had to be found by following philological and iconographic rules.\stepcounter{footnote}

Newton’s descriptive-translational approach can be contrasted to another humanist-trained natural philosopher: Kepler. Kepler believed in an allegorical manifestation of the Platonic solids in the true nature of the planetary orbits. Newton, in contrast, would have understood any application of the Platonic solids to the heavens as a figurative description that, once translated, would provide specific information about planetary motion or the nature of the mechanism causing that motion, but not that they were truly present in the heavens in some way. Newton’s approach was first translational and then descriptive; while he believed the ancient authors to be expressing natural truths, he did not take what he considered to be

\footnotetext{66\textsuperscript{1}} Guicciardini, “Musical Analogies,” 65-66. Newton’s descriptive-translational methods may have some affinity to an ‘archaeological’ approach to symbolic representation in the seventeenth century that tended to catalog and record symbolic representations rather than assign allegorical and Neo-Platonic meaning to their forms. Daniel Stoltzenberg argues that this secondary, weaker, form of seventeenth-century interest in symbolic representation reflected an empirical approach to texts which emphasized the plain and non-allegorical meaning. His characterization of Athanasius Kircher’s attempts to interpret Egyptian hieroglyphics fits into this latter understanding, as Kircher’s motivations for researching the Hermetic corpus were more in service of understanding how the figurative forms functioned as a language than as an attempt to bring back the allegorical worldview generally perceived to be embodied in the Hermetic texts. See Stoltzenberg, \textit{Egyptian Oedipus}, 43-48.
ancient figurative or ciphered language as either purely literal or purely allegorical speech. It was merely a foreign symbolic language. For Kepler, the universe and man were outward expressions of the Divine, who created them in mathematical proportion and according to musical harmonies. For Newton, however, Neo-Pythagorean concepts of celestial harmony did not indicate a deep mystical connection between Creator and creation. Rather, they were figurative expressions that could be translated into tangible, empirically accessible natural truths.

In the previous chapter, I considered Newton’s use of analogy: the translational function of the political analogy at the heart of the prophetic language and the analogy between macrocosm and microcosm. In contrast to Mamiani’s understanding of Newton’s typological use of analogy according to the Baroque imaginative emblem, I argued that Newton’s use of the analogy between natural forms and political entities (i.e. sun for king, flood for invasion, etc.) was directly translational. Similarly, Newton’s allusions to ancient forms of worship as an analogue of the operations of the heavens should be understood from a translational perspective. Newton’s claim that the Greeks called man a microcosm of the heavens in his revolution about the Prytaneum, or central fire, shows the translational nature of the macrocosm-microcosm analogy for him. Newton did not believe that the circling worshippers were in some mystical way connected to the larger structure of the universe, or that by attuning oneself with the macro-structures of the heavenly motions one could affect physical change or personal spiritual transformation. Rather, the structure of the central fire

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462 Guicciardini, “Musical Analogies,” 47.

463 See Chapter 2, Sections 4.5, 5.1, and 5.2.

464 Chapter 2, Section 5.2.
and revolving worshippers demonstrated the specific natural truth (Copernicanism) of how the universe was constructed. These truths had been encoded into the worship practice of the people. And, the original forms, pregnant with natural knowledge, had lost their natural associations and became idolatrous. Newton’s description of this descent into idolatry echoes Maier’s implication that Egyptian figurative representation of chymical knowledge generated pagan myth. The analogy between natural or physical occurrences and political events had enabled the translational principle by which to understand the figurative language of the prophets. In the same manner an analogy between actual or physical forms of worship and the structure of the universe gave Newton insight into how to determine the original form by which the ancients had encoded natural knowledge in mythological and allegorical language such as Apollo’s lyre and Mercury’s caduceus. In the interpretation of texts and the ancient history they described, Newton’s understanding of analogy was translational and not allegorical. Nonetheless, the natural-political analogy operated as a key to understanding the prophetic figures. In his concern to uncover the original translational key—both in the natural-political analogy and the macrocosm-microcosm analogy—Newton reveals his concept of the language of the adept that informs his approach to figurative texts.

465 Newton devoted a fair amount of time in the late 1680s and early 1690s to working out his scheme by which original worship practices and ancient natural knowledge had been corrupted, his uncompleted and unpublished “Theologiae Gentilis Origines Philosophicae,” recorded in notes in various manuscripts: Newton, Yahuda Ms. 13, Yahuda Ms. 16, Yahuda Ms. 17, National Library of Israel, Jerusalem; and Newton, New College Ms. 361(3).

466 Newton’s use of analogy in his Rules of Reasoning in Philosophy is somewhat different, as will be explored in Chapter 4. In this context analogy was specifically tied to the “analogy of Nature” by which Newton meant simplicity and universality: as a means of judging empirically accessible facts of nature to be universally extended on the basis that Nature “is wont to be simple, and always consonant to itself,” see Newton, Mathematical Principles (1934), 398-9. This could be seen as either a very specific use of “analogy” or as a distinction between “reasoning philosophically” and textual reasoning, where Newton’s use of analogy appears very much to be translational.
Newton believed that the plain meaning of essential chymical and prophetic knowledge had originally been enciphered in figurative forms to ensure it was only accessible to the worthy. Newton’s introduction to the interpretation of biblical prophecy claims that the truth of the prophecies are “wrapt up in obscurity” to prevent the unworthy from understanding them. The original class of prophets and wise men had conversed in a figurative prophetic dialect that could be accessible to the humble interpreter who genuinely sought its meaning. However, the unworthy showed their moral poverty in their presumptive imposition of private imagination, distorting the true sense of the prophetic Scriptures. Newton goes so far as to say that these Scriptures were intentionally obscure so that God could sift out the hypocritical and lukewarm from the church. Concern for keeping true knowledge from the unworthy suffuses the symbolic chymical literature and constitutes the standard explanation for why the chymical authors so often obscured their meaning in figurative and mythological language. Newton himself exhibited this concern in a letter to Henry Oldenburg written on April 26, 1676 discussing Boyle’s recent publication in the *Philosophical Transactions* about an impregnated mercury capable of heating gold when mixed with it. In the letter Newton commended Boyle’s reticence to share the method of producing this mercury as it was in keeping with the decision of “the Hermetick writers” to conceal such knowledge—along with the knowledge of transmutation—to prevent “immense dammage [sic] to the world” should it be widely distributed. Newton expressed some doubts about the transmutational

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467 Newton, Yahuda Ms. 1.1, fol. 17r. See chapter 2, section 4.1.

468 Newton, “Letter to Oldenburg,” 26 April 1676, in Turnbull, ed., *Correspondence*, vol. 2, 1-2. A portion of the letter reads: “But yet because ye way by wch ☼ may be so impregnated, has been thought fit to be concealed by others that have known it, & therefore may possibly be an inlet to something more noble, not to be communicated without immense dammage [sic] to ye world if there should be any verity in ye Hermetick writers, therefore I question not but that ye great wisdom of ye noble Authour will sway him to high silence till he shall be resolved of what consequence ye thing may be either by his own experience, or ye judgmt of some other that throughly understands what he speaks about, that is of a true Hermetic Philosopher, whose judgmt
enterprise in this letter, but nonetheless seems to have genuinely believed in the possibility that there were some chymical adepts—true Hermetic Philosophers, as he calls them—who possessed full knowledge of the “Hermetick” or chymical secrets. These adepts had withheld chymical secrets from general knowledge, but they could be determined through the proper translation of the symbolic or Hermetic texts. Thus Newton’s awareness of privileged access applied equally to his pursuit of the knowledge of how to translate prophetic figurative texts and to his reading of symbolic chymistry. In the same way, he believed the original purpose of the Pythagorean harmonies was to disguise true knowledge of universal gravitation from the vulgar. And just as with enciphered ancient natural knowledge, Newton believed himself worthy of obtaining the translational keys in chymistry and biblical prophecy, pursuing the original translational principle that had caused straightforward, if privileged, knowledge to be enciphered in figurative language.

As seen from Newton’s interpretation of ancient allegory and his concept of the language of the adept, it appears that his descriptive-translational method reveals a unity that goes beyond chymistry and biblical hermeneutics. Newton’s descriptive-translational approach to figurative texts draws on his understanding of language as a series of signifiers for objective realities. This general approach to texts assumes an objective reality that is empirically accessible and can be communicated through translatable linguistic signifiers. Newton held to this understanding of the accessible interchange between the world of things and the world of words from his earliest study of language in 1661. Newton’s general

Though the Author seems desirous of the sense of others in this point, I have been so free as to shoot my bolt: but pray keep this letter private to yourself."

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reading of texts followed the patterns he learned from his scholastic and humanist training in seventeenth-century Cambridge. He employed commonplace methods, listing quotations, summaries, and ideas drawn from his reading under topical headings. And, when it came to figurative texts, or texts that Newton interpreted as figurative, he employed a specifically translational method. The symbolic forms and image- or mythology-laden chymical, prophetic, historical, and other allegorical texts were all treated as figurative ciphers that concealed a plain meaning accessible to the enlightened interpreter. Newton sought to understand the original keys or principles by which natural or historical knowledge had been enciphered in these figurative languages so that he could translate them back into their basic meaning.

8. A Concord of Chymistry and Theology

Newton’s methods of interpreting symbolic chymistry and biblical hermeneutics are in many ways part of the same overarching translational method that is central to Newton’s textual style of reasoning—his method for generating knowledge from texts. However, the extent to which chymistry and prophecy uniquely require a correct interpretation of the figurative forms to access foundational knowledge necessary for their basic comprehension, combined with Newton’s respectively far greater interest in deciphering such forms in these two fields, suggests a closer relationship between them than mere instantiations of an overarching translational method. Furthermore, Newton translated and indexed the complex array of chymical symbols at the same time as he first determined his translational approach to the figurative prophetic dialect and constructed an elaborate index-like lexicon of prophetic figures (the 1670s and 1680s). This raises the question of whether there was a more specific
relationship between Newton’s chymistry and theology, be it in the specifics of how the figurative language had been generated from plain meaning, in Newton’s methods for determining those plain meanings, or in the area of spiritual alchemy, in which alchemical ideas and results had eschatological implications or theological meaning.

Chapter 2 discussed the possibility of a specific connection between Newton’s methods in textual chymistry and prophetic hermeneutics in the relationship between the “Parable of the World” that had created the prophetic figures and the idea of the macrocosm being used to model the microcosm in chymical philosophy.\(^{469}\) There is little evidence that Newton’s used a Paracelsian concept of the microcosm and macrocosm, whereby astronomical or astrological forces affected earthly activities, be it the generation of chymical substances or their effect on bodily health. In fact, Newton’s chymical writing contains barely any references to “microcosm.” Where the word does appear, Newton is either quoting the title of a work (Valentine’s “Mystery of the Microcosm”) or using it under a specific understanding as a referent to a particular chymical substance. It appears in the “Index Chemicus” under the entry: “The lesser world, microcosm, \(\delta\) [antimony], the magnesium [from which are] each of the four elements.”\(^{470}\) Hence, Newton’s use of the term “microcosm” in his chymistry was according to his translational understanding: it is a symbolic name for antimony (also known as the fermentative magnesium) that contains within its figurative description an understanding of its internal elemental function in chymical processes.\(^{471}\) Nonetheless, Newton’s table of the seven planets, the elements and

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\(^{469}\) Chapter 2, section 4.5.

\(^{470}\) Newton, Keynes Ms. 30.1, fol. 63r. “Mundus minor, microcosmus, \(\delta\) [antimony], magnesia compositum omne ex quatuor elementis. Senior. p. 219, 223, 74.”

\(^{471}\) This entry is not evidence that Newton holds to the Aristotelian four elements, rather, it is a record of the conceptions associated with this chymical figure, which in the literature was often conceived according to
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their associated gods and chymical substances (Babson Ms. 420) reveals his awareness of the microcosm-macrocosm translational hierarchy. Aspects of the macrocosm: the seven planets, the four elements, and the earth, had been used to represent both deities and chymical substances.472 But, just like with the parable of the world analogy used to interpret the prophetic figures, Newton’s connection between heavenly objects and specific chymical products in this table is translational.473 It shows Newton’s conception of the macrocosmic source for the forms of the figures that represent the chymical compounds and how to work backwards from the macrocosmic imagery towards a plain translation of specific chymical substances. In the parable of the world analogy, the translational key took images from the natural world—the sun moon and stars, but also trees and floods and hailstorms—to describe straightforward political events. Similarly, in chymistry the planets and elements represented chymical substances, and thus associated deities and myths about them came to describe specific chymical procedures. All of these could be translated back into their plain meaning if the original connection between figurative signifiers and plain referents could be determined.

Newton’s chymistry forms a unique bridge between his textual and experimental work. The process of determining the connection between figurative signifiers and plain referents

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472 The final of the twelve figures is in fact δ, the traditional representation of the globe of the earth, the fermentative chaos and elemental principle element out of which comes the four elements. Hence this symbol was itself known as the microcosm, and in the table Newton lists its plain meaning similarly to the reference he gives in the “Index Chemicus”, namely that it was antimony or the magnesium of Geber.

473 Likewise the connection between the heavenly bodies and historical figures that became gods is translational. Newton used the table to organize the figurative associations of specific symbols that had originally represented heavenly bodies with their real historical figures. Hence his table tracked the translational use of the same figurative depictions of the heavens in both history and chymistry.
in chymisty and prophecy involved creating vocabulary lists and using extensive cross-comparison of texts for both. However, chymistry added an additional source for determining the operation of the symbolic forms to this process: experimentation. Newton’s translational method—central to his prophetic hermeneutics—is very much present in his chymical writing, as seen in Section 6 of this chapter. In the process, however, Newton used experimentation to determine and test the plain chymical nature of the procedures and products enciphered in the figurative texts.474 This is evident in his chymical laboratory notebooks, as he recorded his developing understanding of such symbols as the doves of Diana, Neptune’s trident, and Mercury’s caduceus. The notebooks detail his chymical experiments, many of them derived from his reading of symbolic procedures, and provide plain meanings for the figuratively referenced chymical substances. In fact, the notebooks often used a specific symbol, such as \( \bigodot \), the green lion (possibly sal ammoniac), or a mythological name, such as “the oak” (antimony regulus), as a direct name for the substances used in his experimental descriptions, indicating their transformation from textual figure to experimental reagent.

Newton’s translational approach to the symbolic texts of chymistry and the interaction between his work in the laboratory and the library exemplify the multiple natures of seventeenth-century chymistry. Tara Nummedal’s article, “Words and Works in the History of Alchemy,” emphasizes the simultaneously bookish and practical aspects of alchemy. Doing alchemy required sorting through a maze of allegorical references and confusing terminology while at the same time employing artisanal skills at the furnace.475 Another

474 See also Chapter 1, Section 6.

contemporary example of the relationship between word and works in early modern alchemy can be found in William Newman and Lawrence Principe’s detailed study of George Starkey’s (1628-1665) laboratory notebooks. Newman and Principe refer to Starkey’s methodology of “evaluation-interpretation-observation-conjecture-experiment-assessment” throughout his notebooks.\(^{476}\) Newton’s back and forth between his own chymical reading and his laboratory notebooks should be seen in the same light. Moreover, as Newman demonstrates in an article on Newton’s chymistry, Newton’s chymical interests were additionally theoretical and directed his corpuscular matter theory.\(^{477}\) These themes have been explored in more detail in chapter one. They demonstrate the in-between position that chymistry occupied in seventeenth-century ways of knowing, and specifically in Newton’s work. Newton’s method of reading symbolic chymical texts drew heavily on his humanist background, as did that of his contemporaries.\(^{478}\) Furthermore, he applied a specifically translational hermeneutics to the symbolic chymical literature. Hence, it is precisely in this area, where Newton’s translational method extends into the experimental realm, that the role of chymistry as a bridge between Newton’s textual pursuits—which certainly included his biblical hermeneutics—and his experimental activities can be seen.

Betty Dobbs’ *Janus Faces of Genius* emphasizes the unity of Newton’s thought in his pursuit of God’s activity in all areas of his study. For her, Newton’s alchemy was a link between his rational and spiritual pursuits, the means by which God’s activity could be understood in the material world. Dobbs’ characterization of Newton’s alchemy has a


number of flaws, not least of which are her assumption of Newton’s purely Arian theology and her persistent Jungian interpretations of seventeenth-century alchemy. As this chapter has demonstrated, Newton most certainly did not hold to an allegorical understanding of the transformations occurring in chymical reactions, especially not a mystical connection between alchemical substances and spiritual realities. Dobbs’ argument that Newton viewed the alchemical vegetative spirit as the physical manifestation of the Arian Christ, the mediator between a transcendent God and his activity on earth, does not at all follow from his descriptive-translational approach to chymistry demonstrated in this chapter. Newton interpreted the chymical symbols and myths translationally, not allegorically, and held firm to a plain natural knowledge behind each figurative description.

In a review of the recent play, “Let Newton Be!” by Craig Baxter, Rob Iliffe makes an opposite claim to Dobbs, discounting any connection between Newton’s alchemical and theological work. Iliffe writes,

There is no evidence, unlike the cases of many other alchemists, that Newton was concerned with spiritual alchemy. His theological researches are clearly different in approach, tone and content from anything to be found in this area and there is not one reference to alchemical themes or concepts in his unpublished theological papers.

This chapter disputes Iliffe’s claim that Newton’s theological researches differed from his alchemical in approach; there was clearly overlap in Newton’s translational approach to figurative and symbolic images in both chymistry and biblical prophecy—a major component of Newton’s theological researches. However, I agree that in the area of content

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Iliffe’s statement matches the evidence of Newton’s manuscripts and his reading interests. Iliffe’s specific wording, “spiritual alchemy,” is important to note. An example of spiritual alchemy can be found in Newton’s compatriot of a century prior, John Dee, and serves as a useful counterfoil to the chymistry that Newton engaged in.

Deborah Harkness has written extensively on John Dee (1527-1608) and how his self-perceived communication with angelic spirits through an optical glass combined eschatology with natural philosophy. Dee’s conversations touched on themes related to the restoration of the divine language of creation and the resultant return of alchemy to its original state, allowing a material redemption of nature.\textsuperscript{481} Dee’s angels revealed the “true names” of sulphur and mercury and gave him uncorrupted explanations—albeit still allegorical—of the processes by which to make the Philosopher’s Stone.\textsuperscript{482} The purpose of these revelations were for Dee’s work—through alchemy and cabalistic true knowledge of the natural world—to aid the apocalyptic rebirth of humanity and the natural world.\textsuperscript{483} Dee’s work became known to Newton’s contemporaries following Meric Casaubon’s publication of Dee’s diaries in 1659.\textsuperscript{484} Casaubon’s publication created no small amount of interest in the Royal Society, although Dee’s assertions were not received entirely positively. Robert Boyle considered it a great moral achievement that he resisted the temptation to look in a spirit glass when given


\textsuperscript{482} Harkness, “Alchemy and Eschatology,” 9.

\textsuperscript{483} Some sort of eschatological expectation associated with new developments in technology and natural knowledge was fairly common in the early modern period, as can be seen in Francis Bacon’s \textit{Great Instauration}. For more on this topic see Charles Webster, \textit{The Great Instauration: science, medicine and reform, 1626-1660} (New York: Holmes & Meier Publishers, 1975).

\textsuperscript{484} Harkness, “Alchemy and Eschatology,” 11.
the opportunity, and Robert Hooke rebuked Casaubon for publishing “Dr. Dee’s Delusion,”
suggesting that Dee was actually a spy for Elizabeth I and the conversations enciphered
intelligence correspondence.485 Harkness admits a lack of evidence that Newton knew of
Dee’s diaries, but argues that the general interest in the eschatological aspects of alchemy
demonstrated by those who discussed them in the Royal Society requires a more detailed
investigation of similar links in Newton’s work.486 The evidence from Newton’s chymical
reading and writing, however, shows no reason to speculate about Dee’s influence on
Newton, or about similar patterns of eschatological purpose behind his chymical research, be
it textual or experimental. In fact, given ample opportunity to demonstrate his interest in
theological speculations very much present in some of the chymical works in his library,
Newton’s dog-ears show a decided avoidance of such content.

As discussed in Chapter 1, general patterns of dog-ears in the chymical books in
Newton’s library included procedural or substantive meaning behind myths and symbols and
even the occasional reference to the origins of the use of such myths for enciphering
chymical truths. One pattern, however, that I found to be lacking as I investigated over fifty
chymical works in Newton’s library, was the presence of any dog-ears which pointed to the
theological uses or eschatological benefits of successfully procuring the Philosopher’s Stone.
And this pattern was lacking in spite of a number of places where books that Newton had

485 Harkness, “Alchemy and Eschatology,” 14. In this Hooke shows a similar predilection to Newton to
discern enciphered plain meaning in obscure figurative language. For Hooke however, the link between cipher
and symbolic language had an obvious context: espionage in the Elizabethan period.

486 Another example of early modern spiritual alchemy can be found in the sixteenth-century Anna
Zieglerin who believed a certain golden oil, once perfected, would enable her to regenerate the world through
its repopulation with pure alchemical children. Zieglerin also framed one of the steps of the process towards
making this golden oil, which involved the death of a small bird, according to Christ’s death on the cross. See
elsewhere dog-eared contained unannotated mention of the spiritual benefits of the Philosopher’s Stone, connections between Christian theology—such as the nature of Christ—and the Philosopher’s Stone, and other spiritual allegories derived from the Bible. These connections, and the possibilities of an alchemical material renewal coinciding with the eschaton, are equally absent from Newton’s own chymical writing. Nor, as Iliffe points out, is there any mention of such a connection in Newton’s theological work. In fact, as has been demonstrated already, Newton clearly disparaged those who interpreted the end of the world as a physical end of the material world. This interpretation was the product of ignorant disregard for the original translational principle by which the figurative language of prophecy functioned.

Hence, in the area of content, it appears that there is not much of a special connection between Newton’s chymistry and theology. Nonetheless, an alternative approach to the dichotomy of Dobbs’ and Iliffe’s positions connects the two areas of interest by recognizing the ubiquity of Newton’s descriptive-translational approach in his research of texts and by realizing the affinities between Newton’s textual chymistry and prophetic hermeneutics within that approach. Newton did not have a grand unified theory of everything, nor even a single-minded pursuit of divine activity that drove his every endeavour. However, when it came to his reading methods, Newton approached all texts in a similar fashion, at once guided by his humanist training and—when confronted with symbolic texts—informe
his own descriptive-translational method. Newton’s descriptive-translational method extended to all of his work with symbolic texts, not just chymical or prophetic. Nonetheless, the vast majority of his translational work operated within those two categories. Moreover, his work in chymistry necessitated a correct interpretation of the symbolic forms to gain knowledge of the natural world in a way that his reading of other texts related (in his mind) to natural philosophy did not. In his interpretation of enciphered ancient natural knowledge, of heliocentrism or the inverse-force law of gravity, understanding the true meaning of the symbolic forms according to a descriptive-translational method certainly added to his arguments for his own position. However, Newton arrived at these positions independently of a careful construction of the plain meaning of symbolic representations of nature. In chymistry, correct derivation of experimental procedures or even understanding key aspects of the nature of matter required—for Newton at least—the application of the descriptive-translational approach to the symbolic chymical literature. In a similar manner the key to understanding the meaning of the Apocalypse required the same descriptive-translational understanding of the figurative language of the biblical prophets. One could argue that an equally necessary descriptive translation of symbolic texts was central to other of Newton’s textual research (chronology, the origins of Gentile religion, the corruption of true religious and natural knowledge). Yet, even in these other textual areas of interest, Newton did not specify the necessity of directly translating the symbolic forms as he did in his hermeneutical rules for interpreting biblical prophecy, nor did he construct lexicographical tables as he did for the chymical and prophetic figurative languages alone. And, even if the connection

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488 This, of course, was in addition to the equal importance, to Newton’s chymistry, of experimental techniques and theoretical reasoning.
between Newton’s chymistry and theology via his translational approach to the symbolic texts of each field is itself merely a subset—however considerable these two topics were in his estimation—of a wider textual method in Newton’s epistemological toolbox, the centrality of Newton’s descriptive-translational method to his research of chymical and prophetic texts nonetheless reveals a strong methodological connection between the two.


This chapter has explored Newton’s method of interpreting symbolic and figurative texts, which I have labelled his descriptive-translational method. In contrast to the enduring narrative that Newton’s highly organized, critical, and literal approach indicates the application of his unusual “scientific mindset” to the interpretation of texts, these aspects of Newton’s textual methodology have been shown to derive from his scholarly heritage. Newton’s organizational and text-critical strategies have their roots in the humanist commonplace method of working with an abundance of printed textual information. Nonetheless, Newton did develop his own special flavour of textual scholarship, which I argue can be best categorized as translational. Newton’s translational hermeneutics set the foundation for his interpretation of the prophetic texts. It governed his reading of chymical metaphor and it informed his interpretation of ancient natural philosophy. Newton’s translational principle was demystifying and de-allegorizing. The textual world was replete with plain simple meaning that could be consistently deciphered by the informed reader. This principle not only demonstrates a specific methodological connection between Newton’s chymistry and his theology, but it also represents a form of unity in all of Newton’s
Newton’s Descriptive-Translational Method in Chymistry and Theology  Paul Greenham

scholarship. Moreover, the overlap between text and experiment in chymistry allows us to approach Newton’s chymical researches as a nexus of both sources of knowledge, as the translation of both textual symbol and natural world came together in the synthesis of the library and the laboratory.

Newton’s descriptive-translational method can be traced to his articulation of the nature of language in his 1661 preliminary study for a universal language. This understanding of language as a translation of an objective world of things and their states into linguistic signifiers that can be communicated between individuals should inform how Newton’s later work with figurative texts is understood. For Newton, the figurative language of prophecy and the symbolic forms of chymistry also functioned as straightforward linguistic signifiers, discernable to those who knew how to translate them. Newton was not alone in his concept of the figurative prophetic language as an original dialect of ancient wise men; the previous chapter documents his reliance on Joseph Mede and Henry More for this idea. Moreover, Newton’s reading of symbolic chymical texts as representations for true substances and procedures reflected the experimental alchemy of his day. However, in Newton’s cotemporaneous practice of these activities and in their methodological similarities, an overall approach to symbolic texts—best described as translational—can be seen. And, while Newton’s translational method is not necessarily derivative from his experimental and theoretical ways of reasoning, it has a number of parallels to them that suggests a mutually reinforcing affinity.

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489 For more on early modern decoding of chymical imagery see Chapter 1, Section 1.1 and 1.2. See also Newman, “‘Decknamen or pseudochemical language’,” 159-88.
Newton’s descriptive-translational method reveals his belief in an objective reality that can be discerned empirically and communicated in a straightforward manner. In many ways this reflects the matters-of-fact approach to the physical world adopted by the Baconian program of the Royal Society. In his attempt to construct lists of symbols and their plain meanings in chymistry (the “Index Chemicus”) and theology (Yahuda Ms. 1.1) Newton was assembling lists of plain un-interpreted facts (from his perspective) that could then be assembled into an objective description of reality (be it ancient history, future history or chymical process). Robert Hooke used the language of commonplaces to organize matters-of-fact—free from metaphysical speculation—for the Royal Society. Newton used the indexing of language to search written texts for objective descriptions not subject to personal fancy or imagination. The rhetoric of experimental philosophy that Newton espoused—as will be explored in the following chapter on Newton’s Opticks—required building theory from assembled phenomena or uncontested matters-of-fact in the objective world. Similarly, Newton attempted to build a hermeneutical system to interpret biblical prophecy from the phenomenological base units of individual figurative descriptions whose plain meaning was certain and grounded in clear translational principles. And just as chymical facts could be determined from the base phenomena resulting from observation and experiment, leading to higher levels of matter theory, so too could basic knowledge of the nature of matter be determined by a careful assembly of properly translated chymical symbols. Newton’s textual methods of reasoning—his descriptive-translational approach—are related to his

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experimental methodology. They have the same epistemological foundation, operate in similar ways, and in the area of chymistry, interact and converge on the same goals. The early development of Newton’s concept of language and its resulting influence in Newton’s translational methodology in his approach to symbolic texts for the remainder of his life precludes the narrative of his prior development of a scientific orientation that was only later applied to texts. Instead, it demonstrates the importance of context. Newton stands as an excellent example of the extension of humanist reading and commonplace methods to seventeenth-century science (or natural philosophy). Even more so, Newton’s descriptive-translational method lets Newton’s work with texts inform our understanding of the context of seventeenth-century experimental method as it co-evolved with seventeenth-century scholarship.
Chapter 4: Chymistry and Knowledge of the Divine

1. Chymistry and Discourse of the Divine in Natural Philosophy

Thus far this dissertation has considered specific connections between Newton’s interpretive methods: how the ubiquity of his descriptive-translational approach to his textual scholarship reveals a methodological accord between his chymistry and his theology. In this chapter, however, I consider the relationship between Newton’s chymistry and theology at the level of content. This requires a nuanced understanding of the word ‘theology’ as it applies to Newton’s work. In the previous three chapters the ‘theology’ referenced related to biblical interpretation, a central component of seventeenth-century studies in ‘divinity’—the field one studied to become a divine or a theologian. Divinity, while frequently systematic, was nonetheless grounded in revealed truth and considered to be a distinct endeavour from philosophy, which was ostensibly founded on first principles or natural phenomena.491 The question of how these fields related—and determined each other’s interpretations—was a subject of much consternation in the seventeenth-century, as the Galileo affair indicates.492 Newton himself stated the need to keep divine revelation and philosophical theory distinct.493

491 Depending on the specific Christian tradition involved (Protestant or Catholic), revealed truth placed more or less weight on the testimony of Scripture compared to the tradition of the faithful.

492 The negative reception by Church authorities of Galileo’s views that natural philosophy should have priority in interpreting scriptural statements of the sun’s motion—exemplified in his letter to the Grand Duchess Christina in 1616—reveals a clash of differing views concerning the natural philosopher’s authority in interpreting Scripture.

493 Newton, “Seven Statements on Religion,” Keynes Ms. 6, King’s College Library, Cambridge, fol. 1r (see Section 2, below, n. 514); and Newton, CUL Add. Ms. 3965, CUL, Cambridge, fol. 547r. See also Newton’s draft of a new preface for a re-edition of the Principia in Newton, CUL Add. Ms. 3968.9, CUL, Cambridge, fols. 109r-v: “What is taught in metaphysics, if it is derived from divine revelation, is religion; if it is derived from phenomena through the five external senses, it pertains to physics; if it is derived from
For Newton and his contemporaries, “philosophy” was a global term that included what we would call “science,” often with the modifier “natural” philosophy. And, while chymistry was in many ways its own hybrid discipline, as discussed in Chapter 1, in its experimental and theoretical forms it was certainly a part of natural philosophy. This inclusion, I contend, is manifest in Newton’s integration of chymical experimental observations and theories into his optical work.

In this chapter I analyse the relationship between Newton’s chymistry—as an integral part of his natural philosophy—and his understanding of God according to three distinct categories: divinity, physico-theology, and divine metaphysics. Divinity included systematic and revealed theology and focused on interpretive methods, Christian doctrine, Church polity, and the history of the faithful. Physico-theology, a subset of natural theology, was a hybrid discipline in which theological topics such as the existence and nature of God, the resurrection, and other Christian doctrines were investigated exclusively from the phenomena of the natural world. Divine metaphysics, a term I borrow from Andrew Janiak, refers to Newton’s use of philosophical concepts of God’s nature to understand the operation of the natural world.\(^{494}\) I explore the integration of these different modes of understanding God in the chymical aspects of Newton’s natural philosophy, largely as they are revealed in his optical work. I argue that Newton’s Opticks—particularly the final Queries—reveal his physico-theological discourse and divine metaphysical assumptions while at the same time exhibiting a strong foundation in chymical phenomena and theory. These aspects of

\(^{494}\) See Janiak, Newton as Philosopher, 45.
Newton’s *Opticks* converge in Newton’s consideration of the nature the active principles responsible for motion or activity in the micro-world. As such, an investigation of Newton’s ‘chymical Queries’ demonstrates that the chymical aspects of Newton’s natural philosophy connected to his philosophical conception of God. Moreover, as I demonstrate in the final section of the chapter, Newton’s natural-philosophical discourse of God was not entirely divorced from his reading of Scripture, the source of his theology-as-divinity. Rather, in his characterization of descriptions of natural phenomena in Scripture as accommodated to the language of the common person, Newton actually revealed the operation of his descriptive-translational hermeneutic. Although he stated that philosophy and religion were to remain distinct, in practice he used his unique position as a natural philosopher to interpret the natural realities behind the ‘vulgar’ linguistic descriptions. Additionally, I argue that Newton relied on the scriptural assertion that man was made in the image of God to develop his divine metaphysical concept of God’s infinite physical presence in the universe. As such, the overlap between Newton’s theology-as-divinity and his philosophical concept of God in his natural philosophy can be seen, all in the context of an argument built upon chymical phenomena.

2. Divinity, Physico-Theology, and Divine Metaphysics

In one of the many books by Robert Boyle in Newton’s library Newton dog-eared an example of the “theological” use of specific chymical knowledge. In an appendix to his *Sceptical Chymist*, Boyle described the surprising alkali properties of a certain “Egyptian

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Niter” that reacted “briskely” with acidic “Spirit of Salt.” For Boyle this special Niter gave insight into a passage of Scripture that had “puzzled not only me, but far better Criticks in the Hebrew tongue then I ... found in the 25. Chap. of Solomons Proverbs.”\footnote{Boyle, “Producibleness of Chymicall Principles,” Sceptical Chymist, Trinity NQ.16.84, 30.} Newton’s copy once had a dog-ear pointing to this Scripture reference and he wrote in the missing verse reference, “20,” above the line.\footnote{Boyle, “Producibleness of Chymicall Principles,” Sceptical Chymist, Trinity NQ.16.84, 30. The full verse from Proverbs 25:20 is: “As he that taketh away a garment in cold weather, and as vinegar upon nitre, so is he that singeth songs to an heavy heart.” (KJV).} According to Boyle, the original purpose of the biblical passage was “to illustrate Things very incongruous to one another,” using the example of “the disagreement of Vinegar and Nitre.”\footnote{Boyle, “Producibleness of Chymicall Principles,” Sceptical Chymist, Trinity NQ.16.84, 30.} However, “it seems very hard to find what show of Antipathy there is between Vinegar, and the Salt-peter that is commonly sold in our shops for Niter.”\footnote{Boyle, “Producibleness of Chymicall Principles,” Sceptical Chymist, Trinity NQ.16.84, 31.} Thus, Boyle used the alkaline properties of this new substance, the “Egyptian Niter,” which did indeed react with vinegar in “a manifest conflict, with noise, and store of bubbles,” to demonstrate that this was the substance originally referred to by Solomon, and to resolve an apparent inaccuracy in the biblical text. After this side note on the “Theologicall use of the Alcalizate nature of Niter” Boyle returned to his originally intended “Philosophicall use” of the “Egyptian Niter,” exploring how its naturally occurring lixiviate (alkaline) nature challenged van Helmont’s assertion that all “fixt Alcaly’s are productions of the fire.”\footnote{Boyle, “Producibleness of Chymicall Principles,” Sceptical Chymist, Trinity NQ.16.84, 32-33.}
This passage in Boyle’s work gives a clear example of how the terms “theological” and “philosophical” were used in relation to seventeenth-century natural philosophy. The “theological,” use of the alkaline properties of niter involved biblical interpretation. Understanding the properties of a specific chemical substance allowed biblical critics and Hebrew scholars to more adequately interpret the Bible, and to defend the reliability of the biblical text. In contrast, the “philosophical” use of the niter’s lixiviate nature was akin to what we would call “science,” as Boyle used its experimentally verified properties to question a specific theory of the composition of matter. Philosophy in the seventeenth century entailed many things, including a systematic study of the natural world (natural philosophy), foundations of knowledge (epistemology), and the metaphysics of causation and being (ontology). Boyle’s use of the term in this context related directly to natural philosophy, and the English Baconian brand thereof: experimental philosophy. Nonetheless, philosophical discourse also addressed the nature of God and both Boyle and Newton used natural philosophy to discuss the Creator and to speculate regarding his nature.501 Newton’s General Scholium to the *Principia* in 1713 famously claimed that to discourse concerning God from the appearances of things (phenomena) does certainly belong to Experimental Philosophy.502 Philosophical knowledge of God could be rationally deduced from first

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principles—as Descartes attempted—or inferred from mathematical and empirical treatments of natural phenomena—as Newton attempted in the General Scholium as well in the final Queries to the *Opticks*. What distinguished this philosophical discourse of the divine from parallel theological discourse was not necessarily its specific conclusions—such as God’s perfection or his creative and sustaining power—but the extra-biblical nature of its starting points. Philosophy began with reason, logic, first principles and natural phenomena.

Theology, even in its most systematic expression, nonetheless began with scriptural statements and the tradition of the faithful. Even if systematic conclusions regarding God’s nature—such as his infinity—were not strictly scriptural, they were nonetheless derived from the application of reason and logic to Scripture and tradition.\(^{503}\)

An ambiguous position, however, remains occupied by what may be called “natural theology.” In his recent philosophical biography of Newton, Andrew Janiak attempts to distinguish between natural theology—itself a distinct endeavour from revealed and systematic theology—and natural philosophy.\(^{504}\) Janiak acknowledges the enigmatic boundary between natural theology and natural philosophy in the seventeenth century—particularly when the latter discoursed on the divine—and locates their difference in their respective foci. Natural theology focused on God as creator, known through the natural world, while natural philosophy focused on the natural world, understood as created and sustained by God. As applied to Newton’s General Scholium, Janiak differentiates between Newton’s design argument—pertaining to natural theology—and his metaphysical

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\(^{503}\) Thus Thomas Aquinas’ *Summa Theologia*, for example, in the style of the university disputatio, begins each of his queries with quotations from Scripture or the writings of various saints and previous Christian theologians, even as he analyses those sources in conjunction with the writings of Aristotle and his commentators.

\(^{504}\) Janiak, *Newton*, 139-40.
speculations regarding the relationship between space and the divine, which Janiak perceives
to be part of natural philosophy. However, as cited earlier, Newton insisted that natural
philosophy includes a discussion of God from the phenomena. Janiak argues that within
natural philosophy this discussion is metaphysical; it considers God’s existence and divine
nature in relation to the world: to space, time, motion, causation and so forth. Thus Janiak
considers Newton’s natural theology as distinct from his philosophy, even when they have a
common source in natural phenomena and employ the same concepts of the divine nature.

While Janiak provides a helpful distinction, some of the ambiguity regarding the
division between natural theology and philosophy comes from the category “natural
theology” itself. Peter Harrison states that natural theology in the seventeenth century “has
typically been regarded as being concerned with theological doctrines that can be known
through reason alone: God’s existence, immortality of the soul, moral values, and so on.”
This would include arguments for God’s existence not specifically related to natural
phenomena, such as the ‘ontological’ and ‘cosmological’ arguments. Harrison uses the
examples of Francis Bacon, Galileo and Descartes to show the lack of consensus for how
theology should relate to natural philosophy in the early modern period. He argues in
“Physico-Theology and the Mixed Sciences” that the “physico-theology” of Robert Boyle
represents a new attempt in the second half of the seventeenth century to reconcile theology


506 Peter Harrison, “Physico-Theology and the Mixed Sciences,” in P. R. Anstey and J. A. Schuster,
eds., *The Science of Nature in the Seventeenth Century: Patterns of Change in Early Modern Natural
Philosophy* (Dordrecht: Springer, 2005), 174-5.

507 Harrison revises Andrew Cunningham’s thesis that natural philosophy was fundamentally about
God and his creation, arguing that a separate category for how philosophy related to matters of God existed in
the seventeenth century: natural theology, and the branch of this that specifically involved the natural world
known as “physico-theology.” See Peter Harrison, “Physico-Theology,” 165-6.
with natural philosophy through the creation of a hybrid discipline, similar to mixed mathematics. Physico-theology applied the robust phenomenological methods of experimental philosophy to theological topics, including but not limited to the traditional natural-theological proofs of the existence of God. The term “physico-theology” thus provides more precision when describing the kind of natural theology practised in late seventeenth-century England and maintains appropriate actor categories. The term “natural theology” had a number of different meanings for early modern thinkers. For Bacon, “natural theology” had corrupted Plato’s natural philosophy, indicating that Bacon, likely influenced by Augustine and Aquinas, understood “natural theology” in the specific sense of the pagan theology resulting from euhemerism and superstitious idolatry. Cambridge Platonists such as Ralph Cudworth attempted to erode any boundary between “natural” and “revealed” theology in their assertion that doctrines such as the Trinity were accessible through reason and nature alone. Boyle’s physico-theology seems to have encompassed the traditional topics of natural theology (God’s existence, the soul, moral virtues) as well as naturalistic considerations of Christian doctrines such as the resurrection. The term gained greater traction in the 1690s and early 1700s, as seen in works such as John Ray’s Three Physico-Theological Discourses (1693) and William Derham’s Physico-Theology: or A Demonstration of the Being and Attributes of God, from his Works of Creation (1713).

Peter Harrison, “Physico-Theology,” 165-83.

Peter Harrison, “Physico-Theology,” 171 and n. 34.

Peter Harrison, “Physico-Theology,” 175 and n. 49.

Peter Harrision, “Physico-Theology,” 180. Both of these works were in Newton’s library, see John Harrison, The Library of Isaac Newton (Cambridge: Cambridge University Press, 1978), 131, 224 (HL 500 and HL 1375).
Harrison characterizes it, physico-theology was a unique “theological enterprise that relied on the methods of natural philosophy.”

Hence, when considering boundaries between theological endeavours in Newton’s historical context, physico-theology is a better category than natural theology, as an enterprise distinct from revealed and systematic theology in its explicit reliance on natural-philosophical sources and methods, but nonetheless focused on theological, rather than metaphysical or natural topics. Thus we can characterize the overlap between theology and natural philosophy in the late seventeenth- and early eighteenth-century English intellectual landscape according to divinity (revealed and systematic theology), natural philosophy, and physico-theology (a hybrid of the two). Boyle’s “theological use” of the chymical properties of Egyptian niter would thus be an example of the usefulness of chymical knowledge to divinity, to that which ‘Divines’ engage in, which in this instance was specific biblical interpretation. Within this characterization certain of Newton’s statements regarding science and religion make sense. His printed General Scholium to the *Principia* in 1713 proclaimed the suitability of experimental philosophy to speak of God from the appearances of things. However, in a document of seven summary statements on religion written around 1715, Newton wrote that “religion & Philosophy are to be preserved distinct. We are not to

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512 Peter Harrision, “Physico-Theology,” 181. Harrison notes that the term “physico-theology” has evolved in modern analytical philosophy of religion to simply indicate a teleological argument. I use the term in its original seventeenth- and early eighteenth-century meaning as a complex hybrid field that explored the divine nature and Christian doctrine—in addition to design arguments for the existence of God—from natural phenomena.

513 These two terms are not that different etymologically, given that the Greek for “nature” is *phasis*. However, physico-theology has a specific hybrid meaning within the seventeenth-century context that provides better clarity when used.
introduce divine revelations into Philosophy, nor philosophical opinions into religion."\textsuperscript{514} In the latter statement Newton drew a line between divinity and natural philosophy: he is specific that it is divine revelation that has no place in philosophy, not discourse on the divine or notions of a creator derived from natural phenomena. Likewise, philosophical opinions have no place in divinity. Newton clarified this sentiment in a draft on the history of the Church written during the same period:

The grand occasion of errors in the faith has been the turning of the scriptures from a moral & monarchical to a physical & metaphysical sense, & this has been done chiefly by men bred up in the metaphysical theology of the heathen Philosophers[,] the Cabbalists & Schoolmen.\textsuperscript{515}

One of the primary means by which the church had become corrupted—and non-scriptural concepts (which Newton believed included the Trinity) had become markers of true faith—was precisely the importation of natural-philosophical and metaphysical ideas into Christian theology. Divinity was to be founded on a literal interpretation of the divine revelations, which in this case Newton believed to be “moral and monarchical.”\textsuperscript{516}

Nonetheless, in much the same manner as Boyle had used natural knowledge of chymical properties to aid in the interpretation of Scripture, Newton had advocated a methodological link between natural philosophy and divinity at least three decades earlier. In his ninth rule for interpreting the language of Scripture (in his early treatise on Revelation,

\textsuperscript{514} Newton, Keynes Ms. 6, fol. 1r.

\textsuperscript{515} Newton, “Drafts on the History of the Church,” Yahuda Ms. 15.5, fol. 97r.

\textsuperscript{516} By a monarchical sense Newton refers to his interpretation of Christ’s union with the Father as one of shared governance, not shared divine substance (the metaphysical sense). See my paper on Newton’s doctrine of God in the General Scholium, Greenham, “Newton’s Doctrine of God,” (forthcoming). See also Snobelen, “God of Gods, and Lord of Lords’,” 181-4.
Yahuda Ms. 1.1) he emphasized simplicity as a source of truth, comparing biblical interpretation to methods used in natural philosophy:

As the world, which to the naked eye exhibits the greatest variety of objects, appears very simple in its internall constitution when surveyed by a philosophic understanding, & so much the simpler by how much the better it is understood, so it is in these visions. It is the perfection of all God's works that they are all done with the greatest simplicity. He is the God of order & not of confusion.\textsuperscript{517}

In this case Newton supported using the principle of simplicity in biblical interpretation by appealing to its usefulness in natural philosophy.\textsuperscript{518} Newton’s statement of God’s perfection and orderliness displayed in his works reflected a physico-theological understanding of his nature.\textsuperscript{519} However, Newton did not therefore advocate using the knowledge of God’s perfection—derived from a study of the natural world—in his construction of the meaning of the Apocalypse. Rather the natural-philosophical principle of simplicity by which the world was rendered comprehensible was equally valuable when applied to the variety of prophetic figures. This was an instance of employing philosophical methodology, not ideas, in the interpretation of divine revelation.

As seen in the previous chapters of this dissertation, Newton had no qualms about methodological overlap between his biblical and natural-philosophical studies: his descriptive-translational principle yielded true interpretations of biblical prophetic images as well as chymical substances and properties. Newton’s statement regarding the separation of

\textsuperscript{517} Newton, Yahuda Ms. 1.1, fol. 14r.

\textsuperscript{518} A number of authors have commented on Newton’s use of the principle of simplicity, or Ockham’s razor in this treatise on Revelation. See Hutton, “Language of Biblical Prophecy,” 46-47; Maurizio Mamiani, “Newton on Prophecy,” 398-9; and Snobelen, “‘God of Gods, and Lord of Lords’,” 198-200.

\textsuperscript{519} Intriguingly Newton may have additionally been referencing a scriptural source for God’s orderliness in this quotation, as 1 Cor. 14:33 states, “God is not the author of confusion, but of peace, as in all churches of the saints” (KJV).
philosophy and religion operated at the metaphysical and theoretical level, not the methodological. Hence the majority of this dissertation has focused on methodological links between Newton’s theology-as-divinity and his natural philosophy—in this case chymistry. Nonetheless, as stated earlier, within the specific realms of physico-theology and natural philosophy itself, Newton supported a discussion of God grounded in the phenomena. As Janiak argues, Newton’s General Scholium contains both natural philosophy and natural theology, or, using Harrison’s characterization, physico-theology. Newton’s writing reveals physico-theological arguments in a number of places. He disparaged the unreasonableness of atheism in the face of the design evident in biological organisms and defended a knowledge of God’s dominion, intelligence and personal involvement in the constitution of the universe. Moreover, the entirety of Query 31 to the Opticks can be seen as an exposition of a physico-theological argument from specifically chymical phenomena, as will be explored below. However, even within the discipline of natural philosophy as defined in distinction from physico-theology or natural theology (i.e. not focused on understanding or proving God

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520 “Atheism is so senseless & odious to mankind that it never had many professors. … Whence arises this uniformity in all their outward shapes [human and animal bodies] but from the counsel & contrivance of an Author? Whence is it that the eyes of all sorts of living creatures are transparent to the very bottom & the only transparent members in the body, having on the outside an hard transparent skin, & within transparent juyces with a crystalline Lens in the middle & a pupil before the Lens all of them so truly shaped & fitted for vision, that no Artist can mend them? Did blind chance know that there was light & what was its refraction & fit the eys of all creatures after the most curious manner to make use of it? These & such like considerations always have & ever will prevail with man kind to beleive that there is a being who made all things & has all things in his power & who is thersore to be feared,” Newton, Keynes Ms. 7, fol 1r. For the design argument from the structure of the sun and planets, see Newton’s General Scholium to the Principia: “This most beautiful System of the Sun, Planets, and Comets, could only proceed from the counsel and dominion of an intelligent and powerful being. And if the fixed Stars are the centers of other like systems, these, being form’d by the like wise counsel, must be all subject to the dominion of One; especially since the light of the fixed Stars is of the same nature with the light of the Sun, and from every system light passes into all the other systems. And lest the systems of the fixed Stars should, by their gravity, fall on each other mutually, he hath placed those Systems at immense distances from one another,” Newton, Principles (1729), vol. 2, 387.
and specific theological topics), Newton can be seen to have explored and used the notion of the divine. Janiak labels this aspect of Newton’s natural philosophy his divine metaphysics.

In Janiak’s *Newton as Philosopher*, he considers the degree to which Newton could be characterized as employing a consistent philosophical system in his natural philosophy.\(^{521}\) Janiak proposes a specific understanding of Newton’s use of metaphysical ideas in his physics—even as Newton rhetorically disparaged metaphysics—dividing his approach to metaphysical topics (such as the nature of motion and forces as well as of space and time) into “divine” and “mundane” metaphysics.\(^{522}\) Janiak describes Newton’s mundane metaphysics as empirically driven in essence, such that his ideas about motion, force and natural causation were constantly subject to revision and refinement in light of new phenomena.\(^{523}\) However, in Janiak’s account, Newton had a more basic “fundamental conception of God’s nature and relation to the natural world that is not subject to revision.”\(^{524}\) In this framework, which Newton never questioned throughout his career, God was the necessary existent being, who gave rise to all contingent beings in the world. And, although Newton still made evidentiary arguments regarding the existence of God and his spatiotemporal ubiquity, he did not indicate how natural phenomena could falsify his conception of God.\(^{525}\) Within Newton’s divine metaphysical understanding of the world, God

\(^{521}\) Janiak, *Newton as Philosopher*.

\(^{522}\) Janiak, *Newton as Philosopher*, 45.


\(^{524}\) Janiak, *Newton as Philosopher*, 45.

\(^{525}\) Janiak, *Newton as Philosopher*, 44.
was physically extended throughout infinite space: a product of his view of space as an “emanative affectation of being” (an empirically derived concept) and of God as the necessary being (an *a priori* assumption). What this meant, however, was that treatment of God’s being and attributes as they related to physical concepts belonged properly to natural philosophy. Moreover, Newton’s *a priori* commitment to God as a necessary divine being shaped significant aspects of his physical system, such as his bias against action-at-a-distance and for absolute space. Janiak’s description of Newton’s divine metaphysics as that part of natural philosophy dependent on *a priori* commitments to the divine being provides a helpful clarification to Newton’s distinction between natural theology and natural philosophy mentioned above. Newton’s divine metaphysics was neither divinity nor physico-theology, but a conceptual framework guiding Newton’s work in natural philosophy and which derived from the metaphysical relationship between the Creator and the natural world. Natural theology or physico-theology used the nature of motion, forces, space and time to understand God. Inversely, divine metaphysics—the driving force behind (natural) philosophical conceptions of God—sought to understand how God’s role as Creator and sustainer in the natural world affected such things as motion, force, space and time.

Janiak’s main sources for his understanding of Newton’s divine metaphysics are the General Scholium to the *Principia* (1713), Newton’s correspondence—particularly with Richard Bentley (1693) and Thomas Burnet (1681)—and his unpublished “De Gravitatione” (1670s). I extend Janiak’s exploration of Newton’s divine metaphysics to an analysis of Newton’s chymistry as revealed in his optical work, in the “Hypothesis of Light” (1675) and in the *Opticks* (1704, the 1706 *Optice*, and the *Opticks* of 1717/18), particularly the final four

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Queries, 20-23 (28-31). Although a number of studies have considered the theology and metaphysics of the *Opticks*, Newton’s discussion of God in the Queries has received little treatment as a primarily chemical or chymical manifestation of the intersection between Newton’s natural philosophy and theology.\(^{527}\) Thus, in this chapter, I provide a new analysis of Newton’s chymistry and theology in the *Opticks* material according to the categories of physico-theology, divine metaphysics, and divinity.

First, in section two, I establish the extensive integration of chymistry into Newton’s optical work—particularly in his use of chymical phenomena to understand the active principles behind motion (including gravitational motion) in Query 31. Then, in section three, I look at how the final Queries incorporate physico-theological arguments for the existence and attributes of God and reveal the operation of Newton’s divine metaphysics in subjects related to his chymistry. I demonstrate Newton’s employment of divine metaphysics in a manuscript draft of Query 31, as Newton used God’s omnipresence to derive natural properties associated with the laws of motion. Newton developed an intricate design argument from chymical phenomena (physico-theology) while at the same time employing *a priori* concepts of God’s omnipresence to establish the ubiquity of certain active principles associated with his chymical conception of motion (divine metaphysics). Finally in section

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four, I consider the intersection of Newton’s natural philosophy—particularly his chymistry— with his divinity, as he interpreted descriptions of nature in Scripture as translated statements of past phenomena and ultimately founded his natural-philosophical concept of God in the biblical doctrine of the Imago Dei.

2. Chymistry and Opticks

2.1 ‘God in Newton’s chemistry’

The literature on Newton’s discussion of God in his natural philosophy is extensive. This relationship is often conceived of in terms of ‘God in Newton’s physics.’ In many respects this derives from Newton’s seminal publications in ostensibly physics-related fields—the Principia and the Opticks— whose later editions contained his famous discussions of God. Newton’s statements of God’s sensorium and God’s relationship to space and to the nature of bodies are rarely portrayed as ‘God in Newton’s chemistry.’ Nonetheless, even though

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modern disciplinary boundaries place optical theory firmly within the realm of physics and would consider Newton’s theory of light and colours to be a foundational physical theory, such disciplinary associations did not yet hold for Newton or his readers. Newton’s final Queries to the *Opticks*—in which he developed clear physico-theological arguments—were perceived in the eighteenth century to be thoroughly chemical. In a note to his 1753 translation of Herman Boerhaave’s *Elements of Chemistry*, Peter Shaw, an eighteenth-century English chemical author, claimed that, “It is by means of chemistry, that Sir Isaac Newton has made a great part of his surprizing discoveries in natural philosophy; and that curious sett of Queries, which we find at the end of his optics, are almost wholly chemical.”

For Shaw, the Newtonian example demonstrated that “chemistry, in its extent, is scarce less than the whole of natural philosophy....” While Shaw’s statement contains a rhetorical element advocating his chosen field, it highlights the degree to which Newton’s Queries to the *Opticks* were indeed focused on “chemical” topics.

And, as seen in chapter one, chemistry itself was only beginning to emerge as a category distinct from alchemy towards the end of Newton’s life, such that any “chemical” material in Newton’s published work had direct descent from his “chymical” labours—in both library and laboratory—in the decades prior to the publication of the *Opticks* in 1704, and the “chemical” Queries added in

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532 Of course, the distinction between physics and chemistry was not truly present in Newton’s period. However, Shaw’s description of Newton’s work as thoroughly chemical highlights Shaw’s perception of chymical sources, experimental phenomena, and theories in the natural phenomena and concepts of matter espoused in the Queries. One way to avoid the chemistry/physics distinction would be to refer merely to Newton’s “matter theory”, aside from disciplinary associations. Nonetheless, as this chapter demonstrates, the matter theory which Newton espouses in his optical work—and its intersection with his concept of God—most certainly incorporated his earlier chymical work.
1706. That Newton considered his printed optical work to be the natural location for the publication of his chymical work hints at his integration of the two from the beginning. Newton’s optical work in the 1670s—the basis for his 1704 publication—coincided with his extensive textual and experimental chymical research.

A number of scholars have looked to Newton’s chymistry, or alchemy, in both Queries 28-31, and his earlier work, as the source of substantial systematic shifts in Newton’s overall conception of the natural world. His radical departure from purely mechanistic causes—exemplified in his appeal to action-at-a-distance in the operation of gravity—has been attributed to his alchemical allegiance. And, Newton’s “nutshell theory of matter,” articulated in Query 31 and predominant in eighteenth-century Newtonianism, has been

533 While these Queries were numbered 17-23 in the 1706 Latin edition, Newton, Optice: sive de reflexionibus, refractionibus, inflexionibus & coloribus lucis (London, 1706), his later 1717 second English edition added further preceding Queries causing the earlier additions to become numbers 25-31. In this chapter I refer to each Query by its final number except in those instances where the specific content of the original 1706 edition differed from the later editions.

534 See Chapter 1 for more on the integration of Newton’s research of symbolic chymical texts into his chymical experimentation in the 1670s-90s.


linked to Newton’s earlier alchemical theories of the composition of matter. More recently, William Newman has explored the chymical sources for Newton’s early optical theory in his use of Robert Boyle’s methods of chymical experimentation. According to Newman, when Newton separated white light into its component colours and then recombined the parts to regain the original substance (Newton’s *experimentum crucis*) he drew directly on Boyle’s use of analysis and synthesis and his reduction to the pristine state in his chymical experimentation. Just as Boyle used the dissolution of metals in acid, their passage through filter paper, and precipitation back to the original state to prove the unchanged nature of the component parts of metals, so Newton sought to demonstrate the immutable nature of the component colours of light—separated and then recombined on successive passage through prisms—in his *experimentum crucis*. Adding to Newman’s demonstration of how the methodology of Newton’s chymical sources determined his optical methods, I argue that specifically chymical material informed Newton’s ideas of the nature of light and the aether in his early optical theories. Additionally, in the printed *Opticks* (1704), determining the micro-structure of chymical materials formed a primary application for Newton’s optical work. Finally, Newton’s integration of chymistry and optics becomes manifest in the examination of Query 31, first added to the *Optice* in 1706, Newton’s chymical treatise.

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539 Rob Iliffe argues for a similar influence on Newton’s early optics from Newton’s early investigation of the imagination, senses and internal bodily motions in Iliffe, “Political Physiology,” 439-51. Iliffe discusses the alchemical associations of these investigations and characterizes them as biological and physiological, although they could as easily be described as chymical, see below.
2.2. Chymistry in Newton’s optical sources

Most of the experiments and observations that provided the subject matter for the *Opticks* were performed and observed in the 1660s and 70s, even though Newton only published a full account in 1704. Newton appears to have used his earlier notes and unpublished writings over the intervening decades as the main sources for the final work. The published *Opticks*, however, was not Newton’s first public demonstration of his theories of light. His first lectures as Lucasian chair in 1670 incorporated the optical material of his predecessor Isaac Barrow, to which his most significant addition was a discussion of chromatic aberration (the irregular refraction of differently coloured rays of light). Newton’s first publications of these new ideas came through his printed correspondences with Henry Oldenburg and the Royal Society in 1672 and 1675. And it is in Newton’s “Hypothesis of Light” (from 1675) and related works that significant connections between Newton’s optical interests and his chymistry can be discerned.

On the 7th of December 1675, Newton sent a set of observations to Henry Oldenburg accompanied by an extensive letter to be read to the Royal Society, which described coloured rings formed between a convex glass lens and a polished glass plate. In this letter, labelled “An Hypothesis explaining the Properties of Light,” Newton detailed his experimental investigation of the colours resulting from the refraction of light in air and water of various widths, achieved by the increasing height of the curved lens surface compared to the glass plate. The details of this experiment formed the second half of the work, and reappeared in...
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Book II of the 1704 *Opticks*, Parts I and II. In the opening discourse of the “Hypothesis,” Newton proposed his particle theory of the composition of light, albeit in a more hypothetical manner, so as to “avoyde dispute, and make this Hypothesis [the origin of colours] generall.”

To develop his theory of colours he needed to address the medium through which light passed, the aether, expounding on what would become an enduring subject in his natural philosophy. This aether was not uniform, but compounded partly of the maine flegmatic body of aether partly of other various aethereall Spirits, ... . For the Electric and Magnetic effluvia and gravitating principle seem to argue such variety. Perhaps the whole frame of Nature may be nothing but various Contextures of some certaine aethereall Spirits or vapours condens’d ... and after condensation wrought into various formes, at first by the immediate hand of the Creator, and ever since by the power of Nature, which by vertue of the command Increase and Multiply, became a complete Imitator of the copies sett her by the Protoplast. Thus perhaps may all things be originated from aether.

We see in this quotation how Newton sees the nature of the aether affect electric, magnetic and gravitational phenomena. Moreover, Newton’s description of the aether here reveals an example of his divine metaphysics in that the original forms of matter depended on God for their properties and propagated and maintained those properties with law-like consistency at the divine command. This early divine discourse in the “Hypothesis” is not physico-theological—it does not prove or attempt to explain theological topics—but divine

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542 Newton to Oldenburg, 7 December, 1675, “Hypothesis of Light,” 364. This quotation represents an edited form of Newton’s letter to Oldenburg. After his initial letter, Newton sent another to Oldenburg on 25 January 1675/76 requesting certain edits. See Newton to Oldenburg, 25 January 1675/76, in Turnbull, ed., *Correspondence*, vol. 1, 413-15. The original letter read: “Perhaps the whole frame of Nature by be nothing but aether condensed by a fermental principle. Thus perhaps may all things be originated from aether.” The original form shows Newton’s dependency on chymical theory in his understanding of the original creation of the world: the fermentative principle responsible for new matter and motion in certain chymical reactions was also that responsible for the causing the original forms of created matter to condense out of the aether.
metaphysics, whereby Newton’s commitment to God as the sustaining Creator informed his conception of the natural world.

The aether also functioned in Newton’s “Hypothesis” as a chymical medium responsible for a number of motions or activities beyond those associated with gravitational, magnetic or electrical phenomena, particularly animal motion. In his description of the aether’s role in animal motion Newton explicitly treated it as a chymical substance, comparing its effects to the properties observed in mercury, acids, and salts. He speculated that the aether was contained and absorbed by the nerves and muscles through “some secret principle of unsociablenes” akin to the way chymical substances were absorbed by some materials and repelled by others. Although the aether was exceedingly “Subtil,” it could still be contained by coatings on the brain, nerves and muscles.\(^{543}\) Newton used the example of how some fluids, such as oil, “Spirit of Wine,” or mercury, were able to pervade some substances and not others:

> though their pores are in freedome enough to mix with one another, yet by some secret principle of unsociablenes they keep asunder, and some that are Sociable may become unsociable by adding a third thing to one of them, as water to Spirit of Wine by dissolving Salt of Tartar in it.\(^{544}\)

Newton proposed that a consideration of how the addition of a third material changed the “sociablenes” of substances—either helping them dissolve or forcing previously dissolved substances to be reconsolidated.

\(^{543}\) See Iliffe, “Political Physiology,” 447-50 for the context of these physiological theories. Newton drew on the work of Thomas Willis, *Cerebri anatome* (1664) and *Pathologiae cerebri et nervosi generis specimen* (1667), and John Mayow, *Tractatus duo; Quorum prior agit de respiratione: alter de rachitide* (1668), who described muscular contraction as a chymical explosion resulting from the meeting of the animal spirits in the nerves with “nitro-sulphurous” or “nitro-saline” particles in the muscles. Newton’s library contained Willis’ *Pathologiae cerebri*, see John Harrison, *Library*, 262 (HL 1741).

\(^{544}\) Newton to Oldenburg, 7 December, 1675, “Hypothesis of Light,” 368.
materials to then precipitate—would shed light on “how the Spirit may be used for Animal motion”:

Water, which will not dissolve copper, will do it if the copper be melted with Sulphur: Aqua fortis, which will not pervade Gold will do it by addition of a little Sal Armoniac, or Spirit of Salt ... Lead melted with Silver quickly pervades and liquefies the Silver in a much less heat, then is requisite to melt the Silver alone; but if they be kept in the Test, till that little substance that reconciled them be wasted or altered, they part againe of their owne accord.  

This thoroughly chymical description, Newton said, was one way to understand how “the aethereal Animal Spirit in a man” mediated between the external aether, universally present as the medium through which light passed, and the “juices” of the muscles. When the animal spirit entered a muscle, it rendered “the juices more Sociable to the common external aether” allowing the external aether to pervade the repulsive coating of the muscle, mix with the “juices” and thus swell, causing contraction and animal motion. And when the animal spirit, “this Mediator of Sociablenes” was retracted, the aether receded again and the muscle relaxed. Newton then claimed that the animal spirit, the mediator of this motion, was directly manipulated by the soul:

Thus may therefore the Soul by determining this aethereall Animal Spirit or Wind into this or that Nerve, perhaps with as much ease as Air is mov'd in open Space, cause all the motions wee see in Animals....

However, the manner in which the soul interacted with the animal spirit, the ultimate source of animal motion, remained a mystery. In the next paragraph, Newton used this mystery of self-motion to suggest similar as-yet-undiscovered principles of motion behind the

545 Newton to Oldenburg, 7 December, 1675, “Hypothesis of Light,” 369.

546 Newton to Oldenburg, 7 December, 1675, “Hypothesis of Light,” 369.

547 Newton to Oldenburg, 7 December, 1675, “Hypothesis of Light,” 369.
propagation of light in the aether. As he stated, “God, who gave animals self-motion beyond our understanding, is, without doubt, able to implant other principles of motion in bodies, which we may understand as little.” By grounding his suggested principles of motion—as natural-philosophical explanations for the observed phenomena of self-motion—in the direct action of God, Newton yet again employed a form of divine metaphysics. Newton’s theory of aethereal muscular contraction didn’t make its way into the *Opticks* until Query 24 in the 1717 edition. However, Newton’s divine metaphysical approach to the problem of how the soul generated motion did reappear in an earlier draft of the Queries in 1705, which drew analogies between the soul’s connection to the body and God’s omnipresence, analysed in detail below.

In the “Hypothesis,” Newton continued to explain how the aether caused static-electric and gravitational phenomena in terms that are demonstrative of his chymical understanding of the aether. It was the agitation of an internal aether, caused by rubbing a glass rod, which led to electrical effluvia and the erratic motions of nearby fragments of paper. And just as water vapour, after being heated, then condensed, so the agitated aether condensed back into the rod, providing an attractive effect, pulling the paper fragments towards the rod. Likewise, “so may the gravitating attraction of the Earth be caused by the continuall condensation of some other such like aethereall Spirit.” This reveals an early theory of gravity which Newton held before the 1680s, prior to his observation that the

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549 See Newton, *Opticks* (1717), 328.

550 Newton, “Draft to the Opticks,” Cambridge University Library (CUL) Add. Ms. 3970.9, see Section 3.3 below.

motions of the planets experience no visible retardation and his rejection of an aether that filled all of space—the plenist understanding—and associated aethereal explanations of gravity. Nonetheless at this stage, Newton proposed a cyclical operation of air and aether, whereby air was produced by the condensation of aether in the pores and “bowells of the Earth”, rose into the atmosphere and attenuated “at length” into its “first principle” (i.e., aether) at the edge of the atmosphere. This cyclical process created a constant stream of aether towards the centre of the earth, “with great celerity” and caused gravity by bearing “downe with it the bodyes it pervades with force proportionall to the superficies [surfaces] of all their parts it acts upon.” Thus the more internal components (mass) in an object, the more aether stuck to it and the greater the pull towards the earth’s centre. Newton went on to demonstrate this cyclical effect in the motions of the planets around the sun and the conversion of aether into light within the sun, all in strikingly vitalistic terms:

And as the earth so perhaps may the sun imbibe this spirit copiously, to conserve his shining, and keep the planets from receding further from him. And they, that will, may also suppose, that this spirit affords or carries with it thither the solary fewel and material principle of light: and that the vast æthereal spaces between us and the stars are for a sufficient repository for this food of the Sun and Planets.

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553 As discussed above, Newton speculated that aether was the original “first principle” of all natural forms, established and upheld in its properties by God.

554 Newton to Oldenburg, 7 December, 1675, “Hypothesis of Light,” 366. This description of the cause of motion according to action at the surfaces of objects reflects a Cartesian framework at this stage of Newton’s natural philosophy.

555 Newton to Oldenburg, 7 December, 1675, “Hypothesis of Light,” 366.
This description of a living earth, inhaling aether and exhaling air, responsible in its perpetual cycles for the forces of gravity, strongly resembled a passage from an overtly chymical text Newton composed about the same time, “Of Nature’s Obvious Laws and Processes in Vegetation.” Set amongst a discussion of the active principle of vegetation and the pervasive mineral spirit, Newton described how air could be generated by the ebullition of “saline or vitriolate spirits ... when poured together”, by the corrosion of metals “with acid liquors [such] as aqua fortis,” and by fermentation. All of these chymical operations imitated what happened in the earth when aether was “gradually condensed and interwoven with bodyes it meets there” in a “tender ferme[n]t.” Just as this process caused gravitational attraction in the “Hypothesis”, so here Newton asserted that,

[I]n its descent it endeavours to beare along what bodys it passeth through, that is makes them heavy ... [and] the aether being by many degrees more thin and rare then air (as air is than water) it must descend soe much the swifter and consequently have soe much more efficacy to drive bodys downward then air hath to drive them up. And this is very agreeable to natures proceedings to make a circulation of all things. Thus this Earth resembles a great animall or rather inanimate vegetable, draws in aethereall breath for its daily refreshment and vital ferment and transpires again with gross exhalations.

Only one sentence later, Newton claimed that “this is Natures universall agent, her secret fire, the onely ferment and principle of all vegetation,” labelling it “the material soule of all matter.” Clearly for Newton, when he spoke of the aetherial medium in the context of optics, that medium was related to the vegetative and active principles treated in his

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Chymistry, as well as to considerations of electricity and gravity. Thus in the source material for the final printed work of the *Opticks* (1704), we can see a dependency on chymical ideas. Nonetheless, by 1704 Newton had thoroughly rejected the Cartesian aether, particularly in explanations of gravity, and his “exceedingly rare Aethereal Medium” of Query 18 (in the 1717 edition) had not yet been invoked as a possible cause for the activity seen in nature.\(^559\) Lacking the aether as an explanation, Newton needed to deal with the question of the boundary between the material and the non-material, the source of activity, the motion of light, and the properties of matter. Although he would return to these topics in the final Queries, first added to the Latin *Optice* of 1706, the main text of the first edition itself addressed a number of chymical themes, hinting at the solutions two years earlier.

### 2.3. The chymistry of the Opticks

At first glance the body of Newton’s *Opticks* appears to fit wholly within the purview of a mathematical science, unrelated to any theological or alchemical interests. And it appears that Newton’s language in the *Opticks* was intended to give that impression. It was another example of the mathematical experimental philosophy first advocated in his *Principia*. Iliffe’s insistence on disciplinary boundaries and terminology appears to hold strongly in Newton’s systematic and mathematical approach to the science of optics in the work.\(^560\) Knowing the sources behind this work, however, and investigating specific areas that have

\(^{559}\) The explicitly physical aethereal medium, composed of exceptionally small, exceedingly rare, and highly elastic particles, was invoked as a possible cause for gravity and the medium through which light passes in Queries 18-22, which Newton wrote to be included in the 1717 edition of the *Opticks*. See Newton, *Opticks* (1717), 323-27.

\(^{560}\) See Introduction, Section 1 for a discussion of Rob Iliffe’s “Abstract Considerations,” 427-54.
more overlap with chymistry, we can see connections that do not appear on the surface. In Part III of Book II of the *Opticks* Newton’s optical argument moved to a consideration of the corpuscular structure of bodies and an exposition of matter theory seen through optical observations of chymical materials and processes.

Newton opened Part III with a declaration of his intention to use the previous observations and propositions (Parts I and II) on the phenomena of coloured rings between glass plates in an analysis, by way of analogy, of the composition of natural bodies. Newton’s earlier theory (Book I, and also in the 1675 “Hypothesis”) had proposed that light consisted of streams of particles of varying sizes, the differing sizes of which caused our observation of different colours, and when combined together caused the observation of white light. Thus, the way in which light reacted with various materials, and the resulting observed colours of those materials, would give some indication of their internal particulate structures. Light particles of different sizes would be differently absorbed, refracted or reflected depending on the composition of the material. Newton made this central claim in the seventh proposition of Part III: “The bigness of the component parts of natural Bodies may be conjectured by their Colours.”

In his subsequent analysis of the relationship between density, particle size, and colour, Newton relied on knowledge of chymical processes. As an example, in his discussion of white metals, he stated,

> For while the densest of Metals, Gold, if foliated, is transparent, and all Metals become transparent if dissolved in Menstruums or vitrified, the Opacity of white Metals ariseth not from their Density alone. They being less dense than Gold would be more transparent than it, did not some other Cause concur with their Density to make them opake. And this Cause I take to be

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561 Newton, *Opticks: or a treatise of the reflections, refractions, inflections and colours of light* (London: Smith & Walford, 1704), 58.
such a Bigness of their Particles as fits them to reflect the white of the first order.\textsuperscript{562}

Here Newton discussed how chymical changes (dissolution or vitrification) affected the structure of the particles and their resulting opacity and transparency. Moreover, he organized the size of the white metals’ component particles according to a scale he had developed in the earlier parts of Book II. Hence the white of these metals was of the first order, i.e. of the same degree of refraction as the light that formed the first solid white ring (among many coloured rings) when a convex glass lens was placed on top of a flat glass plate.\textsuperscript{563} Newton used the increasing distance from the centre point of this lens-and-plate arrangement to measure the varying refractive effects of increasing widths of air. By calculating specific distances between the resulting coloured rings Newton was able to determine the exact proportions of refractivity between rays of differently coloured light. Thus by assigning orders of colour to various coloured bodies, Newton was able to give an indicator that, used together with density and opacity, could point to its invisible properties: the size of its constituent parts. Hence colour changes—such as those resulting from chymical reactions—were integral indicators of changes in internal structure.

Newton gave further examples of how colour changes could be used to understand changes at the micro-level when amalgamating metals:

\begin{quote}
Gold, or Copper mix’d with less than half their Weight of Silver, or Tin, or Regulus of Antimony, in fusion, or amalgamed with a very little Mercury, become white; which shews both that the Particles of white Metals have much more Superficies, and so are smaller, than those of Gold and Copper, and also
\end{quote}

\textsuperscript{562} Newton, \textit{Opticks} (1704), 61.

\textsuperscript{563} These are the same experiments discussed in his earlier “Hypothesis” of 1675.
that they are so opake as not to suffer the Particles of Gold or Copper to shine through them.\textsuperscript{564}

Moreover, Newton used the internal structure of black bodies to explain their properties. Black bodies “reflect so very little Light as to appear intensely black,” because their component corpuscles were so small and thus “perhaps variously refract [light] to and fro within themselves so long, until it happen to be stifled and lost, by which means they will appear black in all positions of the Eye without any transparency.”\textsuperscript{565} This property of black materials explained a number of processes central to chymistry, including combustion and putrefaction:

\begin{quote}
And from hence may be understood why Fire, and the more subtile dissolver Putrefaction, by dividing the Particles of Substances, turn them to black, why small quantities of black Substances impart their Colour very freely and intensely to other Substances to which they are applied; ... [and] why black Substances do soonest of all others become hot in the Sun’s Light and burn, (which Effect may proceed partly from the multitude of Refractions in a little room, and partly from the easy Commotion of so very small Corpuscles;)
\end{quote}

\textsuperscript{566}

Newton continued his amalgamation of chymistry and optics throughout this section, including an extensive table that listed various chymical materials, comparing their refractive indices, densities, and specific gravities. While space does not allow for a full exposition of each example, Part III of Book II of the \textit{Opticks} demonstrates the immediate use in natural philosophy to which Newton imagined his experiments with optics could be put. For

\textsuperscript{564} Newton, \textit{Opticks} (1704), 61-2.

\textsuperscript{565} Newton, \textit{Opticks} (1704), 63.

\textsuperscript{566} Newton, \textit{Opticks} (1704), 63.
Newton, optics served as a way of understanding the invisible realm, of unravelling the hidden composition of matter, the subject of chymistry.\footnote{This purpose to optics becomes manifest in Newton’s exposition of matter theory—his “nutshell theory”—which was added to Book II, Part III in the 1706 Latin edition as a two page corrigenda. See Thackray, 	extit{Atoms and Powers}, 21-24, 53-65.}

In this light it should come as no surprise that Newton turned to a full investigation of the attractive virtues and powers in the invisible realm in the Queries that he added to the \textit{Optice} in 1706. Newton had been exploring these concepts in his chymical labours from the late 1660s to the 1690s. And, as the foregoing discussion has demonstrated, he integrated his chymical experiments and theory into his optical writing. Newton framed multiple problems in natural philosophy raised by his optical work—such as the nature of the aether, how the soul causes animal motion, and the internal structure of matter—in chymical terms. In many ways his discussion of these topics in his published optical work should be viewed as primarily chymical, rare expressions in print of his extensive experimental and theoretical chymistry over his lifetime. Although Newton’s research of symbolic chymical texts was on the decline as he prepared the \textit{Opticks} for publication in 1704, his chymical interests endured.\footnote{Newton’s research programs in the 1700s and 1710s reflect this continued chymical interest. This is particularly evident in the experimental program he requested of Francis Hauksbee and the chymical work of those in his inner circle. For Hauksbee’s experiments at Newton’s request, see Henry Guerlac, “Sir Isaac Newton and the Ingenious Mr. Hauksbee” in I. B. Cohen and R. Taton, eds., \textit{Mélanges Alexandre Koyré publiés à l’occasion de son soixante-dixième anniversaire} (Paris: Hermann, 1964), 228-53; and Guerlac, “Francis Hauksbee: Expérentateur au Profit de Newton,” \textit{Archives Internationale d’Histoire des Sciences} 16 (1963), 1113-28. Newtont makes specific mention of Hauksbee’s experiments on the capillary action of various fluids in Query 31 as part of his discussion of the sources of attractive power in the micro-world. For Newton’s immediate impact and continuing direction of the chymical ideas of those in his inner circle—including David Gregory, Archibald Pitcairne, John Keill, George Cheyne, and Richard Mead—see Thackray, \textit{Atoms and Powers}, 43-82. See also Figala and Petzold, “Alchemy in the Newtonian Circle,” 173-91.}

And these were by no means divorced from the rest of his natural philosophy, including his divine metaphysics. By the publication of the \textit{Principia} in 1687, unhindered planetary motion had convinced Newton that the world could not be filled with a universally
active material aether. Yet the activity he had earlier ascribed to that aether remained unexplained. Not only did the question of how gravity functioned at a distance remain to be answered, but similar attractive phenomena—across much smaller distances—required explanation. Thus Newton focused instead on active principles, whose natures were as yet unknown—but whose existence was experimentally verified—as the causes behind such motions as planets, acid particles, and animal limbs. In his treatment of these concepts Newton made the chymical context of the *Opticks* explicit, particularly the chymical Query 31, and revealed both physico-theological utility for his chymical theories and the incursion of divine metaphysics into chymical aspects of his natural philosophy.

### 2.4. Newton’s ‘chymical’ treatise: Query 31

In the main text of the first edition of the *Opticks* (1704), chymistry was not, on the face of it, a major topic, but rather a point of application, specifically in the use of optical phenomena to understand the internal structures of bodies. Newton left no doubt, however, as to the chymical nature of his optical interests in the additional Queries added to the 1706 Latin translation. These Queries, numbered 17-23 in the 1706 *Optice* and 25-31 in later editions, were what Peter Shaw referenced in his celebration of Newton’s chemistry.\(^{569}\) In these final Queries Newton picked up a number of themes dealt with in the first half of the 1675 “Hypothesis,” which had been too speculative for him to incorporate in the main text of the *Opticks*: in Queries 28 and 29 he dealt with the aether and the particle theory of light, in

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\(^{569}\) For Peter Shaw, see Section 2.1, above. As noted earlier, I refer to these Queries by their final numeration, unless the difference in editions is relevant to the discussion, in which case the Query receives its given form in the relevant edition. English quotations of the final Queries are taken from the 2\(^{nd}\) English edition of 1717, unless this edition varies from the Latin text of the 1706 *Optice*, in which case I provide the relevant translation.
Query 30 with the transmutation of light into bodies and vice versa, and in Query 31 with generation of air in the earth. In Query 28 Newton posed the question of how “the motions of the body follow from the Will”, a central theme in the “Hypothesis.” In Query 28 and in drafts to the Queries that I consider below Newton addressed this question through an invocation of the sensorium, which, when extended by analogy to God’s interaction with the world, led to one of the main points of contention in the Clarke-Leibniz correspondence.

Regarding the infusion of chymistry into the Opticks, however, Query 31 is unmistakably chymical, forming, as it were, a bridge between his earlier chymical experimentation and the future direction of eighteenth-century British chemistry.

At heart Query 31 addressed the question of activity in matter. It was here that Newton considered the range of forces and powers of bodies beyond gravitation, magnetism and electricity. Just as attractive forces operated in a law-like fashion among the grosser bodies, the earth and planets, so there must have been attractive forces and similar laws at the micro-level. As Newton stated,

The Attractions of Gravity, Magnetism, and Electricity, reach to very sensible distances, and so have been observed by vulgar Eyes, and there may be others which react to so small distances as hitherto escape Observation....

These forces, or attractive (and repulsive) “virtues”, may not have been directly observable, but they could be known through their effects in chymical transformations. Thus Newton launched into a protracted discussion of chymical effects and experiments, drawing both on

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570 Newton, Opticks, (1717), 344.


572 Newton, Opticks, (1717), 351.
his early chymistry and more recent experiments. He compared the attractive powers of salt of tartar (potassium carbonate) and aqua fortis (nitric acid) and how acid particles surrounded and loosened metallic particles in the dissolution of iron filings in acids. He explained the heat resulting from this dissolution according to the violent rush of the acid and metallic particles towards one another due to their strong attraction. Newton detailed the reactions of spirit of vitriol (sulphuric acid) and saltpetre (potassium nitrate), the explosion—greater than gunpowder—that resulted from igniting sulphur, nitre (potassium nitrate) and salt of tartar, and similar violent effects. As he stated,

the above-mention’d Motions are so great and violent as to shew that in Fermentations the Particles of Bodies which almost rest, are put into new Motions by a very potent Principle, which acts upon them only when they approach one another....

These are but a few examples among many; Query 31 continues in a similar fashion for over twenty pages. Newton discussed the dissolving power of various liquids, the mutual attraction of the fixed and volatile parts of every substance, and the repulsive force between particles that led, for example, to the diffusion of salt through water. Throughout, Newton employed language analogous to forces and attractive or repulsive powers in the macro-world that had been more experimentally accessible. The earthy and acidic parts of salt particles were an example:

As Gravity makes the Sea flow round the denser and weightier Parts of the Globe of the Earth, so the Attraction may make the watry Acid flow round the denser and compacter Particles of Earth for composing the Particles of Salt. For otherwise the Acid would not do the Office of a Medium between the Earth and common Water, for making Salts dissolvable in the Water; nor would Salt of Tartar readily draw off the Acid from dissolved Metals, nor Metals the Acid from Mercury. Now as in the great Globe of the Earth and

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573 Newton, *Opticks*, (1717), 355.
Sea, the densest Bodies by their Gravity sink down in Water, and always endeavour to go towards the Center of the Globe; so in Particles of Salt, the densest Matter may always endeavour to approach the Center of the Particle....

The matter theory Newton presented in this example—in his apparent division of matter into earthy and acidic particles—reveals his assimilation of the sulphur-mercury theory, central to early modern chymistry and medieval alchemy. Newton explored this theory more explicitly in a piece written in 1692 (but only published in 1710) called “De Natura Acidorum”. In this treatise, after an almost verbatim analogy with gravity to that from Query 31 quoted above, Newton made the connection to his alchemical forebears explicit: “Note that what is said by chemists, that everything is made from sulphur and mercury, is true, because by sulphur they mean acid, and by mercury they mean earth.”

After this extended treatment of various chymical compounds and their properties, Newton turned to what could appear to have greater affinity with his experiments in optics and mechanics: a discussion of the forces of cohesion and capillary action. Yet Newton’s exploration of these effects equally sought to determine the nature of activity in the micro-world. As he stated, “There are therefore Agents in Nature able to make the Particles of Bodies stick together by very strong Attractions. And it is the Business of experimental Philosophy to find them out.” Newton then presented his theory of the internal structure of

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577 Newton’s interest in cohesion and capillary action as a means of exploring micro-forces extended through much of his later life, as he employed Francis Hauksbee to conduct experiments on the behaviour of fluids in glass tubes. See Henry Guerlac’s work on Hauksbee and Newton, n. 568.

578 Newton, *Opticks* (1717), 369.
matter, connecting the proceeding chymical discussion in the Query to his theory of particle size and external properties such as colour, which he had covered in the main body of the

*Opticks*:

Now the smallest Particles of Matter may cohere by the strongest Attractions, and compose bigger Particles of weaker Virtue; and many of these may cohere and compose bigger Particles whose Virtue is still weaker, and so on for divers Successions, until the Progression end in the biggest Particles on which the Operations in Chymistry, and the Colours of natural Bodies depend....

Building on the specifics of chymistry, Newton now turned to a direct consideration of the power, or “virtue”, producing these attractive forces, the active principles:

Seeing therefore the variety of Motion which we find in the World is always decreasing, there is a necessity of conserving and recruiting it by active Principles, such as are the cause of Gravity, by which Planets and Comets keep their Motions in their Orbs, and Bodies acquire great Motion in falling; and the cause of Fermentation, by which the Heart and Blood of Animals are kept in perpetual Motion and Heat; the inward Parts of the Earth are constantly warm’d ... Bodies burn and shine, Mountains take fire ... and the Sun continues violently hot and lucid, and warms all things by his Light. For we meet with very little Motion in the World, besides what is owing to these active Principles. And if it were not for these Principles, the Bodies of the Earth, Planets, Comets, Sun, and all things in them, would grow cold and freeze, and become inactive Masses; and all Putrefaction, Generation, Vegetation and Life would cease, and the Planets and Comets would not remain in their Orbs.

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579 Newton, *Opticks* (1717), 370. Newton’s operational level of particles as those which are directly accessible through chymical and optical experiments reflects earlier chymical theories of matter. The sixteenth-century chymist Daniel Sennert distinguished between the fundamentally inaccessible four Aristotelian elements and the operationally relevant three chymical principles (Paracelsus’ sulphur, mercury, and salt). The chymical principles represented the limits of what could be isolated via analytical laboratory methods. Similarly, Boyle defined an element as “that into which bodies are ultimately resolved,” see Newman, *Atoms and Alchemy*, 95-97. While Newton’s speculations regarding the subdivision of the experimentally manipulable particle differed dramatically from both Aristotelian elements and Paracelsian principles, his concept of a specific level of particle responsible for observable chymical and optical effects reflects Sennet’s position and reveals the foundation of his matter theory in chymical theory. See also Figala, “Newton as Alchemist,” 102-37.

580 Newton, *Opticks* (1717), 375.
Newton’s observation of the world led him to believe that if everything in nature were only matter and motion—initially set in place at creation, as Descartes proposed—then all life and motion would slowly grind to a halt. Rather, the careful student of nature could see that motion was both lost and newly generated. Newly generated motion—or continuously sustaining motion, as in the case of gravity—was deducible from natural phenomena and could be described according to mathematical force laws. Thus there must have been unknown principles in nature causing these motions, or this activity, which Newton called the active principles.581

Newton’s two primary examples of active principles were those manifested in the operation of gravity and in fermentation, a chymical process. In this association Newton linked his understanding of the cause of gravity to his extensive exploration of the causes for chymical phenomena that had occupied most of the preceding discussion in Query 31. The precise nature and properties of these active principles was as yet unclear. However, Newton was convinced that attraction at the micro-level was related to macro-level attractions such as gravity and magnetism, and that learning more about how attraction functioned at the micro-level might reveal general principles about activity in nature.582 This possibility had motivated Newton’s exploration of the nature of attraction and motion in chymical reactions in the preceding pages of Query 31. He concluded that “God in the Beginning form’d Matter in solid, massy, hard, impenetrable, moveable Particles ... incomparably harder than any

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581 See also Iliffe’s account of Newton’s interest in the generation of self-motion associated with this text, Iliffe, “Political Physiology,” 454.

582 See also Dobbs’ discussion of Newton’s connection between micro-level and macro-level forces and attractions during the period 1687-1713, Dobbs, Janus Faces, 169-212.
Chymisty and Knowledge of the Divine

pores Bodies ... as never to wear or break in pieces."\textsuperscript{583} These particles were unbreakable and immutable (atoms, essentially), “And therefore that Nature may be lasting, the Changes of corporeal Things are to be placed only in the various Separations and new Associations and Motions of these permanent Particles.”\textsuperscript{584} Newton had turned to chymistry to explore the associations and motions of these “permanent particles,” how their attractive properties created heat, light, and motion—in some cases very violent motion—as well as how their interactions composed larger more complex bodies, such as the internal arrangement of acidic and earthy particles in salt. Newton hoped that a deeper exploration of these and similar chymical properties would reveal the nature of the active principles behind both chymical phenomena and gravity:

It seems to me farther, that these Particles have not only a \textit{Vis inertiæ}, accompanied with such passive Laws of Motion as naturally result from that Force, but also that they are moved by certain active Principles, such as is that of Gravity, and that which causes Fermentation, and the Cohesion of Bodies. These Principles I consider, not as occult Qualities ... but as general Laws of Nature, by which the Things themselves are form’d; their Truth appearing to us by Phænomena, though their Causes be not yet discover’d.\textsuperscript{585}

Unlike Aristotelian occult qualities, these principles were capable of being discovered through empirical methods, the very same methods exemplified in his chymical experimentation and set forth earlier in the Query. It was the phenomena of chymistry that enabled Newton to appeal to active principles as the causal step behind motion in nature, which he proposed as being of “very general Extent”:

\textsuperscript{583} Newton, \textit{Opticks} (1717), 376.

\textsuperscript{584} Newton, \textit{Opticks} (1717), 376.

\textsuperscript{585} Newton, \textit{Opticks} (1717), 377.
to derive two or three general Principles of Motion from Phænomena, and afterwards to tell us how the Properties and Actions of all corporeal Things follow from those manifest Principles, would be a very great step in Philosophy, though the Causes of those Principles were not yet discover’d: And therefore I scruple not to propose the Principles of Motion above-mention’d, they being of very general Extent, and leave their Causes to be found out.586

Newton discussed the general principles of motion that arose from looking at phenomena and, as was the nature of the queries, proposed future areas for natural philosophers to explore, setting out the initial steps. In Query 31, these steps were chymical, and came closest to an understanding of the nature of motion in that they came closest to the building blocks of the material world. Chymistry gave access to the composition of matter, the attraction and repulsion of its constituent particles, and insight into the very principles of activity themselves.

The development of Newton’s thought in Query 31, including his discussion of the original permanent particles and the active principles, was thoroughly informed by chymical topics and theory. However, at this point in the argument, Newton introduced God into the discussion, not just in his original formation of atoms, but in their continual governance through the active principles. As he stated,

Now by the help of these Principles, all material Things seem to have been composed of the hard and solid Particles above-mention’d [those formed and given their properties by God], variously associated in the first Creation by the Counsel of an intelligent Agent. For it became him who created them to set them in order. And if he did so, it’s unphilosophical to seek for any other Origin of the World, or to pretend that it might arise out of a Chaos by the mere Laws of Nature.587


587 Newton, *Opticks* (1717), 377-8. In this quotation Newton may be addressing possible atheistic conclusions—traditionally associated with Epicurean atomism.
In this process, Newton turned the chymistry of Query 31 into an extended argument that led to a physico-theological proof of God. Newton’s reference to God as the original source for the nature and arrangement of atomic particles in this quotation introduced one of his best-known published arguments for God’s existence from the design inherent in the natural world. This physico-theological argument, however, is rarely connected to its chymical context in the Query or to Newton’s earlier chymical experimentation and reading of the symbolic chymical literature. 588

By the time Newton published the Opticks, his personal chymical labours had diminished. 589 Nonetheless, Query 31 represents the integration of his earlier chymical ideas and experiments—themselves designed in conjunction with his chymical reading and descriptive translation (as demonstrated in Chapters 1 and 3)—into questions arising from his general natural philosophy and provided an avenue for him to consider the causes of motion. In this context Shaw’s assertion in his commentary on Boerhaave’s Elements of Chemistry that all of Newton’s natural philosophy was chemical makes sense. Boerhaave himself stated in 1719:

But if anyone shall still retain a doubt of the worth and abilities of chymistry, to reward those who cultivate it: let him consider the practice and procedure of the happiest philosopher the world ever yet cou’d boast, the great Sir Isaac Newton: who, when he demonstrates the laws, the actions, and the powers of bodies, from a consideration of their effects, always produces chymical experiments for his

588 Dobbs’ Janus Faces and Iliffe’s “Political Physiology” are notable exceptions. However, neither author frames the connection between Newton’s discussion of God in Newton’s optical writing and his chymistry/alchemy in terms of physico-theology or divine metaphysics and thus miss a valuable framework for understanding the relationship between Newton’s alchemy and his theology.

589 Newton’s removal from his personal laboratory in Cambridge in 1696 and his accompanying decline in chymical composition (or transcription) does not, however, indicate a cessation of chymical interests. See Chapter 1, Section 2.5. See also, Figala and Petzold, “Alchemy in the Newtonian Circle,” 173-91. As stated in Chapter 1, I suggest that Newton’s chymical interests and experimental expertise continued in his work at the Mint. Moreover, he continued to commission experiments related to his chymical interests in the work of Francis Hauksbee, see n. 568.
vouchers; and when, to solve other phenomena, he makes use of these powers, his refuge is to chymistry.\footnote{Boerhaave, \textit{A method of studying physick} (London, 1719), qtd. in Arnold Thackray, \textit{Atoms and Powers}, 8.}

The natural philosophy presented in Newton’s \textit{Opticks} was thoroughly informed by chymical topics and theories. Moreover, in Query 31, Newton used chymical experiments as the empirical foundation for his demonstration of the laws, actions, and powers associated with the motion of bodies—integral to his conception of the natural world. Thus when Newton turned to a discussion of God in this ‘chymical’ treatise, it revealed the intersection of Newton’s chymical work and his philosophical understanding of God. This intersection can be understood according to the categories of physico-theology and divine metaphysics. We have already seen this intersection in Newton’s assertion that God was the cause of the atomic properties. Newton used the design inherent in the composition of the natural world—the arrangement of atoms and their law-like attractive and repulsive actions—to demonstrate God’s existence (physico-theology) and he used God’s necessary being to establish the immutability of the atomic properties without need for further causal speculation (divine metaphysics). In the following section I interpret Newton’s understanding of God’s relation to the world in the final queries to the \textit{Opticks} as the intersection of his chymistry with the physico-theological and divine-metaphysical aspects of his natural philosophy. Newton’s analogy of space as the sensorium of God drew on his earlier speculations in 1675 regarding the nature of animal motion—interpreted according to chymical theory—and his discussion of the principles of activity operational in chymical effects. Newton used the interaction between soul and body in the sensorium, in perception and the generation of new motion, to develop a physico-theological argument for God’s existence derived from natural phenomena.
and to extend his *a priori* concepts of God’s attributes (divine metaphysics) to establish law-like principles of activity in the generation of new motion.

### 3. Chymistry, Active Principles, and Knowledge of the Divine

#### 3.1 Chymical activity and God’s activity: Betty Dobbs and Rob Iliffe

Betty Dobbs and Rob Iliffe are the most prominent of the few authors who have considered Newton’s active principles—and their relationship to God’s activity—in the context of the chymical final Queries to the *Opticks*. Dobbs demonstrates the Stoic influence in Newton’s division of the world into passive and active matter, and argues that Newton separated natural causes into those effected either by mechanical principles or active principles. Active principles causally preceded mechanical, and their ultimate source was the will of God.

Dobbs navigates Newton’s changing views of mechanical and active causes for gravity, from his early mechanical aether prior to 1684, to gravity as an active principle and directly caused by God in the late 1680s through early 1700s, and finally to his “electric and elastic spirit” (mentioned in the General Scholium) and its mechanical extrapolation in Newton’s cosmic aether (elaborated in Queries 18-22 added to the 1717 *Opticks*). In the realm of Newton’s alchemy, Dobbs emphasizes the active power of a mediating universal vegetative or alchemical spirit responsible for alchemical processes. She equates this universal vegetative spirit with Newton’s Arian conception of Christ. Dobbs relies on the specific necessity within Arian theology of maintaining God’s transcendence and therefore removal from direct action in the world to draw this conclusion. Given that Newton’s non-Trinitarian belief did not follow a systematic Arianism—and was likely not Arian at all—her characterization of Newton’s concept of vegetative power and activity in alchemy as the expression of a
mediating Arian Christ is problematic.\textsuperscript{591} Furthermore, as demonstrated in Chapter 3, Newton showed no interest in spiritual alchemy or eschatological interpretations of the symbolic chymical texts he was reading in his earlier studies. And in none of Newton’s own writing, either chymical or theological, are there any statements directly relating the vegetative spirit, the aether, or the electric and elastic spirit to Christ. Nonetheless, Dobbs provides a helpful overview of Newton’s use of active principles in his natural philosophy. While her specific conclusions uniting Newton’s non-Trinitarian theology, his alchemical investigations, and his physical theory may be problematic, she does reveal his integration of God’s nature into the operation of the natural world and thus his divine metaphysics at work.

Rob Iliffe characterizes Newton’s interest in activity in the natural world and divine action as Newton’s fascination with self-motion.\textsuperscript{592} Iliffe shows how Newton’s experimental interest in the nature of self-motion extended throughout his career and was intricately bound up with his medical, alchemical and chemical research. And, as will be shown below, Newton used the undeniable fact of self-motion to demonstrate the existence of non-mechanical laws of nature. In Iliffe’s account Newton sometimes distinguished between the power of self-motion and that of the active principles and sometimes used self-motion as an example of their operation. Iliffe points to the 1705 draft of Query 31 (see below) as an example of the latter, whereby the will, as an active principle, generated self-motion.

Throughout his discussion, Iliffe situates Newton’s wrestling with the problem of self-motion within a more anatomical and biological framework than chymical, although he demonstrates


\textsuperscript{592} Iliffe, “Political Physiology,” 433-58.
the extensive chymical influences on Newton’s speculations. In this chapter, I have largely adapted Iliffe’s characterization to a consideration of the chymical nature of the *Opticks* and how Newton’s appeal to the divine to understand activity came out of an essentially chymical discussion. As Iliffe demonstrates, and as seen in this chapter, Newton’s chymistry was an integral part of his natural philosophy, and as such participated in the divine metaphysical aspects thereof. Moreover, just as Newton used the physics of gravitation and the structure of the universe to advance physico-theological arguments, he used the nature of activity in the constitution and operation of the micro-world to build a physico-theological argument for God’s creative and sustaining presence and power.

### 3.2 Physico-theology in Newton’s chymistry: Query 28 and 31

The *Opticks* was thoroughly informed by Newton’s interests in chymistry and Query 31 was an overtly chymical treatise. At the same time, however, Query 31 fit into Newton’s broader consideration in the final four Queries (28-31) of the fundamental questions of natural philosophy, in language quite similar to what he would write in the General Scholium to the second edition of the *Principia* in 1713. Query 28 set forth these fundamental questions and the correct experimental method to address them,

> Later Philosophers banish the Consideration of such a cause [a non-material cause for gravity] out of natural Philosophy, feigning Hypotheses for explaining all things mechanically, and referring other Causes to Metaphysicks: Whereas the main Business of natural Philosophy is to argue from Phænomena without feigning Hypotheses, and to deduce Causes from Effects, till we come to the very first Cause, which is certainly not mechanical; and not only to unfold the Mechanism of the World, but chiefly to resolve these and such like Questions. What is there in places almost empty.

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593 Iliffe does not use the language of divine metaphysics, but his demonstration of Newton’s investigation of God’s role in self-motion reveals it.
of Matter, and whence is it that the Sun and Planets gravitate towards one another, without dense Matter between them? Whence is it that Nature doth nothing in vain; and whence arises all that Order and Beauty which we see in the World? ... How do the Motions of the Body follow from the Will, and whence is the Instinct in Animals? Is not the Sensory of Animals that place to which the sensitive Substance is present, and into which the sensible Species of Things are carried through the Nerves and Brain, that there they may be perceived by their immediate presence to that Substance?594

We can see here Newton’s rejection of deductive metaphysics and similar arguments to his rules of reasoning in the 1713 *Principia*: the need to argue from effects, or phenomena, to causes and the conformity of nature, that it does nothing in vain. Answering these questions in the correct manner—inductively from phenomena, not deductively from metaphysical first principles—would demonstrate the existence and attributes of God:

And these things being rightly dispatch’d, does it not appear from Phænomena that there is a Being incorporeal, living, intelligent, omnipresent, who in infinite Space, as it were in his Sensory, sees the things themselves intimately, and thoroughly perceives them, and comprehends them wholly by their immediate presence to himself?595

That God exists was known from the phenomena of natural effects and their causes in a backwards chain to the first cause. That God was living and active in the world (contra Deistic concepts of the Creator) could be seen in the phenomena of activity and new motion throughout the world, in the precise and controlled motion of heavenly bodies; that he was incorporeal, in the transmission of that activity across places empty of Matter; that he was intelligent, in the order and beauty of the world and the intricate design of animal parts. Finally God’s omnipresence, his being infinitely extended throughout space and yet

594 Newton, *Opticks* (1717), 344-5, italics mine. The clause, “which is certainly not mechanical” was added in later editions (1717/1718 and the 1719 Latin edition).

595 Newton, *Opticks* (1717), 345.
intimately present to the smallest division thereof, could be seen by an analogy to the mechanics of perception. Just as the sensorium of humans and animals made their minds immediately present to the sensory data coming from their nerves, so God was immediately present to all of creation. In this statement of space being like the sensorium of God Newton revealed his view that God was physically extended through space. Although he attempted to moderate the potential heresy of making God synonymous with his creation by adding the Latin *tanquam* (“as it were”), this particular statement formed a focus for objections to his system, particularly those of Leibniz.596 Regardless of the thorny metaphysical issues raised by this analogy, in this particular instance Newton used it, not to explore the properties of space, but the nature of God—it is part of a physico-theological argument grounded in the study of natural phenomena. As he concluded in Query 28, “And though every true Step made in this Philosophy brings us not immediately to the Knowledge of the first Cause, yet it brings us nearer to it, and on that account is to be highly valued.”597

The final section of Query 31 followed a similar pattern, even as it built to an argument for God from a direct consideration of chymical phenomena, rather than the analysis of the

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596 The original text of the 1706 Query 20 (28 in later editions) did not contain the Latin *tanquam*. However, as it was being printed, or shortly afterwards, Newton wished to insert the disambiguating clause, having a cancel printed in its place. Thus some of the 1706 editions have the *tanquam* and others do not. The equation of space with a physical sensorium belonging to God was the very issue that Leibniz took up in his letter to Princess Margaret in 1715, initiating the Clarke-Leibniz correspondence. As Leibniz stated in the initial letter, “Sir Isaac Newton says, that Space is an Organ, which God makes use of to perceive Things by. But if God stands in need of any Organ to perceive Things by, it will follow, that they do not depend altogether upon him, nor were produced by him.” See Samuel Clarke, *A Collection of Papers, Which passed between the late Learned Mr. Leibnitz, and Dr. Clarke, In the Years 1715 and 1716* (London, 1717), 1. The question remains whether Leibniz had one of the original copies or merely knew of its existence. Regardless, he took the opportunity to accuse Newton of confusing the transcendent God with the created universe. See Koyré and Cohen, “The case of the missing *tanquam,*” 555-66, for a more extensive treatment of this point.

597 Newton, *Opticks* (1717), 345.
aether in Query 28. As seen in the previous section (2.4), Newton’s extensive survey of chymical properties in Query 31 led into a discussion of his matter theory—the composition of chymical compounds and their active principles—and into his declaration of God as the only necessary first cause. In the process Newton was essentially sketching a physico-theological argument from the phenomena of chymistry, a demonstration of what could be called ‘chymico-theology’. This argument built on the experiments and observations in chymistry that he had already outlined. It then looked forward to hopeful future proofs from phenomena that would establish the operations and underlying causality of the active principles. Newton was quite certain that the active principles would be verified by future experiments, and in their verification would demonstrate the need for a causal explanation that was God. He carefully demonstrated how this sketched argument would follow from experimental philosophy (and not hypotheses) and hence would safeguard an experimentally founded proof of God from the pitfalls of deductive metaphysics. In the course of this argument, Newton shifted to an appeal to the design evident in the world, in composition of matter, in the precise paths of planets and comets, and in the perfectly suited structures of insect and animal bodies, echoing the physico-theological language of Query 28. For these things,

\[
\text{can be the effect of nothing else than the Wisdom and Skill of a powerful ever-living Agent, who being in all Places, is more able by his Will to move the Bodies within his boundless uniform Sensorium, and thereby to form and}
\]

\[\text{598 Newton’s understanding of the aether was nonetheless informed by his chymistry, as the preceding discussion of his “Hypothesis” demonstrates.}\]

\[\text{599 Labeling Newton’s exploration of God’s being and attributes as derived from chymical phenomena as “chymico-theology” uses similar terminology to early eighteenth-century combinations of specific hybrid disciplines under the umbrella of physico-theology. See for example Derham’s Astro-theology (1715) (which Newton owned, HL 500), Friedrich Lesser’s Insecto-Theologia (1738), or Peter Ahlwart’s Bronto-Theologie (1745), which set forth natural theological arguments arising from astronomy, entomology, and meteorology, respectively, see Peter Harrison, “Physico-Theology,” 180.}\]
reform the Parts of the Universe, than [our soul, which is in us the Image of God, is able] by our Will to move the Parts of our own Bodies.\footnote{Newton, \textit{Opticks} (1717), 379. Quotation in brackets taken from the Latin of the original Query 23 in the 1706 \textit{Optice}, see Newton, \textit{Optice} (1706), 346. Later additions used “we are,” see Newton, \textit{Opticks} (1717), 379.}

Yet again we encounter Newton’s appeal to the sensorium of God. Newton omitted his reference to the soul as the image of God in later editions, and added an extensive caveat that “we are not to consider the World as the Body of God, or the several Parts thereof, as the Parts of God.”\footnote{Newton, \textit{Opticks} (1717), 379. Compare, for example Newton, \textit{Optice} (1706), 346.} The original reference, in Query 23 of the 1706 \textit{Optice}, to the soul as the image of God is highly significant for understanding Newton’s use of divinity—the biblically revealed truth of the \textit{Imago Dei}—in his natural philosophy, as will be discussed in the following section. The omission and qualification of this statement in later editions was doubtless in response to Leibniz’s accusation that he had made God to be the soul of the world in the original 1706 edition. As Newton stated in the revised Query 31 of the 1717 \textit{Opticks},

he is no more the Soul of them [the parts of the world], than the Soul of Man is the Soul of the Species of Things carried through the Organs of Sense into the place of its Sensation, where it perceives them by means of its immediate Presence, without the Intervention of any third thing.\footnote{Newton, \textit{Opticks} (1717), 379.}

Essentially, the sensorium analogy only applied to awareness of the forms or sensible qualities (“Species of Things”) that the soul obtained within the sensorium, not to the entire apparatus of bodily sensation. And in that analogy, the soul was a separate entity from the
forms it perceived, just as God was separate from the parts of the world, even though immediately present to them. Newton relied on his understanding of the boundary between the soul, or mind, and the body, whereby the “species of things” were physically received by the sense organs and physically conveyed to a physical sensorium (in the brain), through a process mediated by the chymical principle of sociability (as described in the “Hypothesis”). The soul, however, was immediately present to every part of this sensorium, and able therefore immediately to know, or to perceive, the forms once they had been physically transmitted there. For Newton, perception entailed awareness: even though the sense organs and nerves contained physical representations of external forms, it was not until those representations were perceived in the sensorium that the individual became aware of the “species of things.” Likewise, when comparing the awareness of the soul in the sensorium to God in the world, Newton did not include the physical parts involved in sensation, but the transfer between the material and the spiritual that entailed true perception. The analogy only applied to the very specific action of the soul within the sensorium, not the general relationship between the soul and the body. Nonetheless, in the sensorium, the soul had a specific location in space, the sensorium itself, within which it was universally extended. And, by analogy, God, being present everywhere, was necessarily somewhere, located universally throughout space. Newton’s caveat in the 1717 edition did not obviate his ultimate adherence to God’s physical presence, it merely deflected accusations that he thereby made God to be the soul of the world, indistinct from created entities.

The original Query 23 in 1706, however, did not contain this clarification. Rather, Newton’s original argument moved straight from declaring that God could form and reform the parts of the universe at will, in the same manner as we move our own body parts, to a
declaration that God could, if he so willed, shape different parts of the universe with physical properties, fundamental forces and particles, and even natural laws at variance from those in our own world. In the original Query 23, Newton’s discussion of the sensorium differed from his previous focus in Query 20 (28). Rather than looking at how the sensorium demonstrated God’s universal presence, in Query 23 Newton used the example of the sensorium to demonstrate his universal action. As seen in the above quotation, Newton called God the “ever-living Agent, who being in all Places, is ... able by his Will to move the Bodies within his boundless uniform Sensorium.”603 He compared this power of universal action to our ability to cause our own bodies to move at will. In both cases the action derived from the power of the will. It is not a coincidence that this subtle shift in emphasis in Newton’s use of the sensorium analogy occurs in Query 23.604 This discussion emerged from Newton’s earlier consideration in the Query of the activity in the universe—built up from an investigation of chymical phenomena—and the nature of the active principles behind that activity. Hence, when Newton introduced God as the summation of an argument from design, his description of God’s omnipresence according to the sensorium analogy focused more on how God’s universal presence allows him to act rather than to perceive. In Query 20 Newton introduced the sensorium to demonstrate God’s attribute of omnipresence and how his universal and immediate knowledge derived from his universal and immediate presence, a thoroughly physico-theological use of Newton’s understanding of the human sensorium in its focus on the divine attribute. In Query 23 Newton developed a similar physico-theological argument, establishing God’s necessary existence as the ultimate cause for all the activity in the

603 Newton, Opticks (1717), 379.

604 As will be explored below, Newton called the will an active principle in a draft to this Query.
universe and demonstrating, from the evidence of the order and perfect maintenance of the world, that God must be able to act universally and freely according to his will. However, while the structure of Query 23 led to a proof of God and his sovereignty, in this specific instance there was also an aspect of the argument that considered how God, his existence being assumed or already established, acted within the world, how his nature affected the operation of the natural world. Thus in its focus on God’s role in the nature of the activity in the world—a central concern arising from the chymical phenomena that Newton had detailed—Query 23 reveals Newton’s divine metaphysics. This aspect becomes manifest on analysis of one of the English drafts that Newton wrote to this portion of the Query in 1705.

3.3 Active principles and divine action: divine metaphysics at work

In a surviving draft manuscript to Query 23 composed in 1705, Newton provided an alternative opening, directly addressing the question of action at a distance. In the printed version Newton opened with a discussion of the attractive powers of micro-matter, devoted the majority of the text to an investigation of the resulting activity in chymical reactions, and only ended with God. In the draft, however, Newton began with a discourse on God’s role in the generation of motion, specifically gravitational motions, and his maintenance of creation. He attempted to elaborate the relationship between the Deity and the laws of motion, which both Ancient authority and experience affirmed, to understand the nature of action at a distance:

Qu 23. By what means do bodies act on one another at a distance. The ancient Philosophers who held Atoms & Vacuum attributed gravity to Atoms without telling us the means unless perhaps in figures: as by calling God Harmony &

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605 Newton, CUL Add. Ms. 3970.9, CUL, Cambridge, fol. 619r-620v.
representing him & matter by the God Pan & his Pipe, or by calling the Sun
the prison of Jupiter because he keeps the Planets in their orbs. Whence it
seems to have been an ancient opinion that matter depends upon a Deity for
its <laws of> motion as well as for its existence.\textsuperscript{606}

Newton’s reference here to the ancient figurative description of how motion was transmitted
between atoms in a vacuum—enciphered in the image of Pan and his pipe, or the Sun
imprisoning Jupiter—reveals his application of the descriptive-translational approach to his
search for the inner workings of motion.\textsuperscript{607} Newton referred to this symbolic representation to
support the idea that God regulated the motion in the world in the same manner as he upheld
the existence—with all its attendant properties—of matter. Newton modified his statement to
specify that God maintained the \textit{laws} of motion, implying that there were some law-like
principles that governed motion, or activity: the active principles. Newton then contrasted the
passivity of matter with the evidence from experience of an external, non-passive, source of
activity, using an argument similar to that seen in the printed Query,

\begin{quote}
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. It continues in its state of moving or resting unless disturbed. It
receives motion proportional to the force impressing it, And resists as much as
it is resisted. These are passive laws & to affirm that there are no other is to
speak against experience.\textsuperscript{608}
\end{quote}

Newton moved beyond the Cartesian (and Leibnizian) view that God initiated all of the
motion seen in the world—after which it continued to transfer motion between its
interconnected parts as God maintained their properties—to the suggestion that new motion

\textsuperscript{606} Newton, CUL Add. Ms. 3970.9, fol. 619r.

\textsuperscript{607} See McGuire and Rattansi, “Newton and the ‘Pipes of Pan’,,” 108-43, for the full context of
Newton’s use of pagan imagery. See also Chapter 3, Section 7, and Guicciardini, “Musical Analogies,” 45-67.

\textsuperscript{608} Newton, CUL Add Ms. 3970.9, fol. 619r. This is a reiteration of his three force laws.
continuously arose. And God could as easily have initiated and maintained the law-like properties governing that motion as he had initiated original motion and maintained the properties of passive matter. Moreover, the three laws of motion—insertia, proportionality to force, and equal and opposite reaction—could only account for passive motion: response to external forces or the transfer of motion. Experience revealed new motions beyond those explained by these laws: in gravity and, as Newton went on to describe, in the movements of the body, motions that Newton attempted to explain through the active principles and, further on in the draft, through an understanding of chymical phenomena.

The active principles that Newton proposed in the printed Query 23 (and 31) caused gravity, electricity, fermentation and other chymical phenomena. In this section of the draft Newton explored another source of activity, how the motions of the body arise from the action of the will, which was hinted at in the printed Query’s reference to how “we are by our Will [able] to move the Parts of our own Bodies.” Newton’s consideration of bodily motion and its relationship to the mind in the 1705 draft returned to the subject matter of his chymical discourse in the 1675 “Hypothesis.” In the “Hypothesis” Newton had used

609 In many ways this draft was a direct commentary on the natural philosophy of the Principia, given Newton’s reference to his laws of motion, and its title, which proclaimed Newton’s attempt to solve the problem of action at a distance. In the evolution of Query 23 (later 31), then, this earlier version appears to indicate that Newton’s original purpose behind Query 31 was to solve problems raised by his gravitational theory. Nonetheless, the fact that Newton turned to chymistry and the extensive chymical phenomena that comprised the printed Query to solve this problem reveals his natural association of chymical theory with the problem of activity in nature. In fact, even in this draft, on the next folio, Newton wrote a version of what would become part of his opening argument in the printed Query. After declaring the need to first identify the various phenomena of attraction in nature before speculating regarding their causes, he stated, “The attractions of gravity, magnets & electricity reach to very sensible distances & have been observed by vulgar eyes, & there may be others which reach to so small distances as hitherto to escape observation.” He then gave the opening line of his extensive discussion of chymical phenomena, “For when Salt of Tarter runs ---,” indicating a place marker for him to fill in what he had written in a different location. Newton later used the blank space after this place filler to record numerous unrelated notes on church history. See Newton, CUL Add Ms. 3970.9, 620r. This section is almost verbatim to what was published in 1706 and indicates Newton’s reliance on chymical phenomena to understand the problems of attraction and motion raised by his gravitational theory even in this draft.
chymical notions of sociability to explain how the “Animal Spirit” was sent through the nerves by the soul to absorb and release external aether into the muscles, causing them to expand and contract, creating motion. Moreover, he had described animal self-motion as an unknown source of activity directly implanted by God and comparable to other unexplainable motions. By 1705, Newton had abandoned the aether as a mediator of motion, but still considered bodily motion to be one of the phenomena unexplained by his three laws of motion.\footnote{Newton returned to his aetherial explanation for how the will caused animal motion in Query 24 (added to the second English edition of the *Opticks* in 1717): “Is not Animal Motion perform’d by the Vibrations of this Medium [ie. the aether], excited in the Brain by the power of the Will, and propagated from thence through the solid pellucid and uniform Capillamenta of the Nerves into the Muscles, for contracting and dilating them!” (Newton, *Opticks* (1718), 328). This was part of Newton’s general trend to use the aether as an explanation in his later natural philosophy, even though the later aether was explicitly material, as seen in Queries 18-22. However, in this description he also used language similar to that of the “Hypothesis,” demonstrating the enduring power of his early chymical understanding of how the soul generated motion. That early work, I contend, formed an ever-present backdrop to each iteration of the *Opticks.*} As with gravity and fermentation, Newton appealed to active principles as the source of this motion. In the draft Newton named the specific active principles responsible for such motion: life and will (or thought),

> For we find in ourselves a power of moving our bodies by our thought. Life & thinking \(<\text{will}\>) \text{ are active Principles by which we move our bodies, \\

> & thence arise other laws of motion unknown to us. And since all matter duly formed is \\

> attended with signs of life & all things are framed with perfect art & wisdom \\

> & Nature does nothing in vain, if there be an universal life & all space be the \\

> sensorium of a thinking being \(<\text{who by immediate presence perceives all \\

> things in it as that which thinks in us perceives their pictures in the brain} > \\

> \& finite things therein \text{ ... [then] the laws of motion \(<\text{arising from life or will}\> \\

> \text{may be of universal extent.}^{611}$

Newton restated this position a few folios later in the same draft, connecting the motion arising from thought to the attraction of small bodies across small distances that had been the subject of his exploration of chymical phenomena:

\footnote{Newton, CUL Add Ms. 3970.9, fol. 619r.}
Thinking is an active principle by which we move our bodies according to our will, & thence arise other laws of motion unknown to us, which, if Nature be alive the Universe be the sensorium of a thinking Being, may be of great extent. Gravity was reckoned among the laws of motion by the ancient Philosophers who attributed gravity to their Atoms in vacuo, & the forces above mentioned by which small bodies act on one another <at small distances may> have as good a title <as gravity> to be reckoned among those laws.\(^{612}\)

In Query 28 the question of the relation between the motions of the body and the activity of the will led to a discussion of the sensorium and the analogy of Nature. Likewise, here in these quotations we see a reference to Nature’s doing nothing in vain and infinite space as the sensorium of God. However, unlike Query 28, or the final version of Query 31 (in the 1717 *Optiks*), the example by analogy with the sensorium of God was here combined with the assumed principle of his universality to demonstrate a universal property of the natural world.

Let us investigate this argument in more detail. In good inductive fashion Newton began with known phenomena—our ability to move our bodies by our thought. This was another motion to be explained, in the same manner as the motions of heavenly bodies or motions of acidic particles when they dissolved metals needed explanation. And just as these motions were caused by active principles, so our bodily motions are caused by active principles: life and will. The active principles of life and will mediate between our minds—or souls—and our bodies, creating motion, activity. As Newton wrote in Query 28, on receiving sensation, our nerves carry the species of things to our sensoria and create motions there that the sensorium perceives by being immediately present to them. Likewise our wills cause the motion of our bodies at the impulse of our souls. And due to the regularity of these

\(^{612}\) Newton, CUL Add Ms. 3970.9, fol. 620v.
activities, Newton deduced that there must be some law of motion governing them, even if the manner of operation of these active principles was unknown. However, for Newton to posit an actual law of motion associated with this motive principle, it must have had universal extent. To demonstrate the universality of life and the generation of motion in response to thought or will, Newton introduced divine metaphysical assumptions. The active principles of life and will were of universal extent because life and thought were universally extended, since God was a powerful, ever-living, universally extended Agent. And God, in his universal agency, was clearly active throughout the observed world, revealed in the signs of life within all matter (likely what Newton meant by Nature being alive). There is no proof of God here; rather God’s existence and attributes (omnipresence, in this case) are taken for granted: they are the ground and starting point for his reasoning.\textsuperscript{613} This is an example of the role that divine metaphysics played in Newton’s thought.

In other words, Janiak’s concept of Newton’s divine metaphysics applies directly to this example. Newton built most of the case for the universality of life and will, thereby deserving of their own laws of motion, from pure empirical reasoning: 1) all observed matter is attended with signs of life (i.e., active not passive), 2) we observe new motion in our bodies arising purely from the exercise of our wills or thought, and 3) the observed structure of the universe reveals intention and purpose.\textsuperscript{614} Using the principle that Nature does nothing

\textsuperscript{613} See Henry, “Religion and the Scientific Revolution,” in Peter Harrison, ed. Cambridge Companion to Science and Religion (Cambridge: Cambridge University Press, 2010), 39-58, for a discussion on fears of atheism in Early modern England – specifically for the generally held view among natural philosophers that a lack of belief in God hindered the ability to reason properly.

\textsuperscript{614} For Newton, design was clearly evident to the attentive observer, and thus an empirical truth. Although Newton did not give full justification here for why the actions of our Sensorium count as legitimate experimental phenomena, he did discuss the idea in a draft version of the “Regulae philosophandi” (rules of reasoning in philosophy) in the Principia, written after the publication of the second edition (1713). This draft contains a never published “Rule V” in which Newton stated, “And I do not take for phenomena only things which are made known to us by the five external senses, but also those which we contemplate in our minds when thinking: such as, I am, I believe, I understand, I remember, I think, I wish, I am unwilling, I am thirsty, I
in vain, the principle of simplicity—his third rule of reasoning in experimental philosophy—Newton proposed that these locally observed phenomena may be universal.\textsuperscript{615} However, inserted into this pure empirical line of thought were two divine metaphysical concepts: there is a universal life, and all of space is filled with a thinking being. These concepts arose from Newton’s prior commitment to God’s actual infinity and his ubiquity throughout space—itsl self an emanative effect of his being.\textsuperscript{616} It was only by including this reference to God’s universal extension throughout space that Newton could conclude that laws of motion were possible for hitherto unexplained activity in nature. In the second quotation Newton extended this principle to support the idea of finding force laws for the attractions of small bodies, which formed the starting point for his detailed description of chymical phenomena in the printed Query.

One may wonder at the discrepancy between Newton’s treatment of God’s omnipresence as an \textit{a priori} in this instance but as an empirically established fact from the phenomena in Newton’s physico-theological discussion of the sensorium in Query 20. This apparent conflict, can be resolved, however, if we consider that Newton’s physico-theological argument for God’s attribute of omnipresence was not, in fact, proof of the divine

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\textsuperscript{615} Newton reiterated the principle that “Nature is very consonant and conformable to her self” in the printed version of the Query. See Newton, \textit{Opticks} (1717), 351. For the similarity of this principle to the third Rule of Reasoning in Philosophy in the \textit{Principia}, see Newton, \textit{Principles} (1729), vol. 2, 203.

attribute, but a demonstration of how the divine attribute, itself an *a priori*, can be clearly seen from the phenomena. Newton’s *a priori* concepts of God in his divine metaphysics were epistemologically prior to his physico-theological demonstration of them from the phenomena. This did not preclude a physico-theological discussion of God’s attributes arising from a consideration of natural phenomena, but as Janiak delineates in his articulation of Newton’s divine metaphysics, God’s attributes were not subject to empirical modification and thus not grounded in pure empirical proof.617

One of Newton’s central purposes in his natural philosophy was to articulate general laws of motion. Just as the printed Query 31 began by suggesting universal attractive forces or virtues—observable in chymical phenomena—beyond the visible gravity, magnetism, and electricity, the draft suggested that there were laws of motion that governed virtues and powers of similar universal extent. But in this instance Newton began with an appeal to the universality of God, whereas the printed version only ended with a reference to God’s sensorium. Additionally, Newton showed no cautionary *tanquam* in the draft—space *is* the sensorium of God.618 And his will is the active principle by which he governs the world. In the final version of Query 31 (in the *Opticks* of 1717), Newton’s reference to the sensorium

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618 This draft seems to reflect more accurately Newton’s unguarded view. As mentioned by David Gregory in 1705 in a memorandum on the forthcoming Queries, “[Newton] believes God to be omnipresent in the literal sense; ... for he supposes that as God is present in space where there is no body, he is present in space where a body is also present,” David Gregory, in W.G. Hiscock, ed., *David Gregory, Isaac Newton and their circle: extracts from David Gregory’s memoranda 1677-1708* (Oxford: Printed for the Editor, 1937), 30. In contrast to Leibniz’s accusation (see n. 128), Newton likely did not hold to a form of pantheism. When he referred to space as God’s Sensorium there was still an analogous element—God didn’t have a brain or physical Sensorium that was space. Rather, as Newton made explicit in “De Gravitatione,” space was an emanative effect of God. It was an absolute three dimensional reference frame, not to be confused with the finite universe contained within it. Space was ontologically external to the objects that occupy it. Space, as an emanative effect of God was dependant on his properties—it was infinite and eternal—in ways that the created world (which was effectively created in space) was not. See Newton, “*De Gravitatione*,” 24-27.
of God emphasized how that analogy revealed God’s universal presence, dwelling on the nature of God’s perception and qualifying his concept of God’s literal omnipresence. In the 1706 edition, this concluding Query, 23, showed a closer connection to what he had discussed of God’s universal action in the 1705 draft. Newton’s assertion that God was “a powerful ever-living Agent who being in all Places, is ... able by his Will to move the Bodies within his boundless uniform Sensorium” in the printed version drew directly on Newton’s argument for the universality of the active principles of life and will in the draft. Newton’s statement in the printed Query 23 followed an extended argument for the existence of active principles that governed non-passively generated motion and that Newton grounded in chymical phenomena. Moreover, his statements of God’s ubiquity in the draft as proof for the universality of certain of those principles—beyond his already established laws of gravity—linked the universal nature of the active principles to the phenomena of attraction seen in the micro-world. While Newton’s search to understand the activity present in nature certainly encompassed more than chymical phenomena (such as gravity), its location within Newton’s overtly chymical Query (23/31) and the foundation on chymical phenomena of his exposition of activity and active principles demonstrates the full participation of Newton’s chymistry in this aspect of his natural philosophy. In the 1705 draft, Newton used God’s a priori attributes to establish the universality of the laws of motion governing certain active principles (life and will). He then proposed that this universal regularity could be extended to the active principles involved in the motions of very small attractions exhibited in chymical phenomena. Thus not only did chymical phenomena participate in a physico-theological argument for the existence and attributes of God in the final Queries to the *Opticks*, but Newton’s understanding of God’s being and attributes contributed to his exposition of
universal laws governing the generation of chymical activity (among other new motions to be explained). In the background picture provided by this draft to Query 31, the integration of Newton’s divine metaphysics and his chymistry can be seen.

4. Newton’s Chymistry and Divinity: Accommodating Appearances and Expressing Realities

Thus far we have considered how the aspects of Newton’s natural philosophy that discussed God—understood as physico-theology and divine metaphysics, and separate from revealed theology or divinity—most certainly included Newton’s chymistry. His use of chymical phenomena to develop a physico-theological demonstration of God’s existence in Query 31 and his use of God’s omnipresence to advocate laws of motion for the micro-world in a draft to the Query indicate the role played by Newton’s chymistry in the aspects of his natural philosophy that deal with the divine. Nonetheless, as discussed previously, this does not therefore indicate a connection between his chymistry and theology-as-divinity. The previous chapters of this dissertation have demonstrated just such a connection in Newton’s common descriptive-translational approach to the symbolic texts of chymistry and biblical prophecy. However, Newton asserted in his unpublished seven statements of religion ca. 1715 that philosophy and religion should remain distinct, and his earlier discussions of God in his natural philosophy appear to maintain this kind of disciplinary boundary.619 This seems apparent in his claims that descriptions of nature in the Bible should be read as mere descriptions of the appearances accommodated to the speech of the common intended hearer.

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619 Newton, Keynes Ms. 6, fol. 1r. See also CUL Add. Ms. 3965, fol. 547r.; and CUL Add. Ms. 3968.9, fols. 109r-v, discussed in n. 493.
and not as natural-philosophical statements. I argue, however, that even when Newton read Scripture according to an accommodationist hermeneutics, he did in practice what he proscribed in the ca. 1715 statement of religion. After translating the ‘vulgar’ speech of biblical descriptions of nature into phenomena (employing his descriptive-translational method), he used his privileged position as a natural philosopher to suggest the realities behind scriptural descriptions of the appearances. Moreover, in his specific interpretation of the scriptural record of the appearances of the creation account in Genesis, Newton used his understanding of chymistry to speculate as to what actually happened from the perspective of natural philosophy. Furthermore, I suggest that Newton’s use of the sensorium analogy in Query 31 relied on more than a priori philosophical concepts of God’s attributes—Janiak’s divine metaphysics—and depended on specific revealed truth found only in Scripture, the Imago Dei, for the applicability of the human sensorium to God. Thus, even though Newton stated his intention to keep his revealed theology, or his divinity in general, separate from his natural philosophy, in practice the two had intersected in key ways. And, in both instances of this intersection considered below, the natural philosophy concerned was largely informed by chymical phenomena and theory.

4.1 Newton’s hermeneutics of accommodation: appearances vs. realities

A number of authors have commented on Newton’s appeal to the hermeneutics of accommodation—that Scripture was written in the language of the common people—to understand statements about the natural world in the Bible. Janiak argues that Newton

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specifically used the hermeneutics of accommodation to distinguish between scriptural
descriptions of nature—which only described appearances—and the descriptions of the
underlying realities that were the sole domain of natural philosophy.\textsuperscript{621} Janiak uses this
distinction to differentiate between Newton’s modes of talking about God, such that his
divine metaphysics—embedding his natural philosophy—was of a different order than his
revealed theology. According to Janiak, Newton’s distinction allowed him to reconcile
scriptural statements, such as the apparent motion of the sun, with assertions in natural
philosophy—that the earth was actually moving—by differentiating the kinds of statements
each makes. For example in “De motu corporum,” a text written in 1684-1685, Newton
stated that “ordinary people who fail to abstract thought from sensible appearances always
speak of relative quantities, so much so that it would be absurd for wise men or even
Prophets to speak to them otherwise.”\textsuperscript{622} Nonetheless, Janiak argues, Newton believed
Scripture should be read literally, not metaphorically or allegorically. Newton expressed this
sentiment in his correspondence with Thomas Burnet in 1681.\textsuperscript{623} In response to Burnet’s
suggestion that the Mosaic description of creation (in six days) had no physical reality, but
should be interpreted ideally or morally, Newton insisted that the Genesis account be read as
a true physical description. However, according to Newton the Mosaic account was still
written in the language of the common person, and thus its true and literal account was of
how the event would have appeared, not of the underlying physical realities that only a

\textsuperscript{621} Janiak, Newton, 167-71.

\textsuperscript{622} Janiak, Newton, 155. The original is taken from Newton, “De motu corporum in mediis regulariter cedentibus,” CUL Ms. Add. 3965.5, fol. 26r.

\textsuperscript{623} See Scott Mandelbrote, “Newton and Burnet: Biblical Criticism,” 149-78, for an in-depth analysis of the hermeneutical differences present in this correspondence.
natural philosopher would have understood. The earth may actually have taken thousands of years to complete one rotation, yet the appearance would have remained that of one day and night.\textsuperscript{624} Newton expressed a similar sentiment in an unpublished “Account of the Systeme of the World” written after 1687:

the Scriptures [speak] not in the language of the Astronomers ... but in that of the common people to whom they were written. So where tis said that God hath made the round world so fast that it cannot be moved, the Prophet intended not to teach Mathematicians the spherical figure & immoveableness of the whole earth & sea in the heavens but to tell the vulgar in their own dialect that God had made the great continent of Asia Europe & Africa so fast upon its foundations in the great Ocean that it cannot be moved therein after the manner of a floating Island.\textsuperscript{625}

Janiak places Newton’s distinction between the words of Scripture, which describe appearances in the language of the common man, and the language used by natural philosophers (astronomers in this case), which describes the realities, in the context of Newton’s innovative concepts of the difference between relative quantities and absolute quantities—between relative meaning and absolute meaning, as it were. Contrary to mainstream Aristotelian natural philosophy, which relied on common sense conceptions arising from unmediated human perception, the new natural philosophy of the seventeenth century posited unseen realities responsible for the appearances. These realities were known either deductively from first principles (in the case of figures like Descartes) or by induction from observed phenomena and as the result of experimentation and instrument-assisted observation (in the case of figures like Boyle). The awareness and description of these

\textsuperscript{624} Newton to Burnet, January 1680/1, in Turnbull, ed., \textit{Correspondence}, vol. 2, 333-4.

\textsuperscript{625} Newton, “An Account of the Systeme of the World described in Mr. Newton’s Mathematicall Principles of Philosophy,” CUL Ms. Add. 4005, CUL, Cambridge, fol. 39r.
realities thus distinguished the language of natural philosophy from other fields, including the language of Scripture. The absolute nature of space and the understanding of motion as an absolute quantity in relation to that space could only be known through philosophical reasoning—for Newton, based on the phenomena—and thus it was vital to pay careful attention to the language used when describing the natural world.

Janiak infers from Newton’s distinction between scriptural descriptions of appearances and natural-philosophical descriptions of realities that therefore Newton believed that Scripture did not in fact convey information about the absolute metaphysical reality of God or the world, only the appearances. Janiak points to Newton’s description of God in the General Scholium to the *Principia*:

> But, by way of allegory, God is said to see, to speak, to laugh, to love, to hate, to desire, to give, to receive, to rejoice, to be angry, to fight, to frame, to work, to build. For all our notions of God are taken from the ways of mankind, by a certain similitude which, though not perfect, has some likeness, however.626

Janiak interprets this passage as an instance of Newton’s view that aspects of Scripture required a non-literal reading, since God’s lack of corporeality meant that there were no direct appearances of him to describe. Hence scriptural descriptions of the divine were framed allegorically to give finite human beings some understanding of the divine. For Janiak this creates a dilemma for Newton, as without scriptural statements to indicate God’s actual infinity in an actually infinite space—rather than his potential infinity—Newton had no tangible source for his philosophical *a priori* understanding of God’s omnipresence.627


627 See below for a discussion of Newton’s scriptural sources for his concept of God’s omnipresence.
suggest that a nuanced understanding of Newton’s biblical hermeneutics may solve this
dilemma by restoring Scripture as the ultimate source of Newton’s true knowledge of God.

4.2 Newton’s accommodationism as translation into natural-philosophical
phenomena

Newton’s assertion that Scripture was written to accommodate common people’s
understanding should be considered in light of his general hermeneutics. Newton’s careful
attention to the language used in scriptural descriptions of natural appearances follows his
pattern of concern for the nature of language—seen in the previous chapter—in his other
fields of study, particularly how symbolic languages should not be interpreted allegorically,
but as direct descriptions. Newton generally sought to understand the language used in
Scripture so that the original descriptive, non-allegorical, meaning could be discerned. Hence
he specified the vulgar dialect in which statements about the natural world had been written.
Just as it was a mistake to interpret the figurative prophetic dialect without first translating
the prophetic symbols into their descriptive meanings, it was a mistake to interpret vulgar
descriptions as direct natural-philosophical statements without first translating them into their
meanings as plain descriptions of the appearances. However, in the interpretation of biblical
prophecy, once the images had been translated, the biblical interpreter could then read the
plain meaning, which Newton did in his construction of the Apocalypse and his matching of
plain meanings to historical events. Likewise, the discerning natural philosopher, when
reading the Bible, could equally observe the appearances of natural events—having directly
translated them according to the mechanics of the vulgar language—and then interpret them
according to natural philosophy. An awareness of the accommodationist language of the
Bible enabled the natural philosopher to have access to the rare observational data of the natural events recorded. The problem occurred when the crucial translational step was overlooked and those reading Scripture for natural-philosophical knowledge assumed that the superficial meaning indicated literal philosophical truth. Rather, the statements of Scripture, once translated according to the language of the vulgar, could be seen as a trustworthy record of pure natural phenomena from a previous time. And those phenomena, as with other natural phenomena, were a valid source for natural-philosophical reasoning.

That Newton practised this approach to scriptural statements about the natural world, can be seen both in the “Account of the Systeme of the World” quoted above, and in his correspondence with Burnet. Newton’s statement that Scripture speaks “not in the language of Astronomers” in his “Account of the Systeme of the World” did not prevent him from providing a natural-philosophical account of the true meaning of the appearances described by Scripture. Newton gave as an example the prophet’s statement that God set the foundations of the earth and that it cannot be moved. For Newton, this statement was not an indication of the earth’s place in the solar system, but of the fixed nature of the great continent (Europa, Asia, and Africa) in the ocean. Here Newton avoided potential conflict between heliocentric astronomy and Scripture by stating that the words of Scripture needed to be translated out of the vulgar dialect before being applied to natural knowledge. Thus the plain descriptive meaning of God’s foundation of the earth was the stability of the great continent. In this process Newton still gave a physical literal meaning for the words of Scripture, however he used the principle of needing to translate before interpreting to avoid taking the surface meaning of the text. This process may seem to indicate that Newton tried to twist the words of Scripture to fit into his given natural-philosophical system. Yet from his
perspective, the text had a plain descriptive meaning, one that emerged clearly from an awareness of the language in which the text was written and would be clear to any well-meaning and careful interpreter. However, regardless of how Newton may have justified it, his plain translated meaning relied on his extra-biblical knowledge of the solar system as heliocentric and reveals the incursion of natural philosophy into the process of his biblical interpretation. Both a careful attention to the nature of the language used and a true natural-philosophical understanding were required to access the natural realities behind the textual statements.

Newton’s interpretation of the Mosaic creation account revealed a similar practice of using natural-philosophical knowledge to ‘read’ the phenomena behind the common descriptions of appearances in the Bible. In this case Newton relied on chymical knowledge of the natural world gained from his textual chymical research. In his letter to Burnet of January 1680/81, Newton gave a conjecture of how the solar system had in fact formed, based on the appearances described by Moses. The deep over which the spirit of God hovered in the beginning, for example, was the fundamental chaos out of which God formed the individual planets. The first light of the first day was the shining of the unformed solar matter “before the earth had any diurnall motion or was formed into a globular body.” And the division of waters on the second day was the settling through gravity of muddy water, air, and vapors (the aether) into their respective layers above the globe of the earth.628 This story

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628 The full quotation is as follows: “yet to say something by way of conjecture, one may suppose that all the Planets about our Sun were created together.... That they all & the sun too had at first one common Chaos. That this Chaos by the spirit of God moving upon it became separated into several parcels each parcel for a planet. That at the same time the matter of the sun also separated from the rest & upon the separation began to shine before it was formed into that compact & well defined body we now see it. And the preceding darkness & light now cast upon the Chaos of every Planet from the Solar Chaos was the evening & morning which Moses calls the first day even before the earth had any diurnall motion or was formed into a globular body. That it being Moses design to describe the origination of this earth only & to touch upon other things only so far as they related to it, he passes over the division of the general chaos into particular ones & does not so
had been told from the perspective of an observer on earth and thus was a true description of the appearances. As he stated, “Moses accommodating his words to the gross conceptions of the vulgar, describes things much after the manner as one of the vulgar would have been inclined to do had he lived & seen the whole series of what Moses describes.”

Nonetheless, Newton as a natural philosopher considered it appropriate for himself to conjecture, on the basis of those appearances, about what actually happened during the creation of the solar system. Newton therefore translated the vulgar manner of describing appearances into the real phenomena they described—the deep for the elemental chaos, waters for air and aether—and then offered his natural-philosophical interpretation.

Newton’s suggestion of this particular natural-philosophical reality behind the vulgar descriptions was heavily influenced by his chymical understanding of the natural world. His reference to the deep as a chaos that condensed into discernable bodies reflected chymical concepts of the generation of new substances. The chymical authors he read—and whose works he transcribed—compared the original chaos out of which God created the world to a specific substance or stage at the beginning of the process of forming the philosopher’s stone. In his “Praxis” (c. 1693, Babson Ms. 420) Newton described a certain earth, or

much as describe the fountain of that light God made that is the Chaos of the Sun, but only with respect to the Chaos of our Earth tells us that God made light upon the face of the deep where darkness was before. Further one might suppose that after our Chaos was separated from the rest, by the same principle which promoted its separation (which might be gravitation towards a center) it shrunk closer together & at length a great part of it condensing subsided in the form of a muddy water or limus to compose this terraqueous globe. The rest which condensed not separated into two parts the vapors above & the air which being of a middle degree of gravity, ascended from the one descended from the other & gathered into a body stagnating between both. Thus was the Chaos at once separated into three regions the globe of muddy waters below the firmament the vapors or waters above the firmament & the air or firmament it self. Moses had before called the Chaos the deep & the waters on the face of which the spirit of God moved, & here he teaches the division of all those waters into two parts with a firmament between them: which being the main step in the generation of this earth was in no wise to be omitted by Moses.” Newton to Burnet, January 1680/1, 332-33.

629 Newton to Burnet, January 1680/81, 333.
chymical substance, known as “the fixt salt of Terra Adamica” or “Adam.” Quoting the chymical treatise, “Manna,” he wrote that “tis not clay nor mud but a quintessentiall matter or Chaos out of which man & all the world was made & that tis called earth but is not so.”

In a commentary on the “Emerald Tablet” of Hermes Trismegistus, written approximately 1680-84, Newton interpreted the meaning of the various symbolic forms described by the pseudonymous “Hermes.” The Hermetic text had provided a cryptic connection between the chymical work depicted and the creation of the world: “So was the world created.” Newton gave a specific descriptive interpretation of this reference:

And just as the world was created from dark Chaos through the bringing forth of the light and through the separation of the aery firmament and of the waters from the earth, so our work brings forth the beginning out of black Chaos and its first matter through the separation of the elements and the illumination of matter.

In this descriptive interpretation Newton referred to the same original proto-planetary Chaos and separation of the parts of the earth and atmosphere into three layers that he had described to Burnet in his natural-philosophical interpretation of the appearances described in the Genesis account. Newton was able to speculate about the specifics of the original Chaos, the unformed sun bursting into light, and the coalescence of the parts of the earth out of that Chaos, which the linguistically simplistic biblical account had glossed over, because of his

630 Newton, Babson Ms. 420, fol. 3r. See also Dobbs, Janus Faces, 305.

631 For more on Hermes and Hermetic writings in Newton’s chymistry see Chapter 1, Section 1.2. Newton’s interpretation of this text followed his general pattern of providing descriptions of the plainer meaning behind the textual symbolism, although in this instance he retained some of the general chymical imagery. Dobbs dates this text to 1680-4, which would make its composition contemporary to the exchange with Burnet, see Dobbs, Janus Faces, 272-73. It is, of course, possible that the commentary itself is not Newton’s work, but a transcription. However, the manuscript contains a number of deletions and insertions that indicate it being an original composition rather than a transcription.

632 Newton, “Commentarium on the Tabula Smaragdina,” in Dobbs, Janus Faces, Appendix B, 274-6. The original Latin commentary is Keynes Ms. 28, King’s College Library, Cambridge.
unique understanding of the formation of chymical substances. This understanding had been based on his own reading and translation of symbolic chymical imagery and its application in his chymical experimentation.633

It is possible that Newton’s commentary on Hermes’ “Emerald Tablet” post-dated his exchange with Burnet and hence that his comparison, quoted here, between chymical operations and the creation of the solar system was based on the theory he had developed in the earlier correspondence. However, Newton’s transcription of symbolic chymical works in the 1670s shows that he had encountered this idea prior to his correspondence with Burnet in 1680/81. In his 1675 transcription of a preface to “The Mirrour of Alchemy,” (communicated to him by the ‘mysterious’ Mr. F) Newton copied:

It may seem an admirable & new Paradox that Alchemy should have concurrence with Antiquity & Theology; the one seeming merely humane & the other divine; & yet Moses, that ancient Theologue describing & expressing the most wonderful Arhitectute [sic] of this great world tells us that the spirit of God moved upon the water, which was an indigested chaos, or mass created before by God with confused earth in mixture; yet in his Alchemical extraction separation sublimation & conjunction so ordered & conjoyned [it] again....634

While this quotation does not necessarily represent Newton’s own views, it does indicate his research interests in his reading of chymical texts, in a similar manner to his dog-ears. In this case, it demonstrates that prior to his letter to Burnet, Newton had encountered the

633 See also Snobelen’s discussion of these passages in relation to Newton’s interpretation of the Genesis account, Snobelen, “Isaac Newton and the Genesis Creation,” (unpublished paper, shared with the author in personal correspondence, 21 April 2012), 5-7. For the integration of Newton’s reading of the symbolic texts of alchemy into his chymical experimentation, see Chapter 1 and Chapter 3, Section 6.

634 Newton, “Manna,” Keynes Ms. 33, King’s College Library, King’s College, Cambridge, fol. 5r (also quoted in the opening section of the introduction). This preface is almost certainly not Newton’s own work, as it contains none of the deletions and insertions characteristic of Newton’s original compositions, and appears to be ascribed by Newton to a Robert Lane of Walgrave of Northampton. Intriguingly this preface was one of the documents communicated to Newton by the mysterious “Mr. F,” see Chapter 1, Section 2.2. Figala interprets this commentary as Newton’s own remarks, see Figala, “Newton as Alchemist,” 134, n. 42.
interpretation of the Genesis account according to chymical phenomena—the primordial deep as “indigested chaos,” manipulated by the spirit of God via alchemical means. Thus Newton’s interpretation of natural appearances in the language of the vulgar in Scripture employed his deeper understanding of natural philosophy and, in this significant example, knowledge of the natural world gained from his chymical textual research.

Newton’s appeal to the hermeneutics of accommodation therefore fits directly into the descriptive-translational principle, which forms the main topic of this dissertation and which characterizes his general approach to texts. While he claimed that Scripture did not describe the natural world in the language of natural philosophy, in practice he drew natural-philosophical knowledge from Scripture after translating the vulgar meaning into the phenomena it described. And it was in his capacity as a natural—and chymical—philosopher that he was able to interpret those phenomena. Thus while Scripture only described appearances, the true realities about the natural world were available to the natural philosopher who read the records of the appearances in Scripture as records of natural phenomena and then inductively reasoned through them. I suggest therefore, in answer to Janiak, that in this regard Newton’s certainty of God’s absolute infinity could still be found to derive from Scripture. His statement in the General Scholium of God’s substantial omnipresence was immediately supported with a quotation from St. Paul, that “in him are all things contained and moved,” followed by a footnote delineating scriptural references to God’s substantial all-pervading presence. Janiak is correct that these statements at most describe God as potentially infinite. However, Newton, as a natural philosopher, was able to interpret the vulgar meaning of these statements and to derive the reality of God’s absolute infinity from them. The statements of Scripture were not enough to directly convey the
absolute realities. Just as the prophetic images in Scripture needed to be translated by the correct (morally upright) interpreter, so the statements of nature in Scripture needed to be correctly interpreted by the same (morally upright) natural philosopher. Newton believed himself to be just such an individual.

4.3 The foundation of Newton’s sensorium analogy in revealed theology

Newton’s understanding of the natural-philosopher as true interpreter of natural appearances described in Scripture sheds light on his use of the analogy of God’s sensorium. In the 1706 version of Query 23, Newton stated that God was able to move objects within his boundless sensorium in the same manner as “our soul, which is in us the Image of God [Imago Dei], is able by the will to move the members of our bodies.”635 Newton’s basis for using the human sensorium as a means to understand God’s omnipresence was founded in his concept of the human soul as being made in the image of God, a theological concept known as the Imago Dei. Newton stated as much in his earlier work of metaphysical reasoning, “De Gravitatione.”636 As part of his argument for God’s creation of bodies and their properties by will alone, Newton proposed a consideration of “our faculty of moving our bodies,” so that God may appear (to our innermost consciousness) to have created the world solely by the act of will, just as we move our bodies by an act of will alone; and moreover, so that I might show that the analogy between the divine faculties and our own may be shown to be greater than has formerly been

635 “Anima nostra, quæ est in Nobis Imago Dei, voluntate sua ad corporis nostri membra movenda valet.” See Newton, Optice (1706), 346.

636 Opinions vary on the exact dates of composition of this work. Dobbs considers it to come from the same period as the composition of the Principia, c. 1684. Others have placed it much earlier in Newton’s career given its heavy interaction with Cartesian philosophy, or emphasized its uncertain date. See Dobbs, Janus Faces, 138-46; Janiak, “Introduction,” in Newton, Philosophical Writings, xviii; McGuire, “The Fate of the Date: The Theology of Newton’s Principia Revised,” in Osler, ed., Rethinking the Scientific Revolution (Cambridge: Cambridge University Press, 2000); and Stein, “Newton’s Metaphysics,” 302, n. 39.
perceived by philosophers. That we were created in God’s image, holy writ testifies.637

Essentially, the argument for God’s free action in the world was grounded in the phenomenon of our own free creation of motion in our own bodies. And the reason Newton could apply this analogy to God was the statement of “holy writ” that we were created in God’s image.638 This foundation remained in Newton’s later use of the sensorium analogy in the 1706 Query 23 and forms an appropriate context for understanding his statement in the General Scholium that we can know something of God through comparison with human actions.639

Newton’s mature writing on the divine within the context of natural philosophy continued to rely on this principle, that the human soul—and thus its unique generation of self-motion and immediate perception of sensory impulses—was an image, a picture, of God’s relationship to the world. The most direct empirical access Newton had to the boundary between a living and active spiritual being and the material world was the relationship between human soul and body. In Query 20 (28), Newton claimed that a proper understanding of the design in nature, of how animal motion followed from the will, and of how the sensorium functioned in animals would reveal God and his attributes—from phenomena—including the manner of his perception of all things as if infinite space were his

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638 See Genesis 1:26.

639 Intriguingly, the initial printing of the General Scholium (1713) lacked the statement of God being known allegorically through human actions and emotions. Newton only added the statement to the third edition of the Principia in 1726, at the very end of his life. However the idea that God could be known through comparison with the human soul was present in his earlier version of the Optica (1706). What changed by 1726 was Newton’s use of the word allegory to describe this way of knowing, something absent in his earlier conception.
sensorium. Yet Newton still gave no empirical reason for why the relationship between animal motion and will was analogous to God’s interaction with the world. He could not. Instead, he relied on the implicit similarity between the observed phenomena of human and animal perception and God’s activity in the world. However, in the initial version of Query 23 Newton made his source for the analogy clear: the human soul, creating bodily motion through the exercise of the will, was the *Imago Dei*, the image of God. This explanation would have been freely accepted by his readers for the same reason that Newton could plainly declare it: Scripture stated as much. Thus while Newton did not specifically spell out his scriptural source for this statement in the Query, his reference to the soul as the image of God was clearly based on Scripture and theological concepts directly derived therefrom. And therefore the reason he could turn his empirical investigation of activity, of the phenomena of human will creating new motion, into a statement of God’s physical extension throughout an actual infinite space was his reliance upon a scriptural truth. Newton as a natural philosopher was able to read the scriptural assertion of humanity made in the image of God according to its additional natural-philosophical implications, that an understanding of how the human soul functioned would give genuine knowledge of the interaction between the divine and the natural world. This was not divinity, but divine metaphysics, understanding God within the realm of natural philosophy in how he interacted with space and the material world. However, in this instance of Newton’s divine metaphysics he relied on the practice of divinity, of scriptural interpretation and resulting doctrinal concepts. In the text of Scripture, Newton, the rightly-interpreting natural philosopher could read true philosophical knowledge: that the boundary of soul and body was a picture of God and the world. This knowledge then enabled him to interpret the phenomena of the natural world—new motion
in bodies arising from the exercise of the will—to reveal the activity of the actually infinite God in an actually infinite space.\textsuperscript{640}

Newton’s appeal to space as the sensorium of God and the knowledge of how God interacted with the material world—both in generating new motions mediated through active principles and in his immediate perception of all things—was ultimately founded on a \textit{scriptural} assertion. As stated earlier, Newton’s use of God’s omnipresence to establish law-like properties for the active principles reveals his divine metaphysics, as he used knowledge of God’s properties to develop his understanding of the natural world. Newton set forth this argument clearly in the 1705 draft to the Queries and implicitly in his description of God’s activity in the universe as the action of the will upon the sensorium in the printed version of Query 23 in 1706. In the draft Newton connected the law-like principles of motion associated with life and will—which he had deduced using God’s attribute of omnipresence—to similar law-like principles responsible for attractions at the micro-level of chymical phenomena. In the printed Query this understanding of God’s activity was the culmination of Newton’s exploration of activity in the natural world, in which his analysis of chymical phenomena had led him to propose fundamental particles acted on by general principles of motion, revealing Newton’s divine metaphysics in his chymistry. Also, the chain of Newton’s chymical argument in Query 23 led to God as the first cause and ultimate source of all motion in the

\textsuperscript{640} It is important to note that for Newton these assertions of the true realities behind the appearances were still framed as speculations or conjectures. He placed them in the Queries, which indicated possible future research and he rhetorically refused to frame hypotheses. Snobelen describes Newton’s preference to describe appearances and keep from metaphysical speculation beyond what was clearly revealed in Scripture or natural phenomena, see Snobelen, “‘God of Gods, and Lord of Lords’,” 200-202. Nonetheless Newton was confident enough in the evidence from the phenomena to make these statements in print, even if they were only framed as suggestions for further research based on what the phenomena indicated. He certainly defended his use of the sensorium analogy in future editions and in correspondence. The example of Newton’s use of the \textit{Imago Dei} in this instance indicates that for Newton the collection of phenomena valid for determining a natural-philosophical concept of God certainly included scriptural statements.
world, both the initial motion and newly generated motion mediated through active principles. In this regard Query 23 revealed a physico-theological argument as it led to a proof and understanding of God’s existence and attributes from the phenomena of the natural world, particularly of the chymical interactions between very small particles. However, as this section has demonstrated, Newton’s chymistry also overlapped with his divinity, in more than physico-theological and divine metaphysical ways. Newton did not functionally follow the boundary between natural philosophy and divinity that he would set forth in his unpublished seven statements of religion in the 1715. Divinity, and the correct interpretation of the revealed text that was at the heart of Protestant expressions thereof, directly pertained to Newton’s natural-philosophical view of God. He used his chymical understanding of the generation of matter to provide a natural-philosophical interpretation of the appearances of the creation account described in Genesis. Moreover, Newton’s use of the sensorium analogy—connected to his understanding of the function of active principles in chymical phenomena—was itself grounded in revealed theological truth. These examples stand as a rare instances of the overlap between Newton’s chymistry as part of his natural philosophy and his theology-as-divinity.

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641 This could either indicate that the 1715 draft reveals a change in Newton’s perspective from his earlier practice (in both the composition of the Queries in 1705 and in his earlier correspondence with Burnet in 1680/81), or that Newton’s practice of interpreting Scripture as a natural philosopher and using it to understand and to derive philosophical concepts was in fact at odds with his stated view that divine revelation and philosophy are to be kept distinct. I am inclined to the latter interpretation, as, contrary to the ‘unified mind thesis’, I believe Newton was indeed capable of human inconsistencies.
5. Modes of Divine Discourse in Newton’s Chymistry

The connections between natural philosophy and discourse of God displayed in this chapter are by no means exclusively chymical. Considerations of gravity, physiology, electricity, and capillary action were very much a part of Newton’s investigation of the activity in nature in Query 31. However, this chapter has demonstrated that, at the very least, the evidence of Newton’s physico-theology, his divine metaphysics, and even his divinity, in his optical work was also chymical. As such, the connection between Newton’s chymistry and theology is more than methodological. As discussed in Chapter 3, the unique nature of seventeenth-century chymistry as both a textual and practical pursuit indicates closer methodological ties between Newton’s interpretive methods in chymistry and his theology than other aspects of his natural philosophy. In the case of the chymistry of Newton’s optical material, however, Newton’s chymical theories and his use of chymical phenomena were not intrinsically more predisposed towards physico-theological or divine metaphysical arguments than the rest of his natural philosophy. Newton’s interest in the nature of activity and new motion was as much grounded in his attempt to understand gravity, if not more so. However, in Newton’s optical material his approach to the problem of activity and his recourse to divine metaphysical concepts, as well as his physico-theological proof of God, did rely heavily on chymical concepts and phenomena. And thus Newton’s discussion of God in his Opticks, in the final Queries, provides insight into the general relationship between Newton’s chymistry and theology.

In this chapter I have highlighted new aspects of the overlap between Newton’s chymistry and theology, employing the categories of physico-theology, divine metaphysics and divinity. My approach is motivated by the presence of different modes of talking about
God in Newton’s work. Rather than assuming that Newton’s discussion of God in his published works of natural philosophy was a natural extension of his understanding of God acquired from reading Scripture or investigating theological debates—recorded in his theological papers—the distinctions Newton drew between his fields of study need more careful investigation. Newton claimed that religion and philosophy (or “science”) were to be kept distinct, although he clearly allowed for methodological overlap as seen in his descriptive-translational approach to texts and his rules for interpreting Scripture. Within the field of natural philosophy, which Newton would have characterized as distinct from revealed and systematic theology, Newton still claimed the legitimacy of a consideration of the divine from natural phenomena. I have characterized this discussion of the divine according to physico-theology (or natural theology) and divine metaphysics, drawing from the work of Peter Harrison and Andrew Janiak. This divine discourse I contrast with divinity, which had its sources in the revealed text of Scripture and pertained to issues of doctrine, hermeneutics and church polity. In contrast, natural theology relied on non-scriptural sources, and—in the specific case of physico-theology—natural phenomena, to investigate issues of doctrine and theological concepts of God. Divine metaphysics, on the other hand, used a priori concepts of God’s nature to understand aspects of the natural world.

I have argued that each of these aspects of Newton’s divine discourse can be found in Newton’s public chymical work, mostly found in his optical publications. The infusion of Newton’s chymical experimental work and theories of matter into his optical theories can be seen in his earlier optical treatise—the “Hypothesis” submitted to Henry Oldenburg and the Royal Society in 1675, in the main section of his Opticks (first published in 1704)—his discussion of colour as an indicator of internal chymical composition, and in Query 31 (first
added in 1706)—his extended chymical treatise. Query 28 and 31 both evidence Newton’s physico-theological demonstration of the existence and omnipresence of God seen in the continually renewed activity (life) throughout the natural world. Moreover, Newton’s specific use of the analogy between the human sensorium and God’s relationship to the physical world reveals his divine metaphysics as he relied on God’s attribute of omnipresence to prove the universally extended—and therefore law-like—properties of active principles responsible for new motion, including the attractions between very small particles responsible for observed chymical phenomena. Finally, I suggest that Newton did not in fact apply as strict a distinction between divinity and natural philosophy in practice as he prescribed in his written statements. Newton’s appeal to the hermeneutics of accommodation to separate scriptural statements of natural appearances from philosophical statements of natural realities appears to maintain the distinction. However, the intersection between Newton’s divinity and natural philosophy can be seen in his translation of the appearances described in the language of the vulgar into philosophical descriptions of phenomena and his use of his unique natural-philosophical insight to interpret the natural realities responsible for the appearances described in Scripture. In particular, Newton used chymical theory to accomplish this in his interpretation of the Genesis creation account. Newton’s divinity additionally intersected with his natural philosophy in his reliance on Scripture as source of the doctrine of the *Imago Dei*, which was the foundation for his analogy between the human sensorium and God’s activity in the world. This analogy, of course, had been used to demonstrate the ubiquity of the law-like principles responsible for chymical attractions, and thus reveals the importance of revealed biblical truth to Newton’s chymical understanding of the world.
Conclusion

In Newton’s physics, a question of particularly vexing concern is the three-body problem: how to account for the combined motions of three gravitationally attracted bodies. When considering the incredible variety of Newton’s scholarship, we can easily apply the label of a “three-body problem” to the question of how his alchemy related to his theology, and both of these fields to his natural philosophy. Perhaps, however, the identification of the “bodies” in this “three-body problem” is misplaced. Given new insights into the interdisciplinary nature of early modern scholarship, and the new historiography of alchemy in particular, the problem of relating Newton’s alchemy—or chymistry—and the rest of his natural philosophy turns out to be more of a problem of modern perception than of early modern practice. Rather, the troublesome relationships in the “three-body problem” of Newton’s scholarship are how his textual methods related to his experimental, and both of these methods to his theoretical conclusions. And thus, while I have taken a different position from seeing a unified mind in Newton’s every endeavour, proposed by Dobbs, I consider her focus on alchemy/chymistry as an intermediary field between Newton’s theology and his natural philosophy to retain a certain validity. Newton does not seem to have been motivated in his research of chymistry by any specifically spiritual, doctrinal, or eschatological concerns. However, he was motivated by philology and as such his desire to understand the original forms by which natural knowledge had been enciphered into figurative language extended to an intensive study of the chymical symbolism. Hence Newton’s chymistry can be seen as an intermediary between his empirical natural philosophy and his scripturally-based theology in
its very nature as fundamentally both textual and experimental. Moreover, Newton’s methods of organizing and interpreting the symbolic texts of chymistry relate to his approach to symbolic or figurative texts in general, including descriptions of ancient history, ancient forms of worship and ancient conceptions of the natural world.

My investigation of Newton’s reading of the symbolic texts of chymistry and of biblical prophecy has revealed two general features of his textual scholarship: 1) the cross-comparison of texts to achieve the most original and uncorrupted reading, and 2) his descriptive-translational approach to figurative language. These are general features of his reading of texts and have their roots in his first encounter with the world of scholarship as an undergraduate at Cambridge in the early 1660s. However, as Newton became more immersed in the world of symbolic chymical literature and began his own serious biblical scholarship, he developed these early methods of organizing texts and interpreting language into robust textual practices that produced otherwise inaccessible knowledge from symbolic sources. And, even as these practices became characteristic of all of his work with symbolic texts, they remained central to his derivation of new knowledge from his chymical and prophetic reading. Correctly interpreting the direct translational meaning of the figurative language with which plain truth had been enciphered in these two specific areas was necessary to the success of each endeavour.

Newton’s descriptive-translational approach was ubiquitous to his interpretation of figurative descriptions in the texts he encountered. In subjects outside of chymistry and biblical prophecy, however, the information gained from applying this translational approach was additive to the main sources of information in those subjects, be those sources
experimental, mathematical or prosaic. However, in these two fields, correct interpretation was necessary to derive the basic truths on which the theories or central components of knowledge in the field was built. After all, Newton’s central force law of gravity was not derived from his reading of Pythagoras, even though he sought legitimation in his translation of the Pythagorean celestial harmonies as indicative of inverse force laws. In contrast, his concept of a coming reign of peace under a specific political entity at the millennium—rather than a conflagration of the physical world—and his understanding of how to heat sulphur and niter over an open flame both required the descriptive translation of symbolic texts. Chymistry, moreover, in its simultaneously bookish and experimental aspects depended on both textual and empirical research to derive truth about the natural world. Perhaps what truly distinguishes early modern chymistry from its modern descendent, chemistry, is the dependence of early modern chymistry on textual research for the essential comprehension of core principles. Thus even though early modern chymistry was also characterized by rigorous experimentation—as the new historiography has emphasized—it necessarily included textual research. And for Newton, this entailed a descriptive-translational approach to the symbolic texts of chymistry in addition to his experimental work in the laboratory and his theoretical speculations regarding the nature of matter. As such Newton’s chymistry holds a unique synthesis of his methodical approaches to truth about the natural world. And, it is in the textual aspects of this synthesis, in their necessity to the overall chymical enterprise, that Newton’s chymistry can be seen to have a closer relationship than his other

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642 Interpreting figurative expressions or hieroglyphic depictions of ancient history formed an important part of Newton’s construction of ancient history and of the origins of pagan religion. However, I posit that even in these fields, in which genuinely new knowledge was derived from Newton’s use of descriptive translation, the role of this method and the necessity of the knowledge thus gained was not as central as in Newton’s reading of chymistry and of biblical prophecy.
natural philosophical endeavours to his theology, or more specifically, that aspect of his theological work that equally necessitated a descriptive-translational approach to symbolic texts: the hermeneutics of biblical prophecy.

In my philosophical consideration of the relationship between Newton’s chymistry and theology, the “third body” is added to the “three body problem” of Newton’s textual, experimental, and theoretical work: theory.\(^{643}\) My investigation of the chymical aspects of Newton’s considerations of the divine in his optical writing differentiates between three modes of speaking about God: divinity, physico-theology, and divine metaphysics. These modes integrate in various ways two disparate sources for knowledge of God—Scripture (divinity) and nature (physico-theology and divine metaphysics)—and two differing goals for such divine discourse—knowledge of God and his attributes (divinity and physico-theology) and knowledge of the natural world (divine metaphysics). Newton’s use of chymical phenomena and chymical theory in his optical writing intersects with each mode in a number of ways. In spite of his stated goal to keep philosophy and religion separate, functionally, a relationship between the chymical aspects of his natural philosophy and his views of God, even from the realm of revealed theology, can be seen. Thus a connection between Newton’s alchemy/chymistry and his theology can be found outside of a strictly methodological

\(^{643}\) A strong case could be made that the third “body” in this problem is actually mathematics, as it is a way of knowing or reasoning and a central component to Newton’s work. In my application of the three body problem metaphor to Newton’s chymistry and theology, however, letting the third body deal with Newton’s theoretical considerations provides greater overlap, as it applies to concepts of God and to metaphysical concepts in ways that mathematics do not. Newton did, however, compare mathematical ways of knowing with his textual methods, arguing that textual methods cannot give the same certainty as “a demonstration in Euclide.” Newton considered it contrary “to God’s purpose that the truth of his religion should be as obvious & perspicuous to all men as a mathematical demonstration,” see Newton, Yahuda Ms. 1.1, fol. 18r-19r. Biblical prophecy, like the natural world, spoke clearly and discernably regarding true knowledge of God (even as rational and ordered methods are still needed—in both cases—to reach that knowledge), but could nonetheless be indecipherable to the wicked. A geometrical proof, however, operated at a different level, one of mathematical certainty, such that all men, regardless of their moral state, could agree that a given set of premises leads to the same inevitable conclusion.
perspective, as Newton used his descriptive-translational approach to reading Scripture to allow a chymical interpretation of past natural events.

There are a number of implications for future research arising from my articulation of Newton’s research methods of the symbolic texts of chymistry and biblical prophecy. First of all, a comparative analysis of the dog-ears in Newton’s theological books, his Bibles (English, Latin, Greek, and Hebrew), and his chronological sources would add fruitful insight to the analysis of the dog-ears in his chymical books discussed in Chapter 1. Additionally, greater comparison of Newton’s specific reading practices to those of his contemporaries is needed. This is particularly true of his acquaintances who shared his interests in both theology and alchemy, such as John Locke and Robert Boyle. Do Locke and Boyle exhibit a similar approach to the symbolic texts of the chymical literature and of the Bible? Or does Newton’s interest in figurative language indicate an unusual focus on these aspects? Considering these figures, and other possible sources for his methods of reading symbolic texts, would not only add to our understanding of Newton himself, but situate his reading practices more thoroughly within the scholarship of his period. Finally, the connections between the epistemological foundations of Newton’s empiricism—his search for underlying realities behind natural phenomena—and his descriptive-translational approach to the linguistic signifiers embedded in symbolic texts remain to be fully explored.

In this dissertation I have demonstrated the connections between Newton’s experimental and textual method in his chymistry—and by extension with his theology. This adds to our understanding of the role of hermeneutics—the interpretation of texts—in the development of early modern science. However, the implications of this pattern in the specific relationship between biblical hermeneutics and scientific method has the potential to
play an important role in wider discussions of the relationship between science and religion. As noted in Chapter 3, Peter Harrison has suggested the importance of de-allegorical and literalist Protestant hermeneutics to the decline of the emblematic view of the natural world. That Newton applied a strongly de-allegorical hermeneutics to symbolic and figurative scriptural and chymical texts suggests a similar potential link between in his putative Protestant method of reading the Bible and his conception of the natural world. However, as discussed in Chapter 3, the immediate source for Newton’s descriptive-translational approach, and his cross-comparative method of organizing textual sources (using commonplace books and indexing techniques) comes from his training in the humanist techniques of scholarship at Cambridge. Hence the similarity between Newton’s de-allegorizing and descriptive-translational tendency and the Reformer’s literalism more likely derives from a common source—humanist concerns for the linguistic origins and plain meaning of texts—than being directly descended from Reformed hermeneutics. Nonetheless, Newton’s concern for the corruption into idolatry that results from misinterpreted symbolic forms and his own heavy reliance on previous Protestant interpreters of Scripture (Joseph Mede), suggests that Protestant hermeneutics played an important role in his developing approach to symbolic texts.

Thus, while Betty Dobbs advocates a special connection between Newton’s alchemy, theology, and natural philosophy in the combined physical and spiritual meanings of the hidden alchemical truths that Newton was uncovering, I suggest the opposite: Newton’s theology connected to his chymistry and his natural philosophy precisely in his de-allegorizing attempts to read the inscrutable symbolic forms as having a plain, descriptive, 

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644 See Chapter 3, Section 5, n. 429.
meaning alone. Newton’s reading of the symbolic literature of chymistry employed the same rejection of “fansy”, of the imagination, as his Protestant forebears applied to the texts of Scripture and as he himself advocated in both his hermeneutical rules and his rhetorical repudiation of hypotheses. Rather, truth was to be arrived at through the careful assembly of natural phenomena and of plain descriptions of meaning in texts—even the symbolic texts of chymistry and of biblical prophecy.
Appendix I. Links between Maier, Secreta Naturae Chymica (Trinity NQ.16.88) and “Index Chemicus” – Keynes Ms. 30/1 and 30/5

To represent the referent for a dog-ear fold, I use the notation: d.[pg#]/[1st word of the line] – “[quotation]”. In this notation d.3/citer – “binis serpentibus” represents a dog-ear on page 3 of Maier that folded down to point at the word “binis serpentibus” which is located on the line beginning with the word or word fragment “citer.” Below each dog-ear referent, I list the folio in the “Index Chemicus” for Newton’s reference to that page in Maier. There are a few dog-ear references without any matching manuscript quotation, listed as such below. When there are multiple references in the “Index Chemicus” to the same page in Maier and the most likely correlations have been italicized. In a number of cases all of the references from Keynes Ms. 30/1 did not appear to correlate with the dog-ear referent, but a better candidate can be found in Newton’s earlier version of the Index (Keynes Ms. 30/5). In these instances the entry in the earlier draft is also given. This list is composed from a search for direct page references to Michael Maier’s Secretioris (Embl. in Newton’s notation) in the “Index Chemicus”.

1) d.3/citer – “binis serpentibus” (in Maier)
   - f.4r – entry on “Aesculapius” (in Keynes Ms. 30/1)
   - f.89r – “Ventus spiritus rapidus ἐν ventre portans”
   - Keynes Ms. 30/5
     - f.3r – entry on “Caduceus”
2) d.3/aureum – “obtinendum viam indicat”
   - f.17r – entry on “Boreas”
   - f.19r-20r – entry on “Calais et Zetae” – “Argonautis viam omnem ostendit”
   - f.42r – entry on “Harpyae”
   - f.44r – entry on “Jason, Artifex”
3) d.8/Rosarius – “inquit, linteamina Duenech Principis”
   - f.2r – “Ablutio Latonae per imbibitionem...”
   - f.32r – entry on “Duenech viridis et liquidus” – “Hic est Rex Deunech”
4) d.9/quernis – “sed metallico,”
   - f.2r – “Ablutio Latonae per imbibitionem...”
   - f.30r – entry on “Debalbatio Latonae per putrifactionem”
   - f.44r – entry on “Ignis Pontani.”
   - f.51r – “Latonae faeculentae dealbatio in regimine Saturni”
5) d.11/siccus – “ideoque valde cholericus ... in amore & foecunditate...”
   - f.59r – entry on “Medium jugendi tincturas”
6) d.16/Philosophi – “Philosophi niveous aurum”
   - f.84r – entry on “Terra alba foliata”
7) d.18/Cytharae – “Cum vero Achilles”
   - f.2r – entry on “Achilles”
8) d.21/rat: - “veluti stellas Erraticas,”
   o not in Keynes Ms. 30/1 or Keynes Ms. 30/5
9) d.23/cuti – “(ceu ex cerebro Jovis Palladi)”
   o f.12v – “Aurum <illeg.> pluit dum nascitur Pallas Rhodi”
10)d.27/est filia – “quae ut Daphne mutata est”
    o f.49r – entry on “Iuvenis et senex”
11)d.30/proprio – “haec aqua ex Parnassi”
    o f.9r – entry on “Aqua mercurialis”
    o f.11r – entry on “Agentum vivum et φ, materia et forma.”
    o f.40r – entry on “Forma, sulphur, aurum,”
    o f.65r – entry on “Pegasus” – “aperit aquae perennis in vertice Parnassi”
12)d.33/nere – “Est autem Latona una ex 12 diis Hieroglyphicis Aegyptiorum”
   o f.30r – entry on “Diana, Latonae filia nuda”
   o f.51r – entry on “Latona iovis filia”
13)d.33/do contingat? – “Latona primo inquirenda & agnosceda est”
   o f.30r – entry on “Dealbatio Latonae per putrifactionem”
   o f.51r – entry on “Latonae faeculentae dealbatio”
   o f.51r – entry on “Latonae dealbatio” (crossed out)
   o f.66r – entry on “Plumbum album” – “Latona dealbata”
   o f.80r – entry on “De sublimatio gradu primu consule”
14)d.35/do – “Nigredo”
   o f.51r – entry on “Latona” and entry on “Lapis”
   o f.76r – entry on “Saturn”
15)d.36/iterum – “evomitur a Saturno cum albescit”
   o f.51r – entry on “Lapis”
   o f.76r – entry on “Saturn”
16)d.36/rat – “id est, fuscam albedinem”
   o f.8r – “Apollo Latonae filius, sulphur rubrum”
   o f.30r – entry on “Diana” – “Argentum quod ex ☿ sophico extrahitur”
17)d.38/humidus – “insuo occulto calidus & siccus est”
   o f.60r – “Venus ... tingendi vim acquirit”
18)d.39/do – “ut de copia feri diximus in quartana”
   o f.3r – entry on “Aes”
19)d.41/Cadmo – “caduceum” or /serpentes – “Per Dracones”
   o f.19r – entry on Caduceus
   o f.21r – entry on Cauda draconis and f.31r – Draco caudam devorans est φ
   o (also ref to d.75/pens) – “devorat” in each location)
20)d.49/Mercurium, – “Lunam tertius orbis habet:”
   o f.45r – entry on “ignis lampadis” (and discussion of three fires)
21)d.56/Geryonis – “tres facies in uno patre”
   o f.41v – entry on “Geryon”
22)d.57/mnes – “Tange enim vel laede aerigerum”
   o Not in Ms. 30/1
   o Keynes Ms. 30/5
     o f.5r – entry on “Elementa quatuor”
23)d.60/rubri – “aurei vestimenti” or /piat – “Bejam seu Blancam”
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- **f.4r** – Beya, Blanca
- **f.16r** – Blanca, Beya
- **f.36r** – entry on Eudica
- **f.43r** – entry on Hercules, sulphur

24) d.64/Saturni – “Saturni in faciem (quae nigra) Spargenives:”
- **f.30r** – “Dealbata Latona per putrefactionem imbitiones & sublimationem in salem”
- **f.51r** – entry on Latona – “Aqua nigra faetida in regimine Saturni”
- **f.51r** – “Latonae faeculentae dealbatio in regimine Saturni”
- **f.66r** – entry on Plumbum album “Quo habito fac opus mulierum”

25) d.65/inscriptionio – “quod ex aere Philoso-phico”
- **f.30r** – “Dealbata Latona per putrefactionem imbitiones & sublimationem in salem”
- **f.49r** – Jupiter quomodo Martis et aliorum Planetarum pater
- **f.89r** – entry on Venus faeminarum

26) d.65/nubes – “vapore & aqua plumbum nigrum abluitur”
- **f.51r** – entry on Latona – “Aqua nigra faetida in regimine Saturni”
- **f.51r** – “Latonae faeculentae dealbatio in regimine Saturni”

27) d.74/nisi – “cum fratre suo & sorore sua, id est, Sole et Luna”
- **f.31r** – “Draco serpens”
- **f.31r** – “Draco triceps”
- **f.31r** – “Drace qui cum fratre & sorore moritur”
- **f.77r** – “Serpens Aesculapii”

28) d.75/pens – “devorat”
- **f.19r** – entry on Caduceus
- **f.21r** – entry on Cauda draconis
- **f.31r** – “Draco serpens”
- **f.31r** – “Draco caudam devorans est ﬂ”
- **f.77r** – “Serpens Aesculapii”

29) d.84/ni – “& Martis cholera seu iracundia fuerit taxatus:”
- Not in Keynes Ms. 30/1
- Keynes Ms. 30/5
  - **f.4v** – “Duenech pro terra nigra residua lavanda”

30) d.84/ornatu – “at amictu specto & vili,”
- Not in Keynes Ms. 30/1 or 30/5

31) d.96/ter – “Humiditatem superfluam”
- Not in Keynes Ms. 30/1 or 30/5

32) d.105/Achilles – “ad bellum Trojanum”
- **f.2r** – entry on “Achilles”
- **f.15r** – entry on “Bacchus, Dionysus”
- **f.21r** – entry on “Ceres Triptoleum”
- **f.85r** – entry on “Triptolemus”

33) d.105/Triptolemi – “jugendos bene agnoscat”
- **f.31r** – “Dracones Triptolemi currui jugendi sunt ...”

34) d.108/educatus – “furacitate insignis”
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- f.59r – entry on “Mercurius triceps”
- f.61r – “Mercurius a Vulcano educatus traditur furacitate insignis ...”
- f.62r – “Montes pro materijs ...”

35) d.110/se mittit – “Haec est illa aqua”
- f.8r – entry on “Aqua Draconis” (twice)
  - “in qua facienda est maximus faetor”
  - “per quam Philosophi lapidem praeparant in principio et fine”
- f.65r – entry on “Pegasus”

36) d.111/Post – “Leo viridis occurrit” or “de quo Rosarius”
- f.32r – entry on Duernech viridis et liquidis, Leo viridis, aea Hermetis
  - “corpus leprosum colore viride”
  - “Leo viridis qui pugnat cum Dracone”
- f.52r – entry on “Leo viridis” – “Leo viridis qui cum Dracone...”

37) d.111/abluendo – “Hic est ignis contra naturam”
- f.52r – entry on “Leo viridis” – “at non sine Leone masculo qui est ignis aureus. Maier.”

38) d.118/Hinc Pueri – “Hinc Pueri”
- not in Keynes Ms. 30/1
- Keynes Ms. 30/5
  - f.8r – entry on “Mercurius duplatis”

39) d.131/Triptolemus – “Luna” (perhaps points to general list)
- f.2r – entry on “Achilles”
- f.4r – entry on “Aesculapius”
- f.8r – entry on “Aper”
- f.8r – entry on “Apollo Latonae filius”
- f.15r – entry on “Bacchus”
- f.43r – “Helena, Luna, Isis.”
- f.43r – entry on “Hercules, Artifex”
- f.43r – “Hippomenes idem significat cum Baccho”
- f.49r – entry on “Iisis”
- f.49r – entry on “Iuno”
- f.49r – entry on “Iupiter et Iuno”
- f.51r – entry on “Latona Iovis filia”
- f.56r – entry on “Magnesia” – “nomine omnis metalli dictum compositum”
- f.58r – entry on “Mars et Venus”
- f.64r – entry on “Oedipus”
- f.64r – entry on “Orcus, pluto, ☉”
- f.65r – entry on “Osiris”
- f.65r – “Pelops idem cum Baccho et Perseo”
- f.65r – entry on “Perseus ☉”
- f.66r – “Pollux, Sol, Osiris, Bacchus.”
- f.70r – “Pyrrhus ☉ rubrum tingens”
- f.78r – entry on “Sol et Osiris, etc.”
- f.85r – entry on “Typho” (crossed out)
- f.89r – entry on “Venus priscorum”

40) d.135/noctem – “nempe Latonam seu magnesiam,”
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- f.45r – entry on “Igneus pharmacus”
- f.46r – entry on “Illuminatio terrae” – “Democritus vult Terram ... ingeo pharmaco”
- f.56r – entry on “Magnesia vero non solum ♂ est” – inserted quotation: “Latona dealbata”
- f.91r – entry on “Umbra solis”
- f.92r – “Umbra solis ignito pharmaco delenda, i. e. Latona dealbanda”

41) d.137/qui gravidam – “Muliere misera post diutones errores”
- not in Keynes Ms. 30/1 or Keynes Ms. 30/5

42) d.146/nis – “qui ex Apollinis, Vulcani & Mercurii”
- not in Keynes Ms. 30/1 or Keynes Ms. 30/5
Appendix II. Summary of all of Newton’s Theological Manuscripts related to Biblical Prophecy and the Books of Daniel and Revelation

The following list has been compiled using information found on The Newton Project website.

1. Yahuda Ms. 3 (6207 words)
2. Yahuda Ms. 13.2 (c. 13900 words)
3. Yahuda Ms. 14 (159343 words)
4. Yahuda Ms. 1 (327362 words)
5. Keynes Ms. 1 (4474 words)
6. Yahuda Ms. 2.1 (c. 3300 words)
7. Yahuda Ms. 2.2 (c. 9000 words)
8. Yahuda Ms. 2.5 (c. 3000 words)
9. ASC Ms. N47 HER, James White Library, Andrews University, Berrien Springs, Michigan, USA (19367 words)
10. Yahuda Ms. 10 (19737 words)
11. Yahuda Ms. 9 (134856 words)
12. Keynes Ms. 5 (85069 words)
13. Babson Ms. 434 (24724 words)
14. Yahuda Ms. 4 (34758 words)
15. Yahuda Ms. 6 (14288 words)
16. Yahuda Ms. 7 (c. 300000 words)
17. Yahuda Ms. 8 (15630 words)
18. SL255.5 (135 words)
19. SL255.7 (c. 1500 words)

Additionally, the posthumously published *Observations upon the Prophecies of Daniel and the Apocalypse of St. John* (1733) has a word count of 71157 words.

Total word count for theological manuscripts and works related to Biblical Prophecy (including any treatise on Daniel or Revelation): c. 1,247,800.
Bibliography

Manuscripts

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