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Newton, theology and the inductive method

Sophie Bourrat

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Nom : **BOURRAT**
Prénom : **Sophie**

UFR de Langues Etrangères

Mémoire de Master **1 recherche** - 12 crédits

Spécialité ou Parcours : **Master recherche Etudes Anglophones Parcours PLC**

Sous la direction de **Monsieur Patrick Chezaud**

Année universitaire 2011-2012



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Introduction

When talking about Sir Isaac Newton (1642-1727), one usually thinks about his famous theory on gravity – which, according to the myth, he supposedly discovered after an apple fell on his head – or his works on mathematics and optics. Indeed, there is no denying that Newton’s scientific discoveries greatly contributed to the rise of modern science (“natural philosophy” was its name at the time), an intellectual current which started to spread in the seventeenth century with the works of Sir Francis Bacon and which is still at the basis of our modern conception of science today. According to Richard S. Westfall, “the ‘great institution’, which Sir Francis Bacon announced with the dawn of the century, achieved in the century’s twilight a glorious culmination in the work of Sir Isaac Newton” (Westfall, p. 1). This “great institution” is usually defined in relation to two major scientific principles: empiricism and mechanism. In empirical science, scientific conclusions can only be drawn from evidence obtained through experimentation on empirical facts that is to say phenomena that can be observed in nature. For Michael Ben-Chaim, “empirical research has been construed as a means to obtain evidence. It has been claimed that the function of empirical evidence was methodological, and could be explicated in terms of inferences that determined whether theories could withstand the test of evidence” (Ben-Chaim, p. 8). Significantly, the empirical method is still used in the current research on natural sciences since “procedures of empirical research are routinely applied in assessing the value of concepts and theories as tools in basic and applied research” (Ben-Chaim, p. 1). But science in the seventeenth century was also based upon a mechanical conception of the universe – also known as the clockwork universe theory – according to which the order of nature is comparable to the working of a machine or engine. In *Science and Religion in Seventeenth Century England*, Richard S. Westfall argues that “nature was looked upon as a machine made up of unconscious material parts controlled by external mechanical forces [...], nature as a machine running by itself without external aids, a machine which human science could study and comprehend” (pp. 72-73). In other words, nature was said to resemble the machinery of a clock in which each component performs its role mechanically without being conscious of it; it was defined as inert, lifeless matter. However, seventeenth century scientists – who Westfall calls the *virtuosi* – maintained that the way by which this machine is assembled was not the work of chance; for they were convinced that the order of nature is regulated by a certain number of

fixed mechanical laws (concerning force and motion) and that the harmony and rationality that can be found in the universe and in the laws that govern it necessarily implies that they have been created by a superior Being. At a time in which Protestantism had become so deeply rooted within British society, these *virtuosi* could not conceive that this skilful Artificer was any other than God himself.

Thus, contrary to our modern conception of science which completely separates the fields of science and religion, the Scientific Revolution which took place in the seventeenth century reconciled the mechanical vision of the universe with the unity of God's design in both Nature and Scriptures. As mentioned previously, this has to be set back in the context of seventeenth century England where religion played a very important role in people's lives; indeed, there were hardly any atheists at the time and the great majority of people would not have even contemplated the possibility of putting God's existence and powers into question. The *virtuosi* saw themselves as "simple investigators of God's creation" (Westfall, 1964, p. 32) whose investigations into the natural world offered them constant proofs of God's wisdom in His contrivance of the creation. As will be argued in the third part of this dissertation, this vision of the relationship between God and Nature is in keeping with the Calvinist beliefs in predestination and divine providence which had become deeply rooted within the Protestant faith. According to the concept of predestination, the fate of any individual has been foreordained by God before his birth – namely whether he will go to Heaven or Hell after his death, what he will achieve during his lifetime, etc. – and, as a consequence, human efforts and good deeds accomplished on earth are useless in reversing the situation. Put differently, it implies that men do not have any control on their lives and, on a larger scale, on the unfolding of events, since the whole history of mankind has already been decided by God at the time of the creation. Predestination is usually associated with the concept of divine providence which refers to God's intervention in the physical world, whether it is during or after the original act of creation. Accordingly, men are doomed to a foreordained fate and the only glimmer of hope left to them is the possibility to reconstruct God's grand scheme for the universe; for by observing and studying nature diligently, natural philosophy can help finding proofs of God's wisdom in His design of the cosmic machine. Newton's scientific writings show perfectly well this "intermingling" between science and religion given that he always takes God's providence into account when devising the mechanical laws that govern the working of the universe. For instance, his great theory of gravity depends on God's power since,

while it is gravity that puts planets into motion, “without the Divine Power it could never put them into such a circulating motion as they have about the Sun” (*Newton’s letter to Doctor Bentley*, p.20). However, while all the *virtuosi* took it for granted that God is the skilful Artificer who created the universe, most of them maintained that He was not intervening in His creation any more. Consequently, a split occurred between the supporters of “general providence”, who argued that Nature has been left to work by itself in accordance with the general laws God promulgated at the time of the creation, and those in favour of “special providence” who claimed that God can transcend and reverse the order of nature at will by altering the course of events. According to Westfall, Newton defended the concept of “general providence” since he believed that God’s intervention after the act of creation was limited to the sustaining and mending of the laws of nature He had promulgated (in correcting inequalities in the motion of planets for instance); Newton was therefore convinced that God’s hand is influencing the actions of each component in the universe even though He has ceased intervening directly in His creation. Once again, this is an argument in favour of the conciliating relationship that existed between science and religion at the time given that “the Calvinist God in His remote majesty resembles the watchmaker God of the mechanical universe” (Westfall, p. 5). Yet, Newton’s vision of the Creator differed from the one of other scientists like René Descartes who described an inert, godless world in which God has completely ceased to intervene.

Newton’s inductive method which is developed at length in *The Mathematical Principles of Natural Philosophy* (or *Principia*) first published in 1687 betrays Newton’s desire to reconcile the comprehension of the universe with God’s providence. Based on a draft version of Rule IV of the *Principia*, G.A.J. Rogers draws the following implications concerning Newton’s inductive method: “experimental philosophy only advances through induction”, “the phenomena of nature are in some sense already fixed”, “our knowledge of these phenomena may be improved by our observational techniques”, “we should not make use of hypotheses in determining the phenomena” (James E. Force, Richard H. Popkin, pp. 223-224). The concept of “induction” mentioned by Rogers, also known as *inductive reasoning*, is a process of generalisation in which “an initial observation leads to the discovery of a certain pattern; this allows a tentative predication to be made which leads to a general theory about how things work” (Experiment-resources.com, s.d.). In other words, Newton was convinced that it is only through observation and experimentation upon empirical facts that general laws about the working of the universe can be devised. But it

has also been argued that Newton believed the mechanical laws governing the order of nature to be the work of God and that the support of these laws is only made possible through constant divine intervention. When both concepts are put together, it explains why Newton's study of the Book of Nature (natural philosophy) led him to devise general laws about God's providence in His governance of the universe. For that matter, Newton's intention with the inductive method is made clear in the *Opticks* (1704) when he says that "the main business of natural philosophy is to argue from phenomena without feigning hypotheses and to deduce causes from effects, till we come to the very First Cause which certainly is not mechanical" (Westfall, p. 193).

But what is less known about Newton is that he wrote more about theology than he did about science. Newton's views on theology are very little known to the public and the fact is that readers had to wait until 1855 and the first major autobiography dedicated to Newton to discover the scope of his work outside the scientific field (Sir David Brewster, *The Life and Writings of Sir Isaac Newton*). However, Newton's thoughts on religion remained rather occult until the English Unitarian, Herbert McLachlan, published in 1940 a book in which he highlights the gap between the official Anglican doctrine of the seventeenth century and Newton's own conception of the Trinity and the genesis of religions (*The Religious Opinions of Milton, Locke and Newton*). According to Jean-François Baillon, Newton's theological reflexions on the Scriptures can be tracked down as early as the 1670s that is to say a few years after his graduation from Cambridge University and the publication of his *Theory about Light and Colours*. Newton's first theological writings were concerned with the interpretation of prophetic texts and more specifically the prophecies of Daniel and the Apocalypse of Saint-John, which were published in a posthumous book called *Observations Upon the Prophecies of Daniel and the Apocalypse of Saint-John* (1733). Newton's interest in prophetic texts was not accidental. As noted previously, Newton's thought was shaped by his belief that the universe is ruled according to God's providence and, as Arthur B. Robinson explains it in his preface to the *Observations*, this led him to believe that "these books of prophecy were provided so that, as they are historically fulfilled, they provide a continuing testimony to the fact that the world is governed by the Providence of God" (p. x-xi). In other words, by foretelling historical events that have come to be fulfilled, the prophecies are supposed to be the proof that the fate of mankind has been foreordained by God at the time of creation. But the problem is that "the books of prophecy [...] did not speak the language of ordinary

men. [...] The language of prophetic writings was symbolic and hieroglyphical and their comprehension required a radically different method of interpretation. The prophecies were God's direct revelations of hidden truths" (Manuel, pp. 86-87). Put differently, the prophecies have to be set apart from the historical narratives of the Scriptures because they are the direct transcription of God's words, hence their allegorical language; the prophetic style is a code that needs to be deciphered. Consequently, Newton had to find a method that would allow him to reveal the hidden meaning of prophetic figures and allegories. To that purpose, he drew his inspiration from Joseph Mede's work on the Apocalypse, the *Clavis Apocalyptica* (1627), which had introduced an innovative scientific system of interpretation. Like Mede, Newton believed that reasoning and methodising have to be the landmarks in interpreting prophetic texts. According to Frank E. Manuel, both Mede and Newton stated that it is necessary to re-establish the chronology of the prophecies which is in fact quite confused in the original texts since the historical events foretold in the Apocalypse are dispersed and do not follow the order of the visions chapter after chapter. Influenced by Mede's work, Newton devised a set of rules (*The Untitled Treatise*, 1670s¹) to organise the prophetic visions and decipher the meaning of the prophetic style so as to ensure that the content of the prophecies would be properly interpreted.

The aim of this dissertation is to go against the received assumption that Newton's science influenced his theology², a view which is only one-sided and which does not take into account the unity of Newton's thought. Indeed, it will be argued that the hermeneutic method Newton devised in the 1670s to interpret the language of the prophecies and its subsequent application in the *Observations* already showed the seeds of the inductive method Newton later defined in the *Principia* while it was written twenty years earlier. This argument was first suggested by Maurizio Mamiani in his essay on "Newton prophecy and the Apocalypse" in which he presents an interesting chart³ comparing the rules of the *Untitled Treatise* and those of the *Regulae Philosophandi*. However, while Mamiani restricts his comparison of Newton's rules of interpretation to the *Principia*, this dissertation will also show their concomitance with the method used in the *Theory about*

¹ Appendix n°4

² Look at the works of Frank E. Manuel, Richard S. Westfall, Derek Whiteside or I.B. Cohen. On the contrary, the thesis propounded in this dissertation is in the line of the works by Sarah Hutton, James E. Force, Margaret J. Osler, Richard H. Popkin or Maurizio Mamiani.

³ Appendix n°1

Light and Colours Newton published in 1672. Consequently, this dissertation will analyse the main principles governing Newton's hermeneutic method, the application of these principles in the *Observation*, and the implications that can be drawn from them alongside *The Theory about Light and Colours* and some parts of the *Principia* in order to show that the origin of the inductive method can be tracked down in Newton's early scientific and theological writings alike and that his religious beliefs greatly contributed to shape the frame of his science. The choice of *The Theory about Light and Colour* is significant because, as it was published just before Newton started working on the interpretation of the prophecies, it will be interesting to compare the methods applied in both works and to analyse the similarities that can be found between them. Ultimately, the different arguments propounded in this dissertation, by laying emphasis on the constant intermingling between Newton's science and religion, will serve as proofs of the unity of Newton's thought. As James E. Force argues in his essay on *Newton's God of Dominion: "Refracting Newton in shades and hues may be a reasonable learning aid but we miss the blinding incandescent light of his true genius if we forget finally to recombine his many parts into the integrated whole which is the totality of his genius"* (p.89). This implies that Newton's views on science and religion cannot be separated and that they have to be studied side by side when analysing both his scientific and theological works.

Firstly, I will show how both the hermeneutic method and the inductive method devised by Newton aimed to avoid hypotheses and uncertainty in the study of science and theology. Secondly, I will comment on the parallels that can be drawn between Newton's rules for "methodising" the interpretation of prophetic texts and those of the inductive method as defined in the *Principia*. Thirdly, I will argue that Newton's interpretation of both the Book of Nature and the Book of Law – his general rule – is used as a proof of God's Providence in His contrivance of the universe.

Part 1

-

A method to avoid hypotheses and uncertainty

Chapter 1 – Structural organisation

A major characteristic shared by Newton's hermeneutic method and inductive method alike is the desire to avoid hypotheses and uncertainty in devising scientific or religious propositions. One way by which this is achieved is through structural organisation that is to say the manner by which ideas and arguments are presented in a piece of work. Indeed, Newton's scientific writings are based upon a codified structural organisation of the arguments propounded since the latter are more likely to make sense to the reader when they are ordered in a logical manner. Thus, structural organisation is quite important when exposing a scientific theory given that the certainty of the arguments presented only seems acceptable to the reader when they appear to fit naturally and logically with one another.

The use of a general introduction or preface

One way by which Newton orders his arguments in both his scientific and theological writings is by introducing the subject of his study and his reasons for studying it in a *preface* as well as by giving precise definitions of the concepts presented before starting demonstrating his theory. In his "Preface" to the *Principia*, Newton presents the phenomena studied (attractive and impulsive powers), the methodology used to determine their causes (mechanical principles), and his reasons for studying these phenomena before entering into any scientific explanation. In that respect, Chapter I of the *Observations* resembles the "Preface" of the *Principia* since it is a sort of general introduction which explains what the facts studied are (the Scriptures "contain the covenant between God and his people, with instructions for keeping this covenant; instances of God's judgements upon them that break it; and predictions of things to come" p.14) and why it is necessary to study these facts ("And the giving ear to the Prophets is a fundamental character of the true Church" p.14). Besides, Chapter II of the *Observations* – "Of the Prophetic Language" – is similar to the first chapter of the *Principia* entitled "Definitions" since it introduces the various prophetic figures that are going to be presented in the book alongside their figurative meaning in the physical world. Thus, Newton always starts from the concepts themselves before analysing their larger sense in the prophetic visions (in the case of theology) or in the design of Nature (in the case of science). To ensure that the concepts studied in a piece of work are precisely defined right from the beginning is a way to avoid

misunderstandings and misinterpretations when coming to the demonstration of the arguments propounded to support a particular theory.

The use of a conclusion

Each chapter of Part I of the *Observations* ends with a sort of conclusion in which the facts presented (historical, scriptural, or both) are synchronised with Daniel's vision; each conclusion makes the reflexion move forward since it establishes the truth of the vision under study and announces its relation with the next one. The end of Chapter III can be quoted by way of example: "Then by the incursion of many northern nations, they brake into many smaller kingdoms, which are represented by the feet and toes of the Image, composed part of iron, and part of clay. For *then*, saith Daniel, *the kingdom shall be divided, and there shall be in it of the strength of iron, but they shall not cleave one to another*" (p.26-27). The same technique is applied in the *Theory about Light and Colours* in which the results obtained through experimentation and the conclusion Newton draws from them leads to new areas of reflexion. For instance, the results Newton obtains from his experiment with a first triangular-glass prism (the fact that the form of the refracted colours is oblong) leads him to try the experiment with a second prism to see whether the results are not due to "any unevenness in the glass or other contingent irregularity" (p.2).

The use of specific terms: "proposition", "substance", "definition"

In addition to the usual concepts of introduction and conclusion, Newton devised a certain number of specific terms constituting the structure of his inductive method as defined in the *Principia* but which he had certainly in mind when he wrote the *Theory about Light and Colours* and the *Untitled Treatise* in the 1670s. Indeed, the *Principia* is divided into different parts respectively called *definitions*, *axioms*, *lemma* and *propositions* and which, except for the *definitions* section, are organised as thus: one axiom / lemma / proposition for a title and then the demonstration, supported by the results obtained through experimentation on empirical facts, which leads to the axiom / lemma / proposition propounded. The concept of *proposition* – that is to say the main doctrine or law governing a particular correlation – had already been used in the *Theory about Light and Colours* but, more significantly, it is mentioned alongside the concept of *definitions* in Newton's hermeneutic method as well. In the *Untitled Treatise*, Newton defines the term *definitions* as "the heads to which I reduce these words [the words of the prophecies]" (p. 5) and the

term *proposition* as being “the substance of the Prophecy” (p. 6). The term “substance” is likewise used by Newton in his *Theory about Light and Colours* when he says that light is the substance from which the qualities of colours are derived; light is defined as “the subject of” colours. All these definitions suggest that Newton’s propositions are “the subjects of” his various writings; they are the laws or principles that the scientist or theologian tries to demonstrate through the study of empirical facts. For instance, Chapter V of the *Observations* called “Of the Kingdoms represented by the feet of the Image composed of iron and clay” is the proposition that this particular chapter tries to demonstrate through the comparison between the prophetic language and the historical events that led to the splitting of the country of Dacia into smaller kingdoms. As mentioned previously, the *propositions* of the *Observations* (the title of each chapter) are presented in relation to the *definitions* of the prophetic figures under study given that “it was [with the interpretation of the Apocalypse] that Newton introduced the rule for the first time with a goal of reconciling the understanding of particulars with the definitions. Finally, the proof or demonstration of the proposition was obtained both with the help of the definitions and with recourse to particulars, ordered according to the rules” (I. Bernard Cohen, George E. Smith, p. 397). Consequently, Newton tried to prove the truth of his interpretation of prophetic figures (the propositions) by reconciling historical events that have already been fulfilled (the particulars) with what a specific prophetic figure stands for in the natural world (the definitions). Newton applies the exact same method in his scientific writings when he reconciles the particulars of his experiments with the definitions of the concepts he studies. For instance, the reliability of Newton’s first proposition about the refraction of colours is proved by reconciling the definition of colours as the “original and connate properties” of light and the results obtained through experimentation (“The species of colours [...] is not mutable by Refraction [...] nor by any other cause, that I could yet observe”).

Chapter 2 – The relying on empirical facts

Another mean by which Newton achieves order in devising scientific and theological propositions is by relying on empirical facts. In the *Opticks* published in 1704, Newton argues that “the main business of natural philosophy is to argue from phenomena without feigning hypotheses and to deduce causes from effects, till we come to the very First Cause which certainly is not mechanical” (Westfall, p. 193). This summary of “the main business of natural philosophy” is certainly one of the most meaningful definitions of the inductive method since it highlights the three main characteristics of Newton’s method of reasoning: 1) natural laws are inferred from the observation and experimentation on natural phenomena; 2) imagination does not have its place in the study of natural philosophy; 3) the natural laws that govern the order and sustaining of the universe have to be related to the Creator.

The role of induction in the Theory about Light and Colours

Newton believed that scientific principles have to be inferred from evidence based upon experimentation on phenomena that exist in nature (“to argue *from* phenomena”) and not the other way around, which explains why his scientific method is based on *induction* rather than on *deduction*. In the *General Scholium*, Newton reminds that “in this philosophy [natural philosophy] particular propositions are inferred from the phenomena and afterwards rendered general by induction” (Newton, 1729). Put differently, it means that the scientist carries various experiments on a set of empirical facts to find a natural regularity which is then ascribed a universal quality of all bodies. This way of getting at knowledge shows the influence of empiricism on Newton’s inductive method given that his scientific theories are inferred from the study of empirical evidence which cannot be refuted, namely the results of experimentation on natural phenomena. For instance, Newton’s empirical approach is visible in his *Theory about Light and Colours* in which propositions are based upon the results obtained through various experiments with prisms. Besides, his treatise on light and colours reflects the step by step process of the method he would later develop in the *Principia*: 1) experimentation on one particular correlation observable in nature (“I procured me a triangular glass-prism to try therewith the celebrated phenomena”, p.1); 2) the objective analysis of the results obtained through experimentation (“I became surprised to see them in a oblong form” p.1); 3) the

investigation of the cause(s) of these results with the help of other experiments; 4) the general law / principle which governs the correlation under study (“And so the true cause [...] was [...] that light consists of rays differently refrangible” p.3). Consequently, Newton inferred his *Theory about Light and Colours* from the results he obtained with his prism-experiments that is to say empirical facts that could not be rejected.

The role of senses in the inductive method

It has been said that experimentation is at the basis of Newton’s inductive method since the scientific principles he devises are inferred from the results of experiments upon natural phenomena. However, it is necessary that these experiments produce reliable evidence (grounded facts) otherwise the scientist takes the risk of devising incorrect or faulty principles. This is the reason why experimentation is carried on observable phenomena (phenomena that exist in nature and can be observed) given that it is usually taken for granted that what can be perceived necessarily exists and cannot be refuted. Senses (sight especially) are therefore of overall importance in Newton’s inductive method because they ensure the reliability of the empirical results on which scientific principles are based. Their role is in fact highlighted in Rule III of the *Regulae Philosophandi* in which Newton says that it is because the scientist perceives extension in sensible objects that he is able to ascribe it a universal property of all bodies: “that all bodies are impenetrable we gather not from reason, but from sensation”⁴. In theology, religious propositions about God’s power and role in the creation and governance of the universe are similarly inferred from the observation of the scriptural language, namely the action of reading. However, Newton warns that human senses can sometimes be deceptive. In the *Theory about Light and Colours* for instance, he explains that, while light appears to be similar or homogeneal at first sight (because of its whiteness), experimentation with prisms shows that it consists in fact of rays differently refrangible. Concerning the prophecies, Newton reminds the reader of the danger of hearing without understanding and seeing without perceive as one can read the prophecies without being able to understand its true meaning. Consequently, a method of investigation, based on repeated experimentation / analogy, is needed to ensure the reliability of the scientific / theological propositions inferred.

⁴ See Appendix 3

The role of induction in Newton's theological writings

Like in his scientific writings, Newton applies inductive reasoning in his interpretation of prophetic texts; for in the same way that the results of experiments with prisms helped Newton devise a theory about light and colours, his study of God's words – the prophecies – were proofs for him of God's wisdom in His contrivance of the universe and, more specifically, His plans for the human race. Even though this can seem surprising to our contemporary minds, it was nevertheless taken for granted at the time that the words of the prophecies were as reliable as the evidence obtained through experimentation on natural phenomena. Indeed, Newton was convinced that the prophecies were "God's direct revelations of hidden truths" (Manuel, p. 87) and, at a time in which religion played such an important role in people's lives, no one would have dared putting God's words into question. Furthermore, Newton maintained that the prophecies are the history of events that have already been fulfilled or are yet to be fulfilled, which means that the various visions described in the prophecies can be synchronised with history and are therefore grounded facts that cannot be rejected. Significantly, a parallel can be drawn between the definition of the *General Scholium* mentioned previously and Rule 5 of the *Untitled Treatise* which states that it is necessary "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" (Newton, p. 7). Thus, the theologian infers the meaning of the prophecies from the words themselves by choosing the interpretation which appears to be the most logical and reasonable to the use, property and tenor of the prophetic language in the original text. As argued previously, the relying on empirical facts was a way for Newton to ensure that the propositions inferred were based upon solid foundations that could not be shaken. Indeed, a theory built upon evidence that can be traced in Nature or Scriptures is less likely to be wrong given that it relies on verifiable, grounded facts rather than on hypotheses or personal speculations. It explains why Newton makes constant references to the results of his experiments in his scientific writings and to the content of the prophecies in the *Observations* (cf. Chapter III *Observations*).

Mathematical application of the prophetic language

The intermingling between science and religion reaches its climax at the end of Chapter VIII of the *Observations* where Newton interprets numbers taken out from the prophecies mathematically: “he reigned *with a look more stout than his fellows*, and *times and laws were henceforward given into his hands, for a time, times and half a time*, or three times and an half; that is, for 1260 solar years, reckoning a time for a Calendar year of 360 days, and a day for a solar year” (p. 113-114) This direct correlation between science and religion has several implications: 1) the words of the prophecies are empirical facts which a rational and reasonable mind can study and comprehend; 2) religious propositions about the meaning of the Book of Law can be inferred from the study of the scriptural language in the same way that a rational study of the Book of Nature allows the scientist to infer general rules about the working of the universe; 3) both the Book of Nature and the Book of Law can be analysed rationally, namely with the same method of reasoning. It implies that the frontier between the work of the theologian and the work of the scientist is thin for Newton since not only is the method applied similar in both fields of knowledge but, as will be shown in the third part of this dissertation, the study of both the Book of Nature and the Book of Law is supposed to arrive at the same general rule about God’s Providence.

Chapter 3 – A method to render interpretation univocal

It has been shown that structural organisation and the relying on empirical facts were ways for Newton to avoid hypotheses and uncertainty in the study of both natural philosophy and theology. But why is it necessary to do so? According to Mamiani, the method Newton devised for interpreting prophetic texts aimed “to render its interpretation univocal” (p. 391) so as to ensure that the message God intended the prophecies to retain was properly understood. Incidentally, the use of a method in devising scientific principles should have the same function, namely that the theory the scientist infers from his observation on a set of empirical facts cannot be said to have a different interpretation than the one which is most in accordance with God’s precepts.

The danger of misinterpretation when studying prophetic texts

The use of a method based upon inductive reasoning compelled the interpreter to rely on empirical facts rather than on the excess of his imagination to devise religious propositions. This was the only way by which he could be prevented from misinterpreting God’s message in the Scriptures, something which is particularly to be feared with regard to the content of prophetic texts. Firstly, to misinterpret the prophecies is similar to the distorting of God’s words, which is a sin against the Almighty. Secondly, to make the interpretation of the prophecies uncertain by relying on his imagination rather than on the direct words of God is to acknowledge that the Scriptures are “no rule of faith & to reflect upon the spirit of God who dictated it” (UT, p.7). Thirdly, since the prophecies are concerned with events that have yet to be fulfilled, misinterpreting their content would prevent men from recognising the signs of time and from being properly prepared for the ordeals they will have to face in the future (see Part III Chapter 3). In the preface to his hermeneutic method, Newton reminds the reader that “to frame false interpretations is to prejudice men & divert them from the right understanding of this book. And this is a corruption equipollent to the adding or taking from it, since it equally deprives men of the use & benefit thereof” (p. 5). The interpreter therefore has to be very circumspect and precise in his interpretation of prophetic texts because to distort the words of the prophecies, whether it is voluntarily or not, is to deprive men from the counsels God intended them to receive through the study of these texts. It explains why Newton fervently warned about the danger of letting one’s imagination taking hold over one’s reason and why he was so harsh with false interpreters

who purposely distorted the words of the prophecies, therefore opening the door “through which all Heresies have crept in & turned out the ancient faith” (UT, p.7). For “by taking the liberty to twist the parts of the Prophecy out of their natural order according to their pleasure without having regard to the internal characters whereby they were first to be connected, it might be no very difficult matter amongst the great variety of things in the world to apply them more ways than one” (UT, p. 5). Because the prophecies are the direct transcriptions of God’s words, the interpreter has to respect the natural order of the prophecies that is to say “the true one which results most naturally & freely” from their language and content and not to try to force them to fit personal interpretations based on nothing else than mere speculations. The interpretation of the prophecies has to be univocal: it has to reveal the truth of the Christian message as God originally intended it.

The position of the scientist with regard to hypotheses

Similarly, Newton constantly warned about the danger of framing hypotheses when studying natural philosophy in his scientific writings. In the *General Scholium*, he argues that “whatever is not deduced from phenomena is to be called a hypothesis; and hypotheses [...] have no place in experimental philosophy” (Newton, 1729). Indeed, in the same way that hypotheses can lead the theologian to misinterpret God’s words in the prophecies, they can lead the scientist to devise incorrect or faulty propositions about the working of the universe. Misinterpretation in the study of Natural Philosophy is as sinful as misinterpreting the words of God in the Scriptures given that both the Book of Law and the Book of Nature are supposed to say something about their author. Put differently, misunderstanding the rules that govern the universe is dangerous because it can lead to a misunderstanding of God’s powers, not to say to a lessening of His role in the governance and maintenance of the cosmic machine. The constraints required by the inductive method (the relying on empirical facts, the need for experimentation...) were supposed to render the interpretation of the Book of Nature univocal because they ensured that only the most likely explanation – that is to say the one that could be derived most freely and naturally from the study of empirical facts – was taken into consideration when devising scientific principles. Induction had therefore the pride of place over hypotheses as it is explicitly stated in Rule IV of the *Regulae Philosophandi*: “In experimental philosophy, we are to look upon propositions collected by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypotheses that may be imagined”.

What are the only exceptions to the rule?

Newton claimed that the only manner by which his scientific theories could be discarded was by proving them wrong through experimentation on empirical facts that directly contradicted his conclusions; he would not accept any theory based upon hypotheses and speculations not supported by empirical evidence. Concerning his *Theory about Light and Colours* for instance, Newton argues that the only way to discard his theory is “by showing the insufficiency of [my] experiments [...] by assigning the flaws and defects in my conclusions drawn from them” or by “producing other experiments which directly contradict me” (*Quere’s* to TLC). This statement is in fact quite similar to Rule 11 of the *Untitled Treatise* where Newton says that “hence if any man shall contend that my Construction of the Apocalypse is uncertain, upon pretence that it may be possible to find out other ways, he is not to be regarded unless he shall show wherein what I have done may be mended” (pp. 8-9). Thus, it is always possible to find various interpretations for a particular correlation or a prophetic figure but these interpretations have to be discarded as long as they are not based upon convincing arguments, that is to say arguments which result most freely and naturally from the study of the Book of Nature or the Book of Law; for “if this not be the true sense, then is the true sense uncertain, & no man can attain to any certainty in the knowledge of it” (UT, p.7). Nevertheless, it is worth mentioning that Newton accepted the impossibility to ascertain that propositions devised in the present time will still be valid in the future: “we are to look for propositions [...] until such time as other phenomena occur, by which they may either be made more accurate or liable to exceptions” (Rule IV RP). In the light of what has been said previously, this can seem paradoxical given that a proposition which is no rule of faith is by definition a hypothesis. But as will be argued in the conclusion to this dissertation, Newton accepted that the real nature of things is unknown to men, either because God wants it to remain obscure or because human intellect is too limited to comprehend it. In other words, the inductive method limited itself to the *highly probable*, which is nonetheless better than hypotheses based upon shaky foundations.

Transition

Thus, it is already apparent with this first part that the methods Newton used to study both science and theology share a lot in common and that his religion is likely to have influenced his science. Firstly, both methods are similar to the extent that they aim to avoid hypotheses and uncertainty through structural organisation and the relying on empirical facts. Secondly, it has been argued that the reason why Newton warned against the danger of hypotheses and the excess of imagination when devising religious and scientific propositions is that it can lead to a misunderstanding of God's powers and role in the contrivance of the universe. Therefore, it explains why general principles are inferred from the thorough study of Nature or Scriptures (empirical facts) with the inductive method; what has been created by God and is observable in the physical world cannot be rejected as unreliable or incorrect.

In the following part, it will be shown that the similarities which exist between Newton's hermeneutic method and inductive method as defined in the *Principia* go further than the apparent desire to avoid hypotheses and uncertainty. Indeed, the main rules governing both methods are in fact very much alike (despite having different names) and can be listed according to the following postulates: analogy & regularity, simplicity and harmony.

Part 2

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**Parallels between Newton's rules for
"methodising" the interpretation of prophetic texts
and the inductive method as defined in the
*Principia***

Chapter 4 – Laws of analogy and regularity

At the very beginning of Chapter II Part I of the *Observations*, Newton argues that “for understanding the prophecies, we are in the first place to acquaint ourselves with the figurative language of the Prophecies. This language is taken from the *analogy* between the world natural and an empire or kingdom considered as a world politic” (Newton, p. 16). Put differently, it means that the prophetic figures mentioned in the prophetic visions correspond to specific constituents of the body-politic; they should have their counterparts in the body-politic. The implication is that the spiritual world of the prophecies and the physical world in which men live are closely related. Indeed, by showing the concomitance between the prophetic figures and the world natural, Newton postulates that the analogy between Scriptures and History is the key for understanding the truth of the prophecies (see Chapter 1 Part III of this dissertation).

Examples of analogy between prophetic figures and the world natural in the Observations upon the Prophecies

In Part I Chapter VII, a direct parallel is made between Daniel’s vision of the eleventh horn of the fourth Beast and its counterpart in the political world: “Kings are put for kingdoms, as above; and therefore the little horn is a little kingdom. It was a horn of the fourth Beast [...]; and therefore we are to look for it among the nations of the Latin Empire, after the rise of the ten horns” (p.74-75). Thus, Daniel’s vision is interpreted in relation to history because the eleventh horn of the fourth Beast is said to correspond to one of the nations of the Latin Empire, namely the Church of Rome. Part II Chapter II, which is significantly called *Of the relation which the Apocalypse of John hath to the Book of the Law of Moses and to the worship of God in the Temple*, is another good example of the agreement between the spiritual and the physical worlds since it shows how John’s vision can be synchronised with the worship of God in the Temple, that is to say the religious traditions of the first Christians. For instance, Newton argues that “the Temple is the scene of the visions, and the visions in the Temple relate to the feast of the seventh month: for the feasts of the Jews were typical of things to come” or “on the first day of that month, in the morning, the High-Priest dressed the lamps: and in allusion hereunto, this Prophecy begins with a vision of one like the *Son of man* in the High-Priest's habit” (p.255). Bearing in

mind Newton's influential work as a scientist, it is interesting to note that analogy is particularly to be found in numbers with his hermeneutic method; this suggests that Newton's scientific mind influenced his interpretation of the prophecies (and – as some would argue – made him see things where there was in fact nothing to be seen) and that is the reason why it is necessary to talk about a constant “intermingling” between his science and his religion. For example, the four Beasts of Daniel are said to represent the four great nations that have ruled over the earth (Babylon, Persia, Greece and Rome), the ten horns of the fourth Beast to the ten kingdoms composing the Roman Empire after the besieging of Rome by the Visigoths, the seven vials of Revelation to the reign of seven emperors from Vespasian to Theodosius, etc. On top of the analogy between prophetic figures and body-politic, Newton studies the visions described in the Book of Revelation as “a series of coterminous segments of time” (Sarah Hutton, p.172), meaning that the visions running concurrently (i.e. taking place at the same moment in time) are synchronised and their content deciphered in relation to one another even though they are dispersed in the original text (one vision belonging to the prophecy of Daniel and the other to the prophecy of John for instance).

The proof in favour of the law of analogy

The argument Newton proposes to prove that his synchronic system and the results he gets from it are correct similarly relies on analogy. Indeed, he tries to show in his *Untitled Treatise* how his interpretation of prophetic figures is in accordance with the one of eastern interpreters living at the time the prophecies were supposedly written: “yet that nothing be wanting to establish them, I shall further show their consent with the scriptures, & also with the interpretations of the Chalde Paraphrast, & with the ancient doctrine of the Eastern Interpreters” (“The Proof”, p.15). For Newton, the spatial proximity of the nation of the Hebrews with Egypt, Persia and India made that the language and manners of these different countries must have had a lot in common. Consequently, it is very likely that the figurative expressions used among eastern interpreters at the time were similar in both use and meaning. Moreover, Newton claimed that the temporal proximity of eastern interpreters with the time in which the prophecies were written ensured that their interpretation of the prophetic language was not biased by the deliberate distortions that came to corrupt later versions of the Scriptures. Thus, Newton tried to prove that his interpretation of prophetic figures was based on historical evidence that could not be

refuted – not fantasies of his imagination – so as to prevent accusations that his hermeneutic method was uncertain and unreliable. This was the only manner by which he could give credibility to his work and method of interpretation which is not something easy when dealing with religious texts; for as the existence of God cannot be proved mathematically, it is difficult to ascertain that one specific interpretation of scriptural facts is more reliable than another.

Why is analogy possible in the interpretation of prophetic texts?

Analogy is therefore at the core of Newton's hermeneutic method; it is the standard on which any other rule of interpretation has to be based. Consequently, it is not surprising that the law of analogy is made the first rule of Newton's hermeneutic method – “to observe diligently the consent of the Scriptures & *analogy* of the prophetic style, and to reject those interpretations where this is not duely observed” – and why it is immediately followed by the law of simplicity (“to assign one meaning to one place of Scriptures”); it shows that the postulate when interpreting prophetic texts is that *one* prophetic figure should always correspond to *one* constituent of the body-politic. However, it has not been explained so far why it is possible to draw analogies between the words of the prophecies and the world natural. How could eastern interpreters be sure that prophetic figures had their counterparts in the physical world? The answer is once again related to the religious beliefs of the time. Indeed, theologians like Mede or Newton tended to set the prophecies apart from the rest of the Bible because they believed them to be “God's direct revelations of hidden truth” (Manuel, p.87). This statement has two implications: 1) the content of the prophecies cannot be refuted as they are supposed to be the direct transcription of God's words; 2) the truths contained in the Book of Revelation are likely to be related to the Book of Nature, otherwise God would not have given the prophecies to men. In fact, similarities were likely to be found in the construction and content of both the Book of Nature and the Book of Law since people were convinced that they were the work of the same author. Thus, God being an intelligent and rational Being, He must have designed both Nature and Scriptures in the same fashion (namely in His image) and that is the reason why what can be said about the spiritual world can be said about the physical world and vice-versa. Furthermore, the prophecies are constructed like stories in which the prophetic figures evolve; this means that it is the *histories* of these prophetic figures (the evolution of the fourth Beast throughout time for instance) which are in fact being

presented in the various visions. From then, theologians concluded that the histories of the prophetic figures were used as a metaphor for the larger history of mankind as decided by God at the time of the creation. For people like Newton, the analogy between the spiritual world and the physical world would ultimately increase knowledge and benefit the edification of the true Church since the revelation of the truth contained in the prophecies would serve as the proof that the world is ruled according to God' will. As will later be argued in this dissertation, the belief according to which God is a *Pantocrator* influenced the general law Newton inferred from his study of both the Book of Nature and the Book of Law.

The law of analogy and regularity in Newton's scientific writings

Newton's law of analogy is not limited to the study of prophetic texts since he makes use of it in his scientific writings as well. To that respect, it can be argued that Rule III of the *Regulae Philosophandi* is the scientific equivalent of Rule 1 of the *Untitled Treatise*: "The qualities of bodies, [...] which are found to belong to all bodies within reach of our experiments, are to be esteemed the universal qualities of bodies". Though the terms used are different, Rule III relies on analogy since what is said to be a quality of parts of bodies is ascribed a universal quality of all bodies through induction; the qualities of the parts are synchronised with the qualities of the whole. It is interesting to note that Newton's early scientific writings – like his *Theory about Light and Colours* – already showed the seeds of the law of analogy he later developed in both his hermeneutic and inductive methods. The most striking example is to be found in *proposition two* when Newton states that one colour corresponds to one specific degree of refrangibility (of light): "And this Analogy 'twixt colours and refrangibility is very precise and strict" (TLC, p.5). Besides, the method Newton applies in devising scientific principles about the refraction of light combines the law of analogy with the law of regularity since it is the resemblance in the results obtained through various experiments with prisms which is used to prove that a set of empirical facts is governed by the same general law. For instance, after discovering that the light rays are oblong and not circular when refracted through a prism, Newton attempts to investigate the cause of this phenomenon by changing the conditions under which the first experiment was carried (to transmit light through parts of the glass of different thickness, through holes of different sizes, etc.). In the end, "the fashion of the colours [is] in all these cases the same" (TLC, p.2) and Newton therefore concludes that this set of empirical facts is

likely to be governed by the same mechanical law which is that “light consists of rays differently refrangible” (p.3). Lastly, Newton establishes the regularity of a particular correlation (“if any one [colour] [is] predominant, the light must incline to that colour” - p.6) by drawing analogies between the results of his experiments and elements in Nature which reproduce the same phenomenon (“the blue flame of brimstone, the yellow flame of a candle, and the various colours of the fixed stars” – p.6). The scientific counterpart of the law of analogy and its relation to the law of regularity is well explicated by Ben-Chaim in his essay on *The Public Transaction of Newton’s Optical Research*: “In Newton’s studies, experiments were the means to develop a technique that could show how empirical properties were correlated. The experimental reproduction of a particular correlation demonstrated its regularity” (p. 72). It is also worth mentioning that the idea according to which one particular correlation should correspond to one specific mechanical law is similar to Rule 2 of the *Untitled Treatise* which states that one prophetic figure should correspond to one constituent of the body-politic; the recurrence / regularity of a particular correlation or prophetic figure – namely as showing the same results or retaining the same meaning whatever the experiments or its place in the Scriptures – proves that this correlation or prophetic figure can only be interpreted in one way. According to Manuel, “once an appropriate political translation of any given ‘prophetic hieroglyph’ (the phrase is Newton’s) had been determined, that same meaning had to be applied whenever it appeared in a book of prophecy. The tests of truth were constancy and consistency.” (Manuel, p. 94). The need to rely on analogy and regularity in both the study of Nature and Scriptures explains why Newton made these laws one of the rules of the *Regulae Philosophandi*: “to the same natural effects we must, as far as possible, assign the same causes” (it may be no coincidence that the law of analogy / regularity is known as Rule II in both Newton’s hermeneutic method and inductive method).

Chapter 5 – Law of simplicity

It has been argued that both Newton’s hermeneutic and inductive methods rely on the laws of analogy and regularity to devise religious and scientific propositions. Another law on which both methods are based, and which is tightly connected to the law of analogy, is the law of simplicity. In the case of the prophecies, the recurrence of a prophetic figure as retaining the same meaning throughout the text shows that there is no need for the interpreter to try to find another interpretation than the one which is most naturally derived from the study of the prophetic style. For instance, the recurrence of the Beast as signifying a body-politic or a single person which heads that body implies that, according to the prophetic style, a Beast is a body politic. Consequently, it is necessary to find the simplest interpretation – that is to say the one which most respects the prophetic style – and not to force a prophetic figure to fit interpretations based on hypotheses rather than on the study of empirical facts (the words of the prophecy).

A mean by which to avoid hypotheses

The law of simplicity was used by Newton in both his hermeneutic and inductive methods to render the interpretation of empirical facts univocal. As shown in the first part of this dissertation, hypotheses are particularly to be feared since they can lead to a misunderstanding of the mechanical laws created by God, or even worse, to a lessening of His powers and role in the governance and maintenance of the universe. Consequently, both the scientist and the theologian have to infer their conclusions from the observation of observable phenomena that exist in Nature and Scriptures for, while empirical facts are based upon solid, concrete evidence drawn from experimentation or history (in the case of the prophecies), there is no way of verifying the truth of a hypothesis based on personal speculations only. In other words, Newton believed that the analogy between what is observed (empirical facts) and what it implies (the interpretation of these facts) is the simplest way to a conclusion since it reduces the risk of errors in devising general principles about how things work. It is therefore not surprising that Newton argues in the *Quaere’s* concluding his *Theory about Light and Colours* that “to determine by Experiments these and such like *Quaere’s* which involve the propounded Theory seems the most proper and direct way to a conclusion”. Rather than enumerating the several ways by which phenomena may be explained – that is to say by confronting contrary suppositions

based on hypotheses – Newton claims that the proper (and simpler) method for inquiring after the properties of things is to deduce them from experiments on empirical facts which conclude positively to the parts of the theory to which they are applied. In other words, the results of a first experiment (like the one with the prism) lead the scientist to propose new experiments which can explain the phenomena under study and which gradually help him design the theory governing a particular correlation. This supports the argument according to which the law of simplicity is intrinsically linked to the law of analogy since it is by drawing analogies between the results of various experiments that the scientist arrives at the simplest and most likely explanation for a phenomenon. In the case of the prophecies, literal interpretation is the best way of avoiding errors in devising religious propositions given that the theologian does not take the risk of losing himself in mystical, obscure interpretations that he will not be able to support empirically. Thus, the rule in studying both the Book of Nature and the Book of Law is to make “bare analogies” between empirical evidence and what they imply. Propositions have to rely on the simplest interpretation as long as they cannot be proved wrong by other experiments which directly contradicts the scientist’s conclusions or by “history or arguments draw from circumstances it appears to be true” in the case of theology (Rule 2 UT). For Mamiani, “we arrive at the heart of Newton’s hermeneutic method: to reduce prophecy to its univocal meaning in the same way in which phenomena could be reduced to a single law” (p.395).

Examples of bare analogies: the literal interpretation of the prophetic figures

When looking carefully at the *Observations*, it becomes clear that Newton uses the law of analogy and the law of simplicity concurrently to decipher the meaning of prophetic allegories. For instance, it has been argued in the previous chapter that one way by which Newton draws bare analogies between prophetic figures and the world natural is by comparing numbers since a number mentioned in a vision is likely to correspond to a similar number in the history of mankind. The examples of the four Beasts and the ten horns have already been noted but other examples of simple analogy between numbers can be mentioned, especially those from Part II Chapter III. By way of example, Newton compares the two candlesticks of John’s vision to the two wings of the woman in the wilderness in Daniel’s vision which are both used to represent the Churches of Smyrna and Philadelphia persecuted by the Roman Empire. However, bare analogies are not only to be

found in numbers. In Part I Chapter II which, as explained in the first part of this dissertation, is similar to the “Definitions” chapter of the *Principia*, Newton maintains that “fire and meteors refer to both heaven and earth, and signify as follows; burning anything with fire, is put for the consuming thereof by war; a conflagration of the earth, or turning a country into a lake of fire, for the consumption of a kingdom by war...” (Newton, p. 18). As argued previously, this shows that literal interpretation has to be the rule when interpreting the prophecies since there are in fact few examples in the Scriptures where prophetic figures retain a mystical sense: “where note that the usual signification of a prophetic figure is in the application of this Rule to be accounted equipollent to the literal meaning of a word whenever it appears that the Prophets speak in their figurative language” (UT, p.7).

Religious justification for the law of simplicity in both science and theology

Yet, one can wonder how Newton was so sure that bare analogies are sufficient to properly interpret the words of the prophecies. Indeed, one would expect the figurative language of the prophets to be allegorical and mystical rather than literal. However, Newton claimed that “this being a language as common amongst them [the prophets] as any national language amongst the people of that nation” (UT, p.7) the words of the prophecies should be expected to refer to common, earthly events (wars, the falling of kingdoms, etc.) and not to mystical or celestial ones. But the main reason Newton gives to justify his bare analogy system is that the truth of the prophecies ought to be simple because God is a Being pleased with simplicity. This is explicitly stated in Rule 9 of the *Untitled Treatise*: “truth is ever to be found in simplicity, & not in the multiplicity and confusion of things. [...] It is the perfection of God’s works that they are done with the greatest simplicity. He is the God of order and not of confusion” (p.8). Though this rule was designed for the interpretation of prophetic texts, a parallel can be drawn with Newton’s scientific writings in which the method applied and the propositions inferred from the study of empirical facts rely on simplicity. The explanation for the application of such a law in both Nature and Scriptures is once again related to the belief that the Book of Nature and the Book of Law are the work of the same author: if God is pleased with simplicity, one would expect the whole of His creation to be simple. Significantly, Rule 9 of the *Untitled Treatise* is not limited to the interpretation of the prophecies since Newton is talking about the concept of “truth” which can be applied to the fields of both science and religion. In fact, the comments following

Rule 9 are an even more striking example of the intermingling between Newton's science and religion: "as the world which to the naked eye exhibits the greatest variety of objects appears simple in its internal constitution when surveyed by a philosophic understanding, so it is in these visions. [...] As they that would understand the frame of the world must endeavour to reduce their knowledge to all possible simplicity, so it must be in seeking to understand these visions" (p.8). From this statement, it becomes clear that Newton does not distinguish the study of the Book of Nature from the study of the Book of Law; since they are both God's creation, Nature and Scriptures are likely to reflect the same characteristics (i.e. God's attributes) and that is the reason why the method applied and the propositions devised in both fields of knowledge can be expected to be quite similar. Incidentally, it is not surprising that Rule 9 of Newton's hermeneutic method resembles Rule 1 of the *Regulae Philosophandi* which says that "we are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances. [...] For Nature is pleased with simplicity, and affects not the pomp of superfluous causes". It is very likely that Newton uses the term "Nature" here as a synonym for "God", therefore implying that "[God] is pleased with simplicity". This belief in God's desire for simplicity explains why Newton argued that natural philosophers have to find scientific theories which seem "the most proper and direct way[s] to a conclusion"; God wanted the natural world to be simple so there is no need for scientists to try to find complexity in the design of the universe.

Parallels with the mechanical conception of the universe and examples of simplicity in the Theory about Light and Colours

The belief according to which God is pleased with simplicity is in accordance with the mechanical conception of the universe in which the order of Nature is compared to a clockwork mechanism, namely a machine obeying fixed mechanical laws without being conscious of it. Indeed, mechanism promotes a simplistic vision of the universe since the multiplicity of phenomena that can be observed in the natural world is said to derive from a limited number of general principles following a rational dynamics (a machine usually obeys a simple rational code such as the binary code). The role of the scientist is therefore to find the connections between the different parts of this machine by looking for simplicity in its design so as to be able to devise simple mechanical laws about its functioning. This implies that simplicity is needed in the method the scientist applies to study the cosmic machine. Examples of Newton's application of the law of simplicity in

his scientific method of reasoning are to be found in his *Theory about Light and Colours* in which both the propositions he devises and the way by which he presents them try to be simple. A perfect example of this is *proposition two* which states that “to the same degree of Refrangibility ever belongs to the same colour, and to the same colour, ever belongs the same degree of Refrangibility” (p.5). The content of the proposition is quite straightforward and easily comprehensible; similarly, the syntactical structure of the proposition reflects Newton’s desire for simplicity since it is based on a parallelism (one proposition and its counterpart). In fact, the *Theory about Light and Colours* is certainly one of the best examples of Newton’s application of the law of simplicity in the study of science since it is one of his most accessible scientific theories; even someone lacking scientific knowledge is likely to understand the main principles governing the theory about light and colours. Though it is not the focus of this dissertation, it would be interesting to analyse more deeply how the overall structure of the text (the way it is presented and organised, the direct addresses to the reader) mirrors Newton’s desire to present the study of science as something simple and accessible to reasonable readers.

Chapter 6 – Law of harmony

A last similarity between the main rules on which Newton's hermeneutic method and inductive method are based (with regard to this dissertation at least) is the law of harmony. According to the Oxford Dictionaries online, harmony can be defined as "the state of being in agreement or concord", which is exactly what Newton tries to achieve in both the presentation and argumentation of his theological and scientific writings. Once again, the law of harmony is intrinsically linked to the law of analogy and simplicity previously presented.

Harmony in the structure

In Rule 6 of the *Untitled Treatise*, Newton argues that it is necessary "to make the parts of a vision succeed one another according to the order of the narration without any breach or interference" (Newton, p. 8). Put differently, it means that the interpreter has to respect the textual order of the prophecies as long as there is no indication of a breach or interfering in the narration. This must be made the rule of interpretation when organising the different parts of the prophecies, even though Newton admits that some visions run concurrently while they are separated in the original text: "in collateral visions to adjust the most notable parts & periods to one another. And if they be not throughout collateral, to make the beginning or end of one vision fall in with some notable period of other (Rule 7, p.8). As has already been argued, theologians believed the (hi)stories of the prophetic figures to be an allegory for the larger history of mankind and that is the reason why the most notable parts of the prophecies are likely to correspond to the most notable periods in history. This is in fact clearly stated in the comments Newton makes on Rule 7: "the visions are duely proportioned to the actions and changes of the times which they respect by the following Rule and therefore they are duely proportioned to one another" (p.8). Significantly, this rule shows that the law of harmony work concurrently with the law of analogy and simplicity since the theologian is expected to make bare analogies between the most notable parts of the prophecies (the reign of the fourth Beast for instance) and the most notable periods in history (the reign of the Roman Empire). As explained in the previous chapter, God was said to be pleased with order and simplicity and it is therefore not surprising that He intended interpreters to take proportions into account when drawing analogies between prophetic figures and the world natural. The use of the term

“proportioned” is in fact another proof in favour of the constant intermingling between Newton’s science and religion given that the concept of proportionality is usually applied in the fields of mathematics and geometry. As will be shown in Chapter 1 Part III of this dissertation, the same mathematical principle is taken again in Rule 14 of the *Untitled Treatise* when Newton points to the necessity “to proportion the most notable parts of the Prophecy to the most notable parts of history” (p.9) to remind the reader that his rules of interpretation are intrinsically linked to the historical character of the prophecies. Thus, Newton does not limit his comparison of the work of the theologian to the work of the scientist given that he explicitly draws a parallel with the work of the historian who has to order and organise historical facts so that his vision of history makes sense to the reader: “Historians divide their histories into Sections, Chapters and Books at such periods of time where the less, greater & greatest revolutions begin or end” (UT, p.9). Again, this shows that Newton did not consider the various fields of knowledge as impenetrable compartments which have to be studied separately since scientific concepts (like proportionality) are similarly applied in the study of science, theology and history. In fact, it may be ventured that Newton saw scientific reasoning as the method by which all fields of knowledge have to be measured so as to ensure that the propositions devised are consistent with the Christian view of the Creator (His liking for rationality, simplicity and harmony for example) and the truth of His message. However, it has not been explained so far why it is preferable to respect textual order and proportionality when organising prophetic visions. The explanation is once again related to seventeenth century religious beliefs: as the prophecies were believed to be the direct transcriptions of God’s words, and remembering that His intentions are never vain, it implies that God must have had His reasons for presenting the words of the prophecies in that particular order and for allowing analogies between prophecies and history to be made. Thus, to disrupt the structural order God intended the prophecies to retain means to distort His words, to elude the meaning of his words, and “to make [them] no prophesy but an ambiguity like those of the heathen Oracles” (UT, p.8). Furthermore, harmony in the structure is needed for the study of prophetic texts given that structural organisation is one of the means by which Newton claims that hypotheses and uncertainty can be avoided when devising scientific and religious propositions. As has been argued in the first part of this dissertation, structural organisation is quite important when exposing a scientific / theological theory for the certainty of the arguments propounded only seems acceptable to the reader when they

appear to fit naturally and logically with one another (and God certainly gave the prophecies to men to be understood).

Harmony in the sense and its relationship with harmony in the structure

However, Newton does not limit his law of harmony to structural organisation only since he also lays emphasis on the necessity to create harmony in the sense. In fact, the first rule of the *Untitled Treatise* which says that one has “to observe diligently the consent of Scriptures & analogy of the prophetic stile” (p.9) implies that the prophetic language has a special code of consent and analogy which has to be respected if one wants to decipher its hidden meaning. Thus, the use of a method of interpretation is not just a matter of proportions and textual order – Newton admits that it is in fact not always possible to adjust the most notable parts of the prophecies with the most notable periods in history – but also of meaning given that the analogy between the prophetic figures and their counterparts in the world natural at a given period in time has to make sense to the reader. The figurative language of the prophecies and the reality of the physical world have to fit logically with one another so that the meaning of the prophetic visions – the truth of the Christian message – may be revealed to the reader. For instance, the conclusion at the end of Chapter VIII Part I of the *Observations* draws a parallel between the historical events presented in Chapter VII and VIII and the words of Daniel in the prophecies in order to show how the meaning of the prophetic language becomes crystal clear when studied alongside history. Furthermore, Rule 8 stresses the need for contemporary visions to be analysed with regard to their meaning in the entire prophecy: “to choose those constructions with without straining reduce contemporary visions to the greatest harmony of their parts [...] For the design of collateral visions is to be a key to one another & therefore the way to unlock them without straining must be fitting one to the other with all diligence and curiosity” (p.8). To put it differently, it means that contemporary visions have to be synchronised and analysed in relation to the visions taking place before and after the event under study – that is to say that they have to fit logically with one another both in their structure and in their sense – since the content of a vision can only be understood once the literal meaning of the previous one has been deciphered. This shows that harmony in the structure and harmony in the sense are tightly connected for the prophecies cannot make sense to the reader when their different parts are not presented in the right order. For that matter, Chapter III and IV of Part I of the *Observations* are a good

example of how harmony in the structure is necessary for creating harmony in the sense. Indeed, Chapter IV – *Of the vision of the four Beasts* – is the continuation of Chapter III – *Of the vision of the image composed of four metals* – since new attributes qualifying the prophetic figure introduced in Chapter III are presented. In Chapter III, Newton compares the image composed of four metals to the four Beasts of Daniel’s vision which are said to represent the four great kingdoms that have ruled over the earth. In Chapter IV, Newton keeps focusing on these four kingdoms but this time by describing specific attributes associated to each one of the Beasts, these attributes being interpreted as metaphors for specific historical events that took place during the reign of each kingdom. This passage from generality to specificity is necessary to the comprehension of Daniel’s prophecy as a whole given that the vision of the four Beasts would not have made sense to the reader if the image composed of four metals had not been presented beforehand. It is for the same reason that the prophecy of Daniel is presented before the prophecy of John since Daniel’s vision is interpreted as being related to the rise of the fourth Beast (the Church of Rome) while John’s vision focuses on the Apocalypse and the defeat of the fourth Beast. Significantly, the law of harmony – with harmony in the structure creating harmony in the sense – is similarly applied in Newton’s *Theory about Light and Colours* in which the theory about light is presented before the theory about colours. Indeed, light is presented as the “substance” from which the “qualities of light” – that is to say colours – are derived. In other words, the theory about light is the key for understanding the theory about colours in the same way that the image composed of four metals is the key for understanding the vision of the four Beasts (or that the prophecy of Daniel is the key for understanding the prophecy of John, etc.).

Transition

Thus, there are strong similarities between the rules Newton devised for the interpretation of prophetic texts and those of his inductive method as defined in the *Principia* since it has been shown that both methods rely heavily on the interrelations between the law of analogy, the law of regularity, the law of simplicity and the law of harmony to devise scientific and religious propositions. Accordingly, scientific concepts and tools are not only limited to the study of natural philosophy for Newton as they can be similarly applied to the fields of theology and history. This suggests that the various fields of knowledge are not impenetrable compartments which have to be studied separately but, on the contrary, that they are constantly intermingling with one another. It is therefore not entirely true to say that Newton's science influenced his theology for, though it is clear from the observations made in this second part that Newton's early science had to some extent an impact on his hermeneutic method, it is important to remember that it is the *Untitled Treatise* which shares the most striking similarities with the *Principia* while it was written twenty years earlier. Consequently, the relationship between Newton's science and religion is not exclusively one-sided given that his religious beliefs and the method he devised to interpret prophetic texts seem to have greatly contributed to frame his future scientific method of reasoning.

The third part of this essay will give more proofs to support the argument in favour of the unity of Newton's thought since it will be shown that the ultimate goal of both natural philosophy and theology was the same for Newton. Indeed, it will be argued that Newton's interpretation of both the Book of Nature and the Book of Law pointed to one general truth about the design of the universe: God's Providence.

Part 3

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Newton's interpretation of the Book of Nature and the Book of Law: God's Providence

Chapter 7 – Scriptures & History, Nature & Natural Philosophy

As argued in the second part of this essay, Newton’s interpretation of the Book of Law is based on the concomitance between Scriptures and History. Indeed, it has been shown that Newton applies the law of analogy in his study of prophetic texts since he synchronises prophetic figures with their counterparts in the body-politic. Significantly, Newton claims in Part I Chapter 1 of the *Observations* that the prophecies “contain the covenant between God and his people, with instructions for keeping this covenant; instances of God’s judgements upon them that break it; and predictions of things to come” (p.14). In other words, the prophecies are both the history of things past and to come, as Rule 5B of Newton’s hermeneutic method clearly states it: “it was God’s design in these prophesies to typify and describe the most considerable things in the world” (p.7).

“Retrospective confirmation”⁵ (Sarah Hutton)

Although the fulfilling of events yet to come cannot be certified scientifically, Newton uses the concomitance between specific prophetic figures and past historical events, what Sarah Hutton calls “retrospective confirmation”, to support his interpretation of the future; for if Newton’s interpretation of prophetic figures can be proved to rely on historical evidence – namely that his interpretation of some parts of the prophecies is in accordance with the way history has been fulfilled so far – there is no reason why the same rules of interpretation could not be used to interpret events that have yet to be fulfilled. Several examples have already been given in the second part of this essay to show that Newton interpreted the prophecies in relation to History. For instance, it has been argued that the image composed of four metals is said to represent the body of the four great nations that have ruled over the earth – the Babylonians, the Persians, the Greeks and the Romans. Another example would be the image of the woman fleeing in the wilderness in the Book of Revelation whom Newton compares to the true primitive Church chased by its enemy, the false Church of Rome, during the Middle-Ages. Thus, the argument Newton proposes to support his hermeneutic method – namely that the prophecies refer to historical events

⁵ *The Seven Trumpets and the Seven Vials: Apocalypticism and Christology in Newton’s Theological Writings* by Sarah Hutton.

that did take place in the past – can be paralleled to the relying on empirical facts he promotes in his inductive method; indeed, the concomitance between Scriptures and History establishes the content of the prophecies as empirical evidence on which propositions can be inferred since the certainty of past historical events cannot be discarded (bearing in mind that Newton believed the prophecies to be the direct transcriptions of God’s words to Daniel and John). In fact, Newton claimed that only the words of the prophets can be relied on when devising religious propositions about things to come on given that “[God] communicates knowledge of future things to Jesus Christ & none in heaven or earth or under the earth is worthy to receive knowledge of future things immediately from the father except the Lamb. And therefore the testimony of Jesus is the Spirit of Prophecy & Jesus is the Word or Prophet of God” (Article 4, *Twelve Articles on Religion*).

Justification of the analogy between Scriptures and History: the parable of the fig-tree

In the introduction to his hermeneutic method, Newton justifies the analogy between prophetic figures and past historical events by referring to the words of Jesus Christ in the Scriptures with his parable of the fig-tree: “When his branch is yet tender and putteth forth leaves, ye know that Summer is nigh. So likewise ye when ye see these things know that it is near even at the doors [...] Wherefore it is thy duty to learn the signes of the times that thou mayst know how to watch, & be able to discern what times are coming on the earth by the things that are already past” (UT, p.2). The fact that Newton refers to the Scriptures to support his interpretation of the prophecies is significant; it shows once again that there is nothing as certain as the relying on empirical facts (the words of the prophets) to prove the truth of one’s arguments, namely that the prophecies contain the history of mankind from its beginning to its end. Indeed, the parable of the fig-tree contains indications about the proper method for interpreting prophetic texts: the interpreter has to look for “signs of time” (past historical events) in the words of the prophets in order to be able to decipher the content of prophetic visions in relation to the fulfilling of history on earth. This will help the interpreter discern the time in which he is living so that he can be best prepared for the events that are approaching (the end of time for example).

Theology & history: a similar method of investigation

From what has been said previously, it can be argued that the work of the theologian is similar to the works of both the scientist and the historian to the extent that the three of them have to derive their propositions from the study of empirical facts that cannot be refuted: scientific propositions have to rely on the results of experimentation on natural phenomena; historical propositions have to be based upon the analysis of historical facts and primary sources; religious propositions have to be inferred from the study of the Scriptures. However, the similarity between the work of the historian and the work of the theologian is even more striking given that they both have to make references to past historical events as a mean to support their argumentation. Newton's view on the similarity between the work of the historian and the work of the theologian is first established in Rule 13 of the *Untitled Treatise* when he says that "if it would be a weakness in an Historian whilst he writes of obscurer actions to let slip the greater, much less ought to be supposed in the holy Prophecies which are no other than histories of things to come" (p.9). Consequently, it is not surprising that some chapters in the *Observations* are based upon primary sources (the works of people who described the state of the world in which they lived) rather than on the words of the prophets. For instance, Part I Chapter V tells the history of the country of Dacia by referring to documents written at the time by Claudian, Varro or Orosius. Moreover, the way by which these chapters are presented is very close to a historical account. In Chapter V, Newton begins with a geographical description of the country of Dacia; he then gives the name of the different tribes that used to live in that country before presenting the history of each tribe by focusing on their revolts against the Roman Empire. As a historian, Newton tries to order the different events he describes chronologically by referring to dates. Significantly, the only reference to the words of the prophecies can be found at the very end of Chapter V when Newton draws a parallel between the historical events he has just presented and the image composed of iron and clay in Daniel's vision. Thus, the *Observations* are pervaded with history: while some chapters are historical accounts only (Chapter V, VI, VIII, etc.) others mix up actual historical events with references to the Scriptures. Furthermore, the criteria that are used to study history (references to dates and primary sources for instance) are similarly applied to the study of prophetic texts. As has already been suggested, this lays emphasis on Newton's belief that – God being the author of both the Book of Nature and the Book of Law – all fields of knowledge are necessarily interconnected and can therefore make use of

the same method in their interpretation of empirical facts. For that matter, it is interesting to note that Rule 14 lays emphasis on the mathematical concept of proportionality since both the theologian and the historian are expected to take proportions into account in their analysis of empirical facts (law of harmony).

The danger of forcing the prophecies to fit historical interpretations

Yet, the interpreter has to be very cautious when interpreting prophetic figures in relation to history “because there can scarce be any certainty in historical interpretations unless the construction be first determined (Rule 10, p.8). In other words, it is necessary to devise a method relying on the laws of analogy, regularity, simplicity and harmony to decipher the meaning of the prophetic figures and organise the visions methodologically before trying to make the interpretation of the different parts of the prophecies agree with things taken out from history. This implies that: “the Construction of the Apocalypse after it is once determined must be made the rule of interpretations. [...] That must not be strained to fit history but things chosen out of history as are most suitable to that” (Rule 12, p.9). Consequently, Newton was very critical of “false prophets” who based their interpretation of prophetic texts on the excess of their imagination since, by distorting the message God intended the prophecies to retain, they took the risk of “prejudic[ing] men and divert[ing] them from the right understanding of this book” (UT, p.5). Indeed, the relying on one’s imagination rather than on the words of God in the Scriptures can lead to the framing of hypotheses, something which is particularly to be feared in the case of the prophecies as they are supposed to contain the truth of the Christian message and to refer to events that have yet to be fulfilled. Besides, Newton claimed that it was the misinterpretation of original biblical texts that had led to the heresy of the Apostasy given that elements which did not exist in the Greek Scriptures – like the doctrine of Trinity – had been added later on to fit Christian ideology (cf. Newton’s work on *A Historical Account of Two Notable Corruption of the Scripture*). Accordingly, the theologian has to be as meticulous and circumspect as the historian in his analysis of historical events to ensure that he “interpret[s] sacred Prophecies of the most considerable things & actions of those times to which they are applied” (Rule 13, p.9).

Chapter 8 – Predestination and divine providence

It has been shown in the previous chapter that history plays a very important role in Newton's hermeneutic method since the (hi)stories of prophetic figures is said to be a metaphor for the larger history of mankind. But the concept of "retrospective confirmation" Newton applies in his interpretation of prophetic texts (namely that events described in the prophecies have eventually come to be fulfilled) suggests that God already knew the fate of mankind when He gave the prophecies in dreams to Daniel and John. Besides, as God is supposed to be the author of both the Book of Nature and the Book of Law, it may be argued that the reason why the prophecies contain the whole history of mankind is because God is the "Intelligent Being" who planned the way in which history is supposed to be fulfilled when He first created the universe. Indeed, God would not have given the prophecies to men if He expected its content (i.e. history) to change for it would have implied that He can be mistaken in His predictions or that His powers are not strong enough to uphold the fulfilling of history the way He had originally planned it. Thus, religious propositions inferred from the study of the prophetic language say something about God and, more specifically, about God's Providence in His contrivance of the creation.

The influence of Protestantism and Calvinism

In Rule 15 of the *Untitled Treatise*, Newton argues that it is necessary "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" (p.10). The same idea is taken again in Part II Chapter I of the *Observations* when Newton propounds that "there is already so much of the Prophecy fulfilled, that as many as will take pains in this study, may see sufficient instances of God's providence"⁶. The belief in "God's providence" – which was shared by most seventeenth century scientists – reflects the dogmas of the Protestant faith (and more specifically Calvinism) which had become deeply rooted within British society and which emphasised the role of predestination and divine providence in the design of the cosmic machine. According to the Protestant concept of predestination,

⁶ From *The Newton Project* (online resource), hence no pagination

all things that happen on earth and, on a larger scale, in the universe have been foreordained by God at the time of the creation. Put differently, it means that the fate of mankind has already been decided by God and that there is nothing men can do to reverse the situation. Predestination is usually associated with the concept of divine providence which corresponds to God's intervention in the world. As mentioned in the introduction, a spilt occurred between supporters of "special providence" and those in favour of "general providence" even though it is believed that many scientists (like Newton) were in favour of "general providence" (that is to say that God's intervention in the universe is limited to the sustaining of the mechanical laws He promulgated at the time of the creation). Nevertheless, Newton argued that God needs to intervene from time to time to repair the cosmic machine, a belief which led to a fierce debate between Doctor Clarke (most likely supported by Newton) and Leibniz who was very critical of the concept of divine intervention (How can God be the skilful Artificer who created the universe if He needs to mend His own work from time to time?).

Impact of such beliefs on Newton's scientific and theological writings

Both Newton's scientific and theological writings were strongly influenced by the Calvinist concepts of predestination and divine providence. In the *General Scholium*, Newton reminds that "a God without dominion, providence, and final causes, is nothing else but Fate and Nature [...] All that diversity of natural things which we find, suited to different times and places, could arise from nothing but the ideas and will of a Being necessarily existing". In other words, the general law Newton infers from his study of the natural world is that Nature has not been left to work by itself randomly given that the order and harmony that can be found in the design of the cosmic machine prove that it is the work of an Intelligent Being who wanted His creation to be both rational and good. This necessarily implies that the role of each component in the universe (including the role of men) was pre-ordained by its maker, a belief which is in accordance with the Protestant concepts of predestination and divine providence. Incidentally, the inductive method Newton devised and brought to its climax with the publication of the *Principia* was a tool to support that theory; from the experiments to the propositions, everything was used to show that God is the skilful Artificer who created the universe and the mechanical laws that govern it. Similarly, the general law Newton infers from his study of prophetic texts points to God's Providence since the prophecies of Daniel and John are supposed to be the

history of mankind from its beginning to its end (bearing in mind that both Prophets were able to describe events related to the past and future of mankind). For James E. Force, “Newton is vitally concerned with what the language of the prophets means because the prophecies, properly interpreted, illustrated the extent of God’s dominion [providence] over his creation” (pp. 80-81).

Religious justification for the pursuit of scientific truth: God’s Providence

The fact that the general rule Newton infers from his study of both the Book of Nature and the Book of Law is the same is another argument in favour of the influence of Newton’s religion on his science. Indeed, it explains why Newton believed that both science and religion have to be studied side by side: while scientific truth should be the yardstick by which to measure religious truth, religious truth should be the justification for the pursuit of scientific truth. This is explicitly stated in a letter Newton wrote to Doctor Bentley (a cleric) in 1692 in which he acknowledges that his study of the planetary system was motivated by his belief in God’s Providence: “When I wrote my treatise about our System I had an eye upon such Principles as might work with considering men for the belief of a Deity & nothing can rejoice me more than to find it useful for that purpose” (p.1). Significantly, the second charter of the Royal Society drafted in 1663 clearly shows that the desire to reconcile science and religion was shared not just by Newton but by all the members of the Royal Society :“at length the whole world of letters may always recognise us [members of the Royal Society] not only as the Defender of the Faith, but also as the universal lover and patron of every kind of truth” (<http://royalsociety.org/about-us/history/royal-charters/>). As explained previously, this constant intermingling between science and religion is made possible because – God being the author of both the Book of Nature and the Book of Law – Nature and Scriptures are likely to be governed by the same general principles (analogy, simplicity, harmony, rationality, etc.). Thus, it is not surprising that Newton first applied a method of reasoning he would later define as the rule for devising scientific principles to the study of prophetic texts. In the end, theology relies on the study of the prophetic language in the same way than natural philosophy relies on experimentation based upon empirical facts to devise a general rule which, in both cases, points to the same conclusion: “God governs all things, and knows all things that are and can be done” (*General Scholium*). The proposition Newton infers in his pursuit of both

scientific and religious truth is therefore quite simple, in accordance with his definition of God in the *Untitled Treatise* and the *Regulae Philosophandi*.

A general rule depending on the “appearances of things” and the impossibility to know God’s inward substance

The close relationship that exists between the Creator and His creation (that a general rule about God can be devised from the study of Nature and Scriptures) suggests that God’s attributes are reflected in His creation, a theory which is significant with regard to the influence of predestination and divine providence on Newton’s method of reasoning. Indeed, Newton argues in the *General Scholium* that “to discourse of [God] from the appearances of things does certainly belong to Natural Philosophy”. According to H.G. Van Leeuwen, this statement shows the impact of Newton’s religion on his science given that one’s ideas about God are based upon evidence drawn from the appearances of things (what can be observed) and, as God is supposed to be the author of both the Book of Nature and the Book of Law, it explains why the propositions inferred can be expected to be alike in both fields of knowledge. Put differently, Newton’s religious assumptions about God made him look for aspects of the natural world which were most consistent with his definition of the Creator. For instance, experiments with prisms in the *Theory about Light and Colours* and the analysis of the prophetic language in the *Observations* convinced Newton that the universe is simple and rational which, by analogy and under the influence of Protestant beliefs, means that God is pleased with simplicity, harmony, and rationality. However, Newton warns in the *General Scholium* that the “inward substance [of objects] are not to be known [...]; much less then have we any idea of the substance of God. We know him [God] only by his most wise and excellent contrivances of things”. In other words, human knowledge is limited since, on the one hand, there are phenomena in Nature and Scriptures that cannot be understood because of their divine character (their inner working has to remain obscure) and, on the other hand, because there are things that the human mind cannot comprehend. It is for example impossible to know with certainty the manner by which God perceives and understands things or the reasons for His actions (Why does the history of mankind have to be fulfilled in this way?). In fact, the *virtuosi* acknowledged that “man cannot fully penetrate human reason and that God has ends beyond human comprehension” (Westfall, p. 6). This impossibility to know “God’s inward substance” was a way to reconcile the doctrine of divine providence with the mechanical

conception of the universe given that the *virtuosi* could not prove God's wisdom in his design of Nature and Scriptures with a mathematical demonstration. With hindsight, it appears as though this argument was used to prevent the new science from being presented in an unfavourable light, namely as not being able to give satisfactory explanations for the entire functioning of the cosmic machine. However, it has to be remembered that this contradiction was not likely to be a problem at the time given that people could not imagine that God was not "the maker of heaven and earth" (Article 1, *Twelve Articles on Religion*); faith was supposed to be more important than a mathematical demonstration of God's powers. Significantly, Newton was very critical of people who would have liked the certainty of the Scriptures to be proved mathematically: "I could wish they would consider how contrary it is to God's purpose that the truth of his religion should be as obvious and perspicuous to all men as a mathematical demonstration" (Rule 15, UT, p.10). According to him, God had intended the content of the prophecies to remain obscure in order to try men and to discern those who are ready to believe in God's Providence without a proof from those who cannot.

Influence of mechanism in devising the general rule

A last similarity concerning the general rule Newton infers from his study of both science and theology is that his interpretation of the prophecies is imbued with his mechanical conception of the universe, namely that the order of nature can be compared to the working of a machine. Indeed, Newton draws a direct parallel with mechanism in Rule 11 of his hermeneutic method: "Tis true that an Artificer may make an Engin capable of being with equal congruity set together more ways than one [...] but this Objection can have no place in the Apocalypse because God who knew how to frame it without ambiguity intended it for a rule of faith" (p.9). Thus, the study of both the Book of Nature and the Book of Law was expected to support the argument in favour of God's Providence, namely that the organisation of the clock has been pre-ordained by its maker, and it explains why Newton claimed that there can only be one reading of the cosmic machine. On the one hand, the simplicity, harmony and rationality that can be found in the universe through the study of natural philosophy prove that it is the work of a skilful Artificer who created Nature in His image. On the other hand, Newton's theological writings on the prophecies – by drawing analogies between the prophetic language and constituents of the body politic – show that the whole fate of mankind has been decided by God at the time of the creation to be as

regular as clockwork. To put it differently, God's Providence is the ultimate, simple truth binding all fields of knowledge together. However, it has been argued that Newton believed there are phenomena that cannot be comprehended by the human mind because of their divine character. As A.B. Robinson explains it in his introduction to the *Observations*, "Isaac Newton states his belief that these books of prophecy were provided so that, as they are historically fulfilled, they provide a continuing testimony to the fact that the world is governed by the Providence of God. He objected to the use of the prophecies in attempts to predict the future" (p.x-xi). This argument goes in the sense of the beliefs in predestination and divine providence for, as the fate of mankind is supposed to have been pre-ordained by God, human efforts cannot be expected to change the course of history. Consequently, there is no need to try predicting events to come for Newton if it is done in an attempt to alter the future; the role of the theologian is not to act as a fortune-teller (it is worth mentioning however that Newton could not prevent himself from trying to calculate the date of the Apocalypse). Thus, the interpretation of the prophecies is not supposed to help men change the future; it has another purpose.

Chapter 9 – Newton’s millennialism

The purpose of the prophecies is explicitly stated in Newton’s introduction to his hermeneutic method: “[these prophecies were] intended for our use that in the midst of Apostacies we might be able to discern the truth & be established in the faith thereof” (p.2). For James E. Force, “by the 1670s, he [Newton] regards the future prophecies recorded in Revelation to be especially preserved by God for mankind’s instruction” (James E. Force, Richard H. Popkin, p. 81). In other words, Newton believed that God had given the prophecies to posterity so as to guide men and the Church away from idolators, false prophets and usurpers in a time of uncertainty and doubts.

A guide for the interpretation of the Book of Nature and the Book of Law

The obscurity of the prophetic language – being full of allegories – makes its true meaning difficult to grasp, even for the most learned. This is the reason why Newton claimed that interpreters like him were needed to help people make sense of the prophecies; for by devising a method of interpretation based upon scientific concepts and tools, the meaning of the prophetic language would become more certain and easier to comprehend for average Christians. Accordingly, Newton wanted his *Observations* to serve as a guide for the interpretation of prophetic texts; he wanted to prepare the judgement of the reader so that he could know “when an interpretation is genuine & of two interpretations which is the best” (UT, p.4). Significantly, the idea of the *Observations* acting as a guide, a set of principles (each chapter representing one specific proposition) to help the reader understand God’s instruction for mankind can be paralleled to the function of Newton’s scientific writings. Indeed, *The Theory about Light and Colours* or the *Principia* are both sets of principles (or *propositions*) which expose the way by which the mechanical laws governing the cosmic machine function; their aim is therefore to guide the reader in his understanding of God’s creation.

The edification of the Church and the advancement of knowledge

Newton’s theological and scientific writings fulfil the same function: they are guides to help the reader better understand God’s creation. But they also have the same aim: the acknowledgment of God’s Providence in his contrivance of the universe. As argued

previously, Newton believed that the way by which history is supposed to be fulfilled has been decided by God at the time of the creation, meaning that the Apocalypse (the end of time as foretold by the Book of Revelation) is part of God's plan for mankind. Yet, one can wonder why God would destroy His creation if he planned it to be both rational and good. Though Newton does not give a straight answer to that question (God's reasons have to remain obscure to men), he was nonetheless convinced that the Apocalypse would allow God to punish the impenitent Christians ("the wicked") so that He could make a new covenant with the faithful ("the wise") and establish the Church in the truth of His religion. Indeed, "the 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, and setting up a kingdom wherein dwells righteousness" (*Observations*, Part II Chapter 1⁷). However, only a few scattered persons – the most devoted and righteous Christians – would be saved since "the design of [the prophecies] is to try men and convert the best, so that the church may be purer & less mixed with Hypocrites & luke-warm persons" (UT, p.10). For Newton, these faithful Christians would be the ones who would not have contended themselves with the principles of the doctrine of Christ but who would have also searched the Scriptures sincerely and earnestly for the truth of the Christian message. Thus, Newton linked the edification of the true Church with the advancement of knowledge since he claimed that the understanding of the prophecies would increase human knowledge which in its turn, by allowing the wise to have a better understanding of the state of the world, would encourage men to go back to the original faith. A parallel can be drawn here with Newton's science in which the study of the Book of Nature through the lenses of natural philosophy is said to contribute to the advancement of knowledge and the edification of the true philosophy (one in accordance with God's precepts). Similarly, it is interesting to note that Newton lays emphasis on the role of senses in helping the wise understand the meaning of the prophecies. At the beginning of the *Untitled Treatise*, Newton argues that one's senses have to be exercised so as to be able to "discern both good and evil", a capacity of judgement necessary to properly interpret the content of the prophecies. But senses can be deceptive and that is the reason why a method of reasoning is needed to determine the extent to which senses can be relied on and the manner by which what is observed can be interpreted, which is exactly the function Newton's

⁷ From *The Newton Project* (online resource), hence no pagination

Observations try to fulfil. By giving indications about the way by which the prophecies have to be interpreted, Newton wanted his book to help Christians understand God's instruction for mankind so that they may be able to guide the Church in the right direction.

Influence of the social and political context of seventeenth century England: the fear of Catholicism and Popery and the renewal of millennialism

But why would men need to be guided in the future? Once again, the answer is to be found in Newton's introduction to his hermeneutic method: "why should we think he [God] will excuse us for not searching into the prophecies which he hath given us to know Anti-Christ by?" (p. 2). In other words, the prophecies are supposed to be full of indications about the Anti-Christ so that the faithful, God's chosen people, may reject him and save themselves when Christ returns to reign over the New Earth at the beginning of the millennium. The study and understanding of the prophecies was therefore a moral duty for Newton since those who will not have been seduced by the Anti-Christ at Christ's second coming will be able to survive the war between good and evil and therefore contribute to the edification of the true Church. This belief in the second coming of Christ and the defeat of the Anti-Christ has to be set back in the context of the time which was marked by the rampant fear of Catholicism and Popery and the renewal of millennialism. Millennialism is the belief in Christ's return on Earth at the end of the sixth millennium to reign over the Saved Nations for one thousand years before the Day of Judgement. Millennialists claimed that the second coming of Christ would be accompanied by a cataclysmic event (maybe a great conflagration though there were disputes over the subject) to purge the physical world from impenitent Christians and to defeat the Anti-Christ which, in the minds of many people at the time, was associated with the Catholic Church. Indeed, it has to be remembered that seventeenth century England was a Protestant nation which, though divided internally, was clearly opposed to Rome. For Barry Coward, "most Protestants in early Stuart England were fearful for the future of their faith, seeing the world, in the past, present, and future, in terms of a continuing and escalating struggle with Catholicism" (p.82). Contempt for Catholicism and Popery in Protestant England was mostly due to the tensions which existed between Protestants and Catholics at home and abroad. In Europe, the Thirty Years War, the Anglo-Dutch wars and the Revocation of the Edict of Nantes by Louis XIV in France are good examples of the ongoing hostility that existed between Protestants and Catholics at the time. In England, the Stuart monarchs were accused of

promoting a pro-Catholic policy; while King Charles I was criticised for his closeness with French papists, the various Acts King Charles II passed after the Restoration (Act of Uniformity, Conventicle Act, etc.) prevented Dissenters from finding their place in the new restored Church which they accused of being too popish in its persecutions. Moreover, the 1678 Popish Plot revealed by Titus Oates (which was in fact a fake one) and the Succession crisis to bar James of York from accessing to the throne of England contributed to feed anti-Catholic hysteria even more. Thus, the escalating struggle with Catholicism seemed to prove that the ultimate war between good and evil was approaching and it explains why the eventual execution of Charles I in 1649 was seen by many Protestants as a sign of the possible return of Christ on Earth.

Examples of Newton's anti-Catholicism and its implication for his interpretation of the Book of Revelation

When looking at Newton's theological writings, it becomes clear that his religious views were in accordance with the general mindset at the time; according to R. Iliffe, Newton "saved his most venomous invective for Roman Catholicism" (James E. Force, Richard H. Popkin, p. 100). Newton's contempt for the Catholic Church is visible in his *Observations* in which the fourth Beast of Daniel – which "was exceeding dreadful and terrible, and had great iron teeth, and devoured and brake in pieces, and stamped the residue with its feet" (Part I, Chapter IV⁸) – is synchronised with the Roman Empire (the eleventh horn of the fourth Beast being the Church of Rome). In Chapter VII and VIII, Newton describes how the Church of Rome was enriched, "the Pope [...] reckoned superior in dignity to the Kings of the earth", the rituals of the invocation of the dead and veneration of their images introduced, and laws imposed on Western nations by Decrees and Epistles signed by the Pope⁹. Thus, Newton interprets the prophecies as predicting the rise of the Catholic Church and its corruption of the original faith until its eventual downfall at the end of time with the second coming of Christ. Due to the context of anti-Catholic hysteria in which Newton lived, it is not surprising that he considered the study of the prophecies as being of overall importance for the edification of the true Church. Indeed, the events that were taking place in seventeenth century England seemed to suggest that the last age was approaching and

⁸ From *The Newton Project* (online resource), hence no pagination

⁹ Ibid

that is the reason why the understanding of the prophecies was more important than ever since God's instruction would prevent devoted and righteous Christians from being seduced by the Anti-Christ (that is to say the Catholic Church). In order to convince his readers of the necessity to study the prophecies, Newton gives the example of the Jews whom God had punished for failing to recognise the signs of Christ's first coming in the Scriptures: "And in a word it was the ignorance of the Jews in these Prophecies which caused them to reject their Messiah & by consequence to be not only captivated by the Romans but to incur eternal damnation" (UT, p.2). Thus, if God had punished the Jews for not recognising Christ at his first coming, Newton argues that He would not excuse him and his contemporaries for failing to recognise the signs of the Anti-Christ given in the Book of Revelation. Besides, Newton maintains that the successful attempts of contemporary interpreters (like Joseph Mede) at deciphering the prophetic language was another proof that the last age was approaching given that "the prophecies concerning the last times should be closed up & sealed until the time of the end" (UT, p. 1). However, it is important to point out that, while Newton's millennialism was at its peak when he wrote his hermeneutic method in the 1670s, "the old Newton, however, while he still believed in the millennium, no longer expected it to come soon" (James E. Force, Richard H. Popkin, p. 217). Consequently, Newton's *Observations* are less concerned with events to come than Newton's early theological writings were, which explains why the old Newton claimed that commentators must content themselves with the interpretation of events that have already been fulfilled.

Transition

To conclude on this last part, there is no denying that the general law Newton infers from his study of both the Book of Nature and the Book of Law is related to God's Providence in His contrivance of the universe. One of the reasons given for it is that Newton's conception of knowledge was tainted by the religious context in which he lived: the influence of Protestantism, anti-Catholic hysteria and the renewal of millennialism. Once again, it shows that Newton's method of reasoning (How can one have access to the truth?) was deeply influenced by his religious beliefs, supporting the argument according to which Newton's religion shaped his conception of science. That goes in the sense of the thesis defended in this dissertation, namely that the seeds of the inductive method as defined in the *Principia* were already present in Newton's hermeneutic method and early theological writings.

Conclusion

To summarise the content of this dissertation, it has been argued that Newton's early scientific writings and, more significantly, his hermeneutic method (and its subsequent application in the *Observations*) already showed the seeds of Newton's inductive method as defined in the *Principia* first published in 1687. Firstly, the methods Newton applied in his study of both the Book of Nature and the Book of Law aimed to avoid hypotheses & uncertainty by organising the way by which ideas are presented and constructed, a principle central to Newton's method of reasoning in both science and theology. For instance, the structural organisation of Newton's scientific and theological writings is quite similar: firstly, the definitions of the concepts presented; secondly, the proposition; thirdly, the demonstration based upon experimentation on empirical facts; fourthly, the conclusion. Besides, both methods agree on the necessity to rely on empirical facts in devising scientific or religious propositions since only conclusions inferred from the result of experimentation (in the case of science) or the scriptural language (in the case of theology) are considered valid for Newton. According to him, empirical facts are reliable sources for the elaboration of universal principles because, as they are observable phenomena – that is to say that they can be seen, heard, touched, read, etc – their existence cannot be put into question (what you can see necessarily exists). Human senses are therefore of overall importance in Newton's method of reasoning: while scientific propositions are inferred from experimentation on observable phenomena that exist in Nature (the refrangibility of light when passing through a prism for example), religious propositions rely on what can be read in the Scriptures, bearing in mind that the content of the prophecies cannot be refuted as it is supposed to be the direct transcription of God's words. Lastly, both structural organisation and the relying on empirical facts are used to render the interpretation of the Book of Nature and the Book of Law univocal. Indeed, Newton believed that the use of a method would prevent the scientist and the theologian from framing hypotheses which are particularly to be feared since both the study of Nature and Scriptures are supposed to say something about their Creator (namely God). Secondly, it has been shown that Newton applied the same rules for "methodising" the Apocalypse than the ones he later used in his scientific writings. The fact is that there are striking similarities between the rules promulgated in the *Regulae Philosophandi* and those of Newton's hermeneutic method, though the latter was written twenty years earlier. For

instance, one of the laws Newton made use of in both methods was the law of analogy: while drawing analogies between the results of various experiments showing the recurrence of a particular correlation to devise scientific theories, Newton similarly synchronised prophetic figures with their counterparts in the body-politic to reveal the truth of the Christian message. Furthermore, Newton insisted on the necessity to resort to the simplest explanation when studying both the Book of Nature and the Book of Law since “it is the perfection of God’s words that they are all done with the greatest simplicity” (Rule 9, UT, p.8). The law of simplicity was a good mean by which to avoid hypotheses and personal interpretations since both the scientist and the theologian were less likely to be carried away by the fantasies of their imagination when looking for simplicity in God’s design. Lastly, Newton stated that harmony can be found in both Nature and Scriptures and that is the reason why it is necessary to retain textual order, to take proportions into account and to present arguments in a logical order (so that one may be the key to the other, harmony of the structure creating harmony in the sense) in the study of both science and theology. Thirdly, Newton’s interpretation of both the Book of Nature and the Book of Law was influenced by his belief in God’s Providence, a religious doctrine according to which the role of each component in the universe has been foreordained by God at the time of the creation. In fact, the pursuit of religious truth had to be the justification for any philosophical enterprise for Newton as he was convinced that all fields of knowledge – whether it is science, theology or even history – supported the argument in favour of God’s Providence. This means that chance has no role to play in the order of nature, the mechanical laws that govern it, or the history of mankind; God’s Providence is the simple truth that rules the design of the entire cosmic machine. Though this interpretation can seem surprising to our modern minds, this was far from being a problem at the time given that people in the seventeenth century were deeply religious. Incidentally, Newton’s interpretation of both the Book of Nature and the Book of Law was tainted by the religious context of the time – that is to say Protestantism with the beliefs in predestination and divine providence, the fear of Catholicism and Popery, and the influence of millennialism. Besides, by contributing to the advancement of knowledge, both science and religion were supposed to benefit the edification of the Church and the true faith since they aimed to prove that God is a *Pantocrator* and that he is pleased with simplicity, harmony, order and rationality. All these arguments are proofs enough that Newton’s early theological views contributed to the development of the scientific method of reasoning he brought to its

climax with the publication of the *Principia*. But the constant intermingling between Newton's science and religion shows that the relationship was far from being one-sided only. As Mamiani puts it very clearly in his essay on *Newton on prophecy and the Apocalypse*: "It is therefore misleading to ask – as many interpreters have done – what influence Newton's theology had upon his science. In his search for a criterion of the truth, Newton made no distinction between science and theology. It was the same approach that led him to break down the boundaries between mathematics and physics, between geometric optics and philosophy, between matter and spirit" (p.391).

However, Newton's scientific method of reasoning has been questioned by many scholars in the last century, especially with regard to the question of certainty in devising scientific or religious principles. Indeed, it is impossible to ascertain the reliability of the propositions devised with the inductive method and that for several reasons. According to Richard S. Westfall, Newton's inductive method was biased by his belief in a divine intelligence pleased with simplicity, order, and rationality since any set of empirical facts would have led him to conclude that the cosmic machine is the work of such a Being: "Newton imagined design in the existence of a single sun warming the planets; had the numbers been reversed with seven suns warming one planet, he would undoubtedly have perceived the hand of God in that arrangement as well" (Westfall, p. 197). Thus, Newton made analogies between the Creation and the Creator (the Creation reflecting attributes belonging to its Creator) but the latter were not objective as they were influenced by his beliefs about God. This implies that Newton's thinking process and line of investigation were based upon religious assumptions which shaped his interpretation of empirical facts. Consequently, it is not surprising that Newton interpreted the Book of Nature and the Book of Law as being proofs of God's Providence in His contrivance of the universe since his beliefs in predestination and divine providence must have made him look for arguments supporting that theory. This questions the premise according to which the inductive method is based on induction only (that a general law is inferred from the study of empirical facts) given that the scientist's / theologian's assumptions about God most likely influenced their interpretation of empirical facts; accordingly, there is a lot of *deduction* in the *inductive* method! Besides, the existence of pre-suppositions may imply that Newton "chose" the empirical evidence that were most consistent with his theory of a particular phenomenon while discarding exceptions and counter-arguments. Indeed, Newton could argue that his theory about light and colours was in accordance with the results obtained

through experiments with prisms or that his interpretation of the fourth Beasts of Daniel was based upon God's words in the prophecies, but there was no way of being sure that he had not chosen the empirical evidence that most fitted his religious or scientific beliefs. For Ben-Chaim, the problem with the inductive method is that the relying on empirical facts can lead to different, even contradictory interpretations depending on people's assumptions about science and religion and this makes the reliability of scientific and religious propositions difficult to ascertain. In his essay on *Newton's Apocalypse*, Michael Murrin gives several examples of Newton's attempts to force empirical facts to fit his interpretation of the prophecies, therefore leading to contradictions in his hermeneutic method. According to Murrin, Newton got confused – like Joseph Mede before him – with his interpretation of the Dragon and the Beast presented in the second half of the Book of Revelation since he struggled to have it agree with Rule 2 of his hermeneutic method (“to assign but one meaning to one place of scripture”). In Chapter 13, the Dragon summons a beast out of the sea which is described as having “seven heads and ten horns, with ten crowns on its horns. And written on each head were names that blasphemed God. This beast looked like a leopard, but it had the feet of a bear and the mouth of a lion!” (Revelation 13:2). Now, the same beast reappears in Chapter 17 when John sees it in a vision where it is ridden by the whore of Babylon. Based on Newton's hermeneutic method, the two beasts should have the same signification (papal Rome) even though they do not appear in the same vision. However, “since in [Newton's] reading the beast is a kingdom (the Western Roman Empire), derived from the dragon's kingdom (initially the whole Roman Empire), the beast becomes one of the heads of the dragon. Meanwhile, the dragon, once it is limited to the Eastern Roman Empire, becomes one of the beast's horns!” (p.214) In the later version of the *Observations*, Newton eventually dropped these claims and kept the basic analysis which required the image of the Beast and the Dragon so that his hermeneutic method should not be put into question; however, this shows that the simplicity of the inductive method does not admit exceptions to the rule while people's assumptions can lead to irrational interpretations of empirical facts. Yet, this is not the only contradiction that can be found in Newton's hermeneutic method since Murrin also gives the example of the image of the woman with child who flees in the wilderness. Indeed, while commentators distinguished the woman in the wilderness of Chapter 12 from the woman riding the scarlet beast in Chapter 17, Newton identified the two women by claiming that the woman in the wilderness eventually becomes the whore (“For the

glorious woman in heaven [...] continued the same woman in outward form after her flight into the wilderness, whereby she quitted her former sincerity and piety, and became the great Whore”, OP Part II Chapter II¹⁰). In other words, the two women are associated with the Church but they represent different stages in its history, a proposition inconsistent with Rule 2 of Newton’s hermeneutic method. For Murrin, “this reading indicates that despite his early protestations Newton let the external history determine his reading of the text. [...] This reading shows admirably how the early uncorrupted Church became the adulterate medieval church” (p. 216). On top of the influence of assumptions on the interpretation of empirical facts, Newton’s refusal to frame hypotheses in his study of both science and theology resulted in the impossibility to provide satisfactory explanations for all natural and divine phenomena. For Leeuwen, “the conclusions Newton thinks worthy of presentation to the public are only those which are experimentally discoverable and verifiable” (p.109). Consequently, knowledge was limited with Newton’s method of reasoning given that the nature and causes of things necessarily remained obscure: “But to determine more absolutely, what Light is, after what manner refracted, and by what modes or action it produceth in our minds the Phantasms of Colours is not easie. And I shall not mingle conjectures with certainties” (TLC, p.7). The same problem is to be found in his theological writings since Newton admitted that God has ends beyond human comprehension and that there are things which have to remain obscure until God thinks it is time for them to be revealed (like in the case of the prophecies). This can explain why the general rule Newton devised from his study of both the Book of Nature and the Book of Law relied so heavily on God’s Providence; even though the nature and causes of things cannot be explained scientifically, they must necessarily be dependent on the work of a voluntary Agent. In the end, “science [and religion] cannot provide an explanatory account of the real structure of nature but must limit itself to a descriptive account of what is observed to occur” (Leeuwen, p. 120). However, the belief in God’s Providence makes that it is impossible to ascertain that what the scientist or the theologian discovers and considers true of Nature really is so. Indeed, the Calvinist concept of divine providence implies that God has the possibility to intervene in His creation and change the laws that govern it, even though Newton was convinced that God’s actions are in fact limited to the sustaining of the mechanical laws He promulgated and the mending of the cosmic machine.

¹⁰ From *The Newton Project* (online resource), hence no pagination

Nevertheless it implies that God's design (the mechanical laws, history, etc.) can be modified, hence the impossibility to know whether what is true in the present will still be true in the future. Because the inductive method is based on the assumption that God acts as a watchmaker over His creation, it makes the propositions inferred no rule of faith since the empirical facts on which the scientist's or the theologian's conclusions rely on can be tampered by God's special intervention. A last point concerning the problems raised by the inductive method is that the experiments and mathematical demonstrations used to show the reliability of the scientist's interpretation of empirical facts could not make his conclusions a mathematical certainty given that they were too dependent upon deduction. For instance, Newton explains in Rule III of the *Regulae Philosophandi* that: "since the qualities of bodies are only known to us by experiments, we are to hold for universal, all such as universally agree with experiments; and such as are not liable to diminution, can never be quite taken away". In other words, a particular proposition is rendered general by induction even though the demonstration of such proposition has only been tested through a limited number of experiments. It means that scientific principles are ascribed universal qualities of bodies without the scientist being sure that there are not exceptions to the rule. Once again, this shows that the inductive method relies a lot on deduction since the scientist deduces that the conclusion inductively established from experimentation on a set of empirical facts can be ascribed a universal quality of all bodies.

To conclude, the arguments given in this dissertation are proofs enough of the tautological character of the Newtonian method. Indeed, Newton's postulates of simplicity, analogy, and harmony in his study of God's creation necessarily led him to a simple, harmonious and synchronic truth with the result that Newton sometimes needed to "rewrite" the Book of Nature and the Book of Law to make empirical facts appear more consistent with his interpretation of a particular phenomenon. For Manuel, "At the height of his [Newton's] powers there was in him a compelling drive to find order and design in what appeared to be chaos, to distil from a vast, inchoate mass of materials a few basic principles that would embrace the whole and define the relationships of its component parts." (p.103). In the light of what has been said, it can be argued that Newton is a perfect example of the influence of assumptions, and more specifically of aesthetics, on our perception of the world. Indeed, human beings tend to choose a truth which is more consistent with the received standards of aesthetics; we like truth when it is harmonious, hence beautiful. This is exactly what Newton does in his study of both science and

theology since the truth he infers from Nature and Scriptures supports his belief that God is an Intelligent Being pleased with simplicity, analogy and harmony. Thus, knowledge is never objective because it relies on pre-suppositions – whether they are religious, scientific, or cultural – and this is problematic especially in the field of science where certainty is supposed to be the basis of any propounded principle. But as G.A. Rogers argues in his essay on *Newton and the Guaranteeing God*: “Newton, then, was not at all dismayed by the fact that his method of natural philosophy did not lead to the discovery of any necessary truths of nature [...] because the truths in question were the product of a God whose essence we could and did, at least in part, know” (p. 234).

Bibliography

Ben-Chaim, M., 2004. *Experimental Philosophy and the Birth of Empirical Science: Boyle, Locke and Newton*. Aldershot, Burlington: Ashgate.

Coward, B., 2003. *The Stuart Age: England 1603-1714*. London, New York: Pearson Education .

Experiment-resources.com, s.d. "Inductive reasoning". [En ligne]

Available at: <http://www.experiment-resources.com/inductive-reasoning.html>

[Accès le 21 Janvier 2012].

Hutton, S. *The Seven Trumpets and the Seven Vials: Apocalypticism and Christology in Newton's Theological Writings*. From J.E Force, S. H. éd., 2004. *Newton and Newtonianism: New Studies*. Dordrecht: Kluwer Academic Publishers.

I. Bernard Cohen, George E. Smith, 2002. *The Cambridge Companion to Newton*. Cambridge, New-York: Cambridge University Press.

J.E Force, S. H. éd., 2004. *Newton and Newtonianism: New Studies*. Dordrecht: Kluwer Academic Publishers.

James E. Force, Richard H. Popkin, 1990. *Essays on the Context, Nature and Influence of Isaac Newton's Theology*. Dordrecht, Boston, London: Kluwer Academic Publishers.

James E. Force, Richard H. Popkin, 1999. *Newton and Religion: Context, Nature and Influence*. Dordrecht, Boston, London: Kluwer Academic Publishers.

Leeuwen, H. G. V., 1963. *The Problem of Certainty in English Thought 1630-1690*. The Hague, Netherlands: Martinus Nijhoff.

Manuel, F. E., 1974. *The Religion of Isaac Newton*. [En ligne]

Available at: <http://www.scribd.com/doc/33839819/Frank-E-Manuel-1974-The-Religion-of-Isaac-Newton-The-Fremantle-Lectures-1973>

[Accès le 21 Janvier 2012].

Newton, I., 1670s. *Untitled Treatise on Revelation MS1.1*. [En ligne]

Available at: <http://www.newtonproject.sussex.ac.uk/view/texts/normalized/THEM00135>

[Accès le 7 Novembre 2011].

Newton, I., 1671-1672. *A Letter of Mr. Isaac Newton...containing his new Theory about Light and Colours*. [En ligne]

Available at: <http://www.newtonproject.sussex.ac.uk/view/texts/normalized/NATP00006>
[Accès le 22 Octobre 2011].

Newton, I., 1672. *A series of Quere's propounded by Mr. Isaac Newton... positively concluding his new Theory about Light and Colours*. [En ligne]

Available at: <http://www.newtonproject.sussex.ac.uk/view/texts/normalized/NATP00014>
[Accès le 22 Novembre 2011].

Newton, I., 1729. *"General Scholium" from the Mathematical Principles of Natural Philosophy*. [En ligne]

Available at: <http://www.newtonproject.sussex.ac.uk/view/texts/normalized/NATP00056>
[Accès le 25 Octobre 2011].

Newton, I., 1729. *Isaac Newton: The Mathematical Principles of Natural Philosophy*. [En ligne]

Available at: <http://www.fordham.edu/halsall/mod/newton-princ.asp>
[Accès le 21 Décembre 2011].

Newton, I., 1733. *Observations Upon the Prophecies of Daniel and the Apocalypse of St. John*. Oregon Institute of Science and Medicine éd. s.l.:s.n.

Newton, I., 1761. *Four Letters from Sir Isaac Newton to Doctor Bentley Containing Some Arguments in Proof of a Deity*. London: Pall Mall.

Newton, I., 1990. *Principes mathématiques de la philosophie naturelle*. Paris: J.Gabay.

Newton, I., s.d. *Twelve articles on religion*. [En ligne]

Available at: <http://www.newtonproject.sussex.ac.uk/view/texts/normalized/THEM00008>
[Accès le 18 Janvier 2012].

The University of Nottingham, 2010. *Isaac Newton and theology: additional footage with Simon Oliver from the Sixty Symbols video about Newton*. [En ligne]

Available at: http://www.bibledex.com/videos/isaac_newton.html
[Accès le 2011 Novembre].

Westfall, R. S., 1964. *Science and Religion in Seventeenth Century England*. New Haven, London: Yale University Press.

Westfall, R. S., 1970. *Science and Religion in Seventeenth Century England*. s.l.:Archon Books.

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Appendix 1

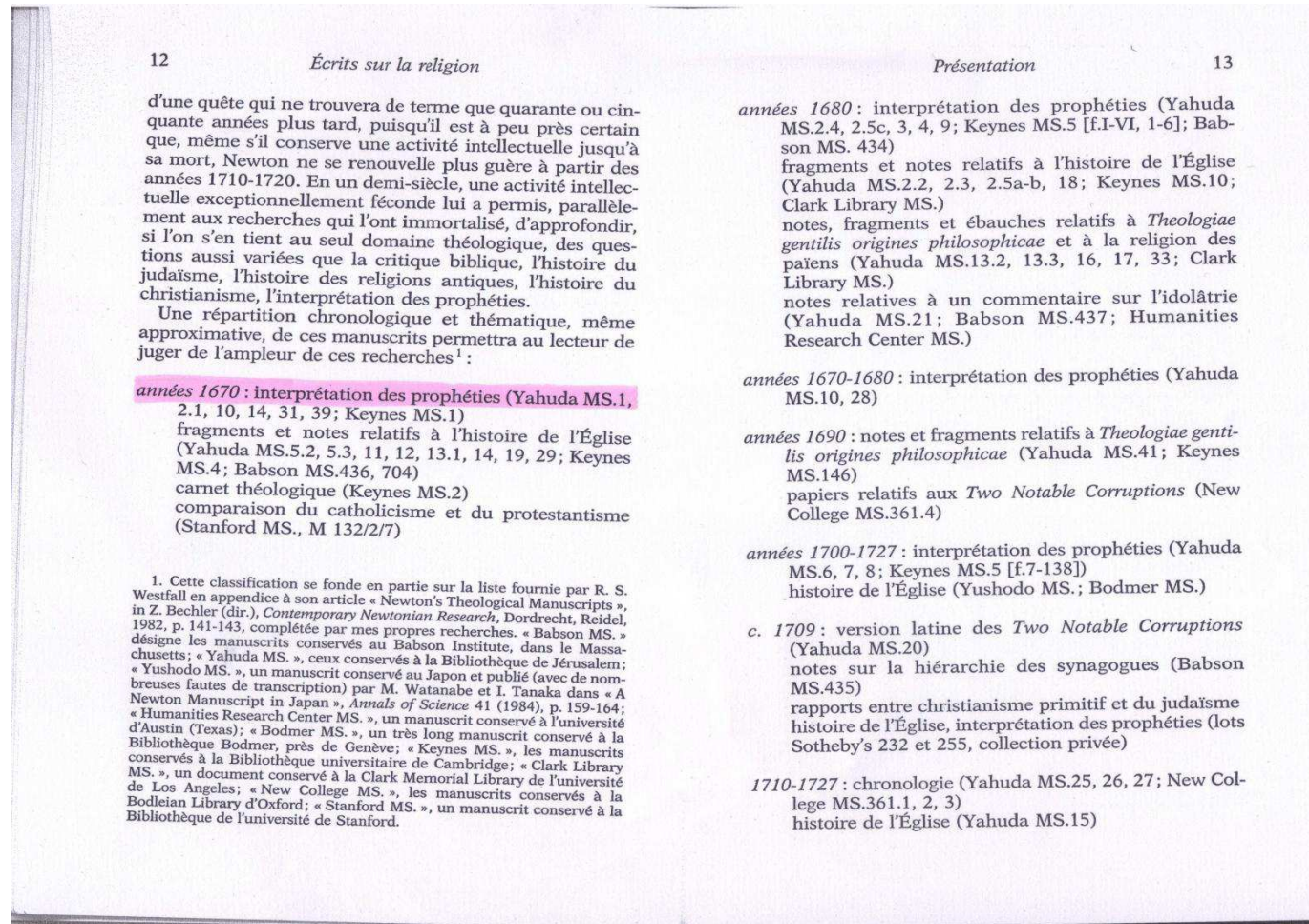
Rules of method: a comparison (Maurizio Mamiani)

The Cambridge Companion to Newton, edited by I. Bernard Cohen & George E. Smith, Cambridge University Press, 2002
 "Newton on prophecy and the Apocalypse" by Maurizio Mamiani, pp. 398-399

Rules of method: a comparison		
Sanderson's <i>Compendium</i>	Rules of the <i>Treatise on Apocalypse</i> (c. 1672)	<i>Regulae Philosophandi</i> (Rules of Reasoning in Philosophy) ³⁴
Law of brevity: "Nothing should be left out or be superfluous in a discipline."	"2. To assigne but one meaning to one place of scripture." "3. To keep as close as may be to the same sense of words."	Rule 1 (1687) "We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances."
Law of harmony: "The individual parts of each doctrine should agree among themselves."	"1. To observe diligently the consent of Scripture." "8. To choose those constructions which ... reduce contemporary visions to the greatest harmony of their parts." "9. To choose those constructions which ... reduce things to the greatest <i>simplicity</i> ."	Comment to Rule 1 "Nature is pleased with simplicity, and affects not the pomp of superfluous causes."
Law of unity or homogeneity: "No doctrine should be taught that is not homogeneous with subject or end."	Rules 4, 6, 7, 10, 12, 14, 15	Rule 2 (1687) "Therefore to the same (<i>eiusdem generis</i>) natural effects we must, as far as possible, assign the same causes."
Law of connection: "The individual parts of a doctrine ought to be connected by opportune transitions."	"5. 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."	Rule 3 (1713) "The qualities of bodies, which admit neither intension nor remission of degrees, and which are found to belong to all bodies within the reach of our experiments, are to be esteemed
	11. To acquiesce in that construction of the Apocalyps as the true one which results most naturally & freely from the characters imprinted ... for insinuating their connexion."	the universal qualities of all bodies whatsoever."
"Induction, by which we make a universal conclusion summoning any experiences."	"[2] If two meanings seem equally probable he is obliged to believe no more then in general the one of them is genuine untill he meet with some motive to prefer one side."	Rule 4 (1726) "In experimental philosophy we are to look upon propositions inferred by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypotheses that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions."

Appendix 2

Chronology of Newton's theological writings - Ecrits sur la religion: Isaac Newton. Présentation et notes de Jean François Baillon. Gallimard, 1996.



Appendix 3

Rules of Reasoning in Philosophy – Modern History Sourcebook: Isaac Newton: *The Mathematical Principles of Natural Philosophy*

RULE I

We are to admit no more causes of natural things, than such as are both true and sufficient to explain their appearances.

To this purpose the philosophers say, that Nature does nothing in vain, and more is in vain, when less will serve; for Nature is pleased with simplicity, and affects not the pomp of superfluous causes.

RULE II

Therefore to the same natural effects we must, as far as possible, assign the same causes.

As to respiration in a man, and in a beast; the descent of stones in Europe and in America; the light of our culinary fire and of the sun; the reflection of light in the earth, and in the planets

RULE III

The qualities of bodies, which admit neither intension nor remission of degrees, and which are found to belong to all bodies within reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever.

For since the qualities of bodies are only known to us by experiments, we are to hold for universal, all such as universally agree with experiments; and such as are not liable to diminution, can never be quite taken away. We are certainly not to relinquish the evidence of experiments for the sake of dreams and vain fictions of our own devising; nor are we to recede from the analogy of Nature, which is wont to be simple, and always consonant to itself. We no other way know the extension of bodies, than by our senses, nor do these reach it in all bodies; but because we perceive extension in all that are sensible, therefore we ascribe it universally to all others, also. That abundance of bodies are hard we learn by experience. And because the hardness of the whole arises from the hardness of the parts, we therefore justly infer the hardness of the undivided particles not only of the bodies we feel but of all others. That all bodies are impenetrable we gather not from reason, but from sensation. The bodies which we handle we find impenetrables and thence conclude impenetrability to be a universal property of all bodies whatsoever. That all bodies are moveable, and endowed with certain powers (which we call the forces of inertia) or persevering in their motion or in their rest, we only infer from the like properties observed in the bodies which we have seen. The extension, hardness, impenetrability, mobility, and force of inertia of the whole result from the extension, hardness, impenetrability, mobility, and forces of inertia of the parts: and thence we conclude that the least particles of all

bodies to be also all extended, and hard, and impenetrable, and moveable, and endowed with their proper forces of inertia. And this is the foundation of all philosophy. Moreover, that the divided but contiguous particles of bodies may be separated from one another, is a matter of observation; and, in the particles that remain undivided, our minds are able to distinguish yet lesser parts, as is mathematically demonstrated. But whether the parts so distinguished, and not yet divided, may, by the powers of nature, be actually divided and separated from one another, we cannot certainly determine. Yet had we the proof of but one experiment, that any undivided particle, in breaking a hard and solid body, suffered a division, we might by virtue of this rule, conclude, that the undivided as well as the divided particles, may be divided and actually separated into infinity.

Lastly, if it universally appears, by experiments and astronomical observations, that all bodies about the earth, gravitate toward the earth; and that in proportion to the quantity of matter which they severally contain; that the moon likewise, according to the quantity of its matter, gravitates toward the earth; that on the other hand our sea gravitates toward the moon; and all the planets mutually one toward another; and the comets in like manner towards the sun; we must, in consequence of this rule, universally allow, that all bodies whatsoever are endowed with a principle of mutual gravitation. For the argument from the appearances concludes with more force for the universal gravitation of all bodies, than for their impenetrability, of which among those in the celestial regions, we have no experiments, nor any manner of observation. Not that I affirm gravity to be essential to all bodies. By their inherent force I mean nothing but their force of inertia. This is immutable. Their gravity is diminished as they recede from the earth.

RULE IV

In experimental philosophy we are to look upon propositions collected by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypotheses that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.

This rule we must follow that the argument of induction may not be evaded by hypotheses.

Isaac Newton, *The Mathematical Principles of Natural Philosophy*, trans. A. Motte (London, 1729). [Capitalization and spelling have been modernized.]

Appendix 4

Untitled Treatise on Revelation (section 1.1) by Isaac Newton. Yahuda MS. 1:

National Library of Israel, Jerusalem. Source: Newton Project

Having searched after knowledge in the prophetique scriptures, I have thought my self bound to communicate it for the benefit of others, remembering the judgment of him who hid his talent in a napkin. For I am perswaded that this will prove of great benefit to those who think it not enough for a sincere Christian to sit down contented with the principles of the doctrin of Christ such as the Apostel accounts the doctrin of Baptisms & of laying on of hands & of the resurrection of the dead & of eternall judgment, but leaving these & the like principles desire to go on unto perfection until they become of full age & by reason of use have their senses exercised to discern both good & evil. Hebr 5.12

I would not have any discouraged by the difficulty & ill success that men have hitherto met with in these attempts. This is nothing but what ought to have been. ffor it was revealed to Daniel that the prophesies concerning the last times should be closed up & sealed untill the time of the end: but then the wise should understand, & knowledg should be increased. Dan 12.4, 9, 10. And therefore the longer they have continued in obscurity, the more hopes there is that the time is at hand in which they are to be made manifest. If they are never to be understood, to what end did God reveale them? Certainly he did it for the edification of the church; & if so, then it is as certain that the church shall at length attain to the understanding thereof. I mean not all that call themselves Christians, but a remnant, a few scattered persons which God hath chosen, such as without being led by interest, education, or humane authorities, can set themselves sincerely & earnestly to search after truth. For as Daniel hath said that the wise shall understand, so he hath said also that none of the wicked shall understand.

Let me therefore beg of thee not to trust to the opinion of any man concerning these things, for so it is great odds but thou shalt be deceived. Much less oughtest thou to rely upon the judgment of the multitude, for so thou shalt certainly be deceived. But search the scriptures thy self & that by frequent reading & constant meditation upon what thou readest, & earnest prayer to God to enlighten thine understanding if thou desirest to find the truth. Which if thou shalt at length attain thou wilt value above all other treasures in the world by reason of the assurance and vigour it will add to thy faith, and stedly satisfaction to thy mind which he onely can know how to estimate who shall experience it.

That the benefit which may accrew by understanding the sacred Prophesies & the danger by neglecting them is very great & that the obligation to study them is as great may appear by considering the like case of the Jews at the coming of Christ. For the rules whereby they were to know their Messiah were the prophesies of the old Testament. And these our Saviour recommended to their consideration in the very beginning of his preaching Luke 4.21: And afterward commanded the study of them for that end saying, Search the scriptures for in them ye think ye have eternall life, and these are they which testify of me: & at another time severely reprov'd their ignorance herein, saying to them when they required a sign, Ye Hypocrites ye can discern the face of the sky but can ye not discern the signes of the times And after his resurrection he reprov'd also this ignorance in his disciples, saying unto them, O fools & slow of heart to beleive all that the Prophets have spoken! Ought not Christ to have suffered these things, & to enter into his glory? And beginning at Moses & all the Prophets he expounded unto them in all the scriptures the things concerning himself. Thus also the Apostles & those who in the first

ages propagated the gospel urged chiefly these Prophecies and exhorted their hearers to search & see whether all things concerning our saviour ought not to have been as they fell out. And in a word it was the ignorance of the Jews in these Prophecies which caused them to reject their Messiah & by consequence to be not onely captivated by the Romans but to incur eternall damnation. Luke 19.42, 44.

If then the Prophecies which concerned the Apostolique age were given for the conversion of the men of that age to the truth & for the establishment of their faith, & if it was their duty to search diligently into those Prophecies: why should we not think that the Prophecies which concern the latter times into which we are fallen were in like manner intended for our use that in the midst of Apostacies we might be able to discern the truth & be established in the faith thereof, & consequently that it is also our duty to search with all diligence into these Prophecies. And If God was so angry with the Jews for not searching more diligently into the Prophecies which he had given them to know Christ by: why should we think he will excuse us for not searching into the Prophecies which he hath given us to know Antichrist by? For certainly it must be as dangerous & as easy an error for Christians to adhere to Antichrist as it was for the Jews to reject Christ. And therefore it is as much our duty to indeavour to be able to know him that we may avoyd him, as it was theirs to know Christ that they might follow him.

Thou seest therefore that this is no idle speculation, no matters of indifferency but a duty of the greatest moment. Wherefore it concerns thee to look about thee narrowly least thou shouldest in so degenerate an age be dangerously seduced & not know it. Antichrist was to seduce the whole Christian world and therefore he may easily seduce thee if thou beest not well prepared to discern him. But if he should not be yet come into the world yet amidst so many religions of which there can be but one true & perhaps none of those that thou art acquainted with it is great odds but thou mayst be deceived & therefore it concerns thee to be very circumspect.

Consider how our Saviour taught the Jews in Parables that in hearing they might hear & not understand & in seeing they might see & not perceive. And as these Parables were spoken to try the Jews so the mysticall scriptures were written to try us. Therefore beware that thou be not found wanting in this tryall. For if thou beest, the obscurity of these scriptures will as little excuse thee as the obscurity of our Saviours Parables excused the Jews. < text from f 3r resumes > Consider also the instructions of our Saviour concerning these latter times by the Parable of the Fig-tree. Now learn a parable of the Figtree, saith he: When his branch is yet tender and putteth forth leaves, ye know that Summer is nigh. So likewise ye when ye see these things know that it is near even at the doors. — Watch therefore for ye know not what hower your Lord doth come. Wherefore it is <4r> thy duty to learn the signes of the times that thou mayst know how to watch, & be able to discern what times are coming on the earth by the things that are already past. If thou doest watch thou mayst know when it is at the door as a man knows by the leaves of a figtree that Somer is nigh. But if through ignorance of the signes thou shalt say in thine heart My Lord delayeth his coming; And shalt begin to smite thy fellow servants & to eat & drink with the drunken: Thy Lord will come in a day when thou lookest not for him & in an hower that thou art not aware of, and cut thee asunder and appoint thy portion with the Hypocrites, There shall be weeping and gnashing of teeth. Matt 24. If thou doest not watch, how canst thou escape more then other men, For as a snare shall it come on all them that dwell upon the face of the whole earth. Luke 21.

Consider that the same Prophets who foretold our saviours first coming foretold also his second coming; & if it was the main & indispensable duty of the Church before the first coming of Christ to have searched into & understood those prophecies aforehand, why should it not be as much the duty of the Church before his second coming to understand the same prophecies aforehand so far as they are yet to be fulfilled? Or how knowest thou that the christian church if

they continue to neglect, shall not be punished even in this world as severely as ever were the Jews? Yea will not the Jews rise up in judgment against us? For they had some regard to these propheties insomuch as to be in generall expectation of our Saviour about that time when he came, onely they were not aware of the manner of his two comings; they understood the description of his second coming, & onely were mistaken in applying that to the time of his first coming. Consider therefore, if the description of his second coming was so much more plain & perspicuous then that of the first, that the Jews who could not so much as perceive any thing of the first could yet understand the second, how shall we escape who understand nothing of the second but have turned the whole description of it into Allegories. And if the Jews were so severely punished for not understanding the more difficult Prophecy, what can we plead who know nothing of the more perspicuous; & yet have this advantage above them that the first which is a key to the second & was hidden from them is made manifest to us, and that we have the second also much further explained in the new Testament. Again consider how the Apostels instructed the Churches of the first age in the knowledg of these latter times 2 Thes 2.5. And if it was the duty of those Christians to understand them which were not to live in them, shall we think that the knowledg thereof is of no concernment to us.

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, then why did God give it? Does he trifle? But if it was necessary for the Church then why doest thou neglect it, or how knowest thou that thou art in the right way, and yet doest not understand it?

Lastly consider the Blessing which is promised to them that read & study & keep the things which are written in this Prophecy. Blessed is he that readeth & they that hear the words of this Prophecy & keep the things which are written therein, for the time is at hand, Rev. 1.3. And again to reinforce the invitation to take these things into consideration, the same Blessing is repeated in Ch 22.7 And does God ever annex his blessings to trifles or things of indifferency? Wherefore be not otherwise in thine own conceit, but as thou desirest to inherit this blessing consider & search into these Scriptures which God hath given to be a guide in these latter times, & be not discouraged by the gainsaying which these things will meet with in the world.

[They will call thee it may be a Bigot, a Fanatique, a Heretique &c: And tell thee of the uncertainty of these interpretations, & vanity of attending to them: Not considering that the propheties concerning our Saviour's first coming were of more difficult interpretation, and yet God rejected the Jews for not attending better to them. And whither they will beleive it or not, there are greater judgments hang over the Christians for their remisness then ever the Jews yet felt. But the world loves to be deceived, they will not understand, they never consider equally, but are wholly led by prejudice, interest, the prais of men, and authority of the Church they live in: as is plain becaus all parties keep close to the Religion they have been brought up in, & yet in all parties there are wise & learned as well as fools & ignorant. There are but few that seek to understand the religion they profess, & those that study for understanding therein, do it rather for worldly ends, or that they may defend it, then to examin whither it be true with a resolution to chose & profess that religion which in their judgment appears the truest. And as is their faith so is their practise. ffor where are the men that do never yeild to anger nor seek revenge, nor disobey governours, nor censure & speak evil of them, nor cheat, nor lye, nor swear, nor use God's name idly in their common talk, nor are proud nor ambitious nor covetous, nor unchast, nor drink immoderately? Where are they that live like the primitive Christians, that love God with all their hearts & with all their soules & with all their might, and their neighbour as their selves; & that in what they do well are not rather led by fashions and principles of Gentility then

religion, & where those disagree do not account it rudeness to depart from the former? I feare there are but very few whose righteousness exceeds the righteousness of the Scribes & Pharisees.

This is the guise of the world, and therefore trust it not, nor value their censures & contempt. But rather consider that it is the wisdom of God that his Church should appear despicable to the world to try the faithfull. For this end he made it a curse under Law to hang upon a tree that the scandal of the Cross might be a tryall to the Iews; & for the like tryall of the Christians he hath suffered the Apostacy of the latter times, as is declared in calling it the hower of temptation which should come upon all the world to try them that dwell upon the earth Rev 3.10. Be not therefore scandalised at the reproaches of the world but rather looke upon them as a mark of the true church.

And when thou art convinced be not ashamed to profess the truth. ffor otherwise thou mayst become a stumbling block to others, & inherit the lot of those Rulers of the Iews who beleived in Christ but yet were afraid to confess him lest they should be put out of the Synagogue. Wherefore when thou art convinced be not ashamed of the truth but profess it openly & indeavour to convince thy Brother also that thou mayst inherit at the resurrection the promis made in Daniel 12.3, that they who turn many to righteousness shall shine as the starrs for ever & ever. And rejoyce if thou art counted worthy to suffer in thy reputation or any other way for the sake of the Gospel, for then great is thy reward.

But yet I would not have thee too forward in becoming a teacher, like those men who catch at a few similitudes & scripture phrases, & for want of further knowledg make use of them to censure & reproach superiours & rail at all things that displeas them. Be not heady like them, but first be thoroughly instructed thy self & that not onely in the prophetique Scriptures but more especially in the plain doctrines delivered therein so as to put them in practise & make them familiar & habituall to thy self. And when thou hast thus pulled out the beam out of thine own eye then shalt thou see clearly to pull out the mote out of thy Brothers eye. Otherwise how wilt thou say to thy Brother, Let me pull out the mote out of thine eye & behold a beam is in thine own eye.

Some I know will be offended that I propound these things so earnestly to all men as if they were fit onely for the contemplation of the learned. But they should consider that God who best knows the capacities of men does hide his mysteries from the wise & prudent of this world and reveal them unto babes. They were not the Scribes & Pharisees but the inferiour people who beleived on Christ & apprehended the true meaning of his Parables & of the Prophetes in the old Testament concerning him. The wise men of the world are often too much prepossessed with their own imaginations & too much intangled in designes for this life. One has bought a piece of ground, another has bought five yoke of Oxen, a third has Married a wife, & therefore since they are for the most part otherwise ingaged it was fit that the poor and the maimed & the halt & the blind & those that are in the high ways & hedges should be also invited. God who intended this Prophecy chiefly for their sakes is able to fit their understandings to it. And it is the gift of God & not of human wisdom so to understand it as to beleive it.

Tis true that without a guide it would be very difficult not onely for them but even for the most learned to understand it right But if the interpretation be done to their hands, I know not why by the help of such a guide they may not by attentive & often reading be capable of understanding & judging of it as well as men of greater education. And such a guide I hope this Book will prove: especially if the judgment of the Reader be prepared by considering well the following Rules for inabling him to know when an interpretation is genuine & of two interpretations which is the best.

It was the judiciously learned & conscientious Mr Mede who first made way into these interpretations, & him I have for the most part followed. ffor 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. His mistakes were chiefly in his Clavis, & had that been perfect, the rest would have fallen in naturally. Whence may be guessed the great uncertainty of others who without any such previous methodising of the Apocalyps have immediately fallen upon giving interpretations. ffor so by taking the liberty to twist the parts of the Prophecy out of their natural order according to their pleasure without having regard to the internall characters whereby they were first to be connected, it might be no very difficult matter amongst the great variety of things in the world to apply them more ways then one to such as should have some show of an interpretation. And yet all that I have seen besides the labours of Mr Mede have been so botched & framed without any due proportion, that I fear some of those Authors did not so much as beleive their own interpretations, which makes me wish that they had been moved to more caution by considering the curs that is annexed to the end of this Prophecy.

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, & out of the holy city & from the things which are written in this book.

For to frame fals interpretations is to prejudice men & divert them from the right understanding of this book And this is a corruption equipollent to the adding or taking from it, since it equally deprives men of the use & benefit thereof. But yet I hope they did it neither out of the vanity of appearing somebody in the world, nor out of designe to promote the externall splendor & felicity of Churches rather then the internall purity which is of infinitely more value, nor out of any other temporal ends, but with an upright heart that God may not lay it to their charge

Yet I could wish that those who make all to be long since past, even in the Apostels age, had considered that when according to them this Prophecy should have been usefull to the Church, their interpretations were not so much as thought upon. All sacred Prophecies are given for the use of the Church, & therefore they are all to be understood by the Church in those ages for whose use God intended them. But these prophecies were never understood by the Church in the former ages: They did not so much as pretend to understand them, nor thought that they concerned their times, but with one universall consent delivered down to posterity the famous Tradition of the Antichrist described therein to come in the latter ages. And therefore since they were never yet understood, & God cannot be disappointed, we must acknowledg that they were written & shall prove for the benefit of the present & future ages, & so are not yet fulfilled. Wherefore let men be carefull how they indeavour to divert or hinder the use of these scriptures, least they be found to fight against God.

Considering therefore the great concernment of these scriptures & danger of erring in their interpretation, it concerns us to proceed with all circumspection. And for that end I shall make use of this Method.

First I shall lay down certain general Rules of Interpretation, the consideration of which may prepare the judgment of the Reader & inable him to know when an interpretation is genuine & of two interpretations which is the best.

Secondly, To prepare the Reader also for understanding the Prophetique language I shall lay down a short description thereof, showing how it is borrowed from comparing a kingdom either to the Vnivers or to a Beast: So that by the resemblance of their parts the signification of the figurative words & expressions in these Prophecies may be apprehended at one view & limited from the grownd thereof. By which means the Language of the Prophets will become certain & the liberty of wresting it to private imaginations be cut of. The heads to which I reduce these words I call Definitions.

Thirdly, These things being premised, I compare the parts of the Apocalyps one with another & digest them into order by those internal characters which the Holy-ghost hath for this end imprest upon them. And this I do by drawing up the substance of the Prophecy into Propositions, & subjoyning the reasons for the truth of every Proposition.

And here I cannot but loudly proclaim the admirable & more then humane wisdom that shines in the contexture of this Prophecy & its accurate consent with all other prophesies of the old & new Testament.

Fourthly,

Rules for interpreting the words & language in Scripture.

1. To observe diligently the consent of Scriptures & analogy of the prophetique stile, and to reject those interpretations where this is not duely observed. Thus if any man interpret a Beast to signify some great vice, this is to be rejected as his private imagination becaus according to the stile and tenour of the Apocalyps & of all other Prophetique scriptures a Beast signifies a body politique & sometimes a single person which heads that body, & there is no ground in scripture for any other interpretation. 2. To assigne but one meaning to one place of scripture; unless it be perhaps by way of conjecture, or where the literal sense is designed to hide the more noble mystical sense as a shell the kernel from being tasted either by unworthy persons, or untill such time as God shall think fit. In this case there may be for a blind, a true literal sense, even such as in its way may be beneficial to the church. But when we have the principal meaning: If it be mystical we can insist on a true literal sense no farther then by history or arguments drawn from circumstances it appears to be true: if literal, though there may be also a by mystical sense yet we can scarce be sure there is one without some further arguments for it then a bare analogy. Much more are we to be cautious in giving a double mystical sense. There may be a double one, as where the heads of the Beast signify both mountains & Kings Apoc 17.9, 10. But without divine authority or at least some further argument then the analogy and resemblance & similitude of things, we cannot be sure that the Prophecy looks more ways then one. Too much liberty in this kind savours of a luxuriant ungovernable fansy and borders on enthusiasm. < text from the right margin resumes >

3. To keep as close as may be to the same sense of words especially in the same Vision and to prefer those interpretations where this is most observed unles any circumstance plainly require a different signification. < text from f 12r resumes > to prefer those interpretations where this is best observed. Thus if a man interpret the Beast to signify a kingdom in one sentence & a vice in another when there is nothing in the text that does argue any change of , sense, this is to be rejected as no genuine interpretation. So if a man in the same or contemporary visions where the earth & sea or the earth & waters stand related to one another shall interpret the earth to signify sometimes the dition of a Kingdom as in the first Trumpet in chap 12 where the Dragon came down to the inhabitants of the earth & sea, , sometimes Councils as where the Earth helped the woman, & sometimes onely a low estate as where the Dragon was cast into the earth or the two hornd Beast rose out of the earth this wavering is not readily to be acquiesced in but such an interpretation to be indeavoured after as retains the same signification of Earth in all cases. vers. pag. So in the vision of the whore chap 17 & 18, to take the Kings of the earth over which the woman or great city reigned chap 17.18 for any other then the kings of the earth which committed fornication with her ch 17.2 & 18.3, 9 and lamented her fall ch 18.9, 10 that is for any other then the 10 Kings or horns of the Beast she reigned over, is not congruous. So in the vision of the whore chap. 17 & 18 to take Kings of the Earth in one sence chap 17.2 and ch 18.3, 9 & in another ch 17.18 is not harmonious.

4. To chose those interpretations which are most according to the litterall meaning of the scriptures unles where the tenour & circumstances of the place plainly require an Allegory. Thus if the wound by a sword should be interpreted of a spirituall wound, or if the battel at the seventh Trumpet & vial exprest by the concours of Armies, & by a hail-storm with other meteors should be in interpreted of a spiritual Battel; since there is nothing in the text to countenance such an interpretation, it ought to be rejected as a phantasy, Where note 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. As 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 as any national language is amongst the people of that nation.

5. 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. For if this be not the true sense, then is the true sense uncertain, & no man can attain to any certainty in the knowledg of it. Which is to make the scriptures no certain rule of faith, & so to reflect upon the spirit of God who dictated it.

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 trust in his own imaginations or in that human authority then in the Scripture . And therefore the opinion of such men how numerous soever they be, is not to be regarded. Hence it is & not from any reall uncertainty in the Scripture that Commentators have so distorted it; And this hath been the door through which all Heresies have crept in & turned out the ancient faith.

Rules for methodising | construing the Apocalyps.

Rule 5B. To prefer those interpretations which, cæteris paribus, are of the most considerable things. ffor it was Gods designe in these prophesies to typify & describe not trifles but the most considerable things in the world during the time of the Prophesies. Thus were the question put whether the three froggs, the head or horn of any Beast, the whore of Babylon, the woman Iezabel, the ffals Prophet, the Prophet Balaam, the King Balac, the martyr Antipas, the two witnesses, the woman cloathed with the Sun the Manchild her Son, the Eagle proclaiming Wo & the like were to be interpreted of single persons or of kingdoms Churches & other great bodies of men: I should by this Rule prefer the latter, unless perhaps in any case the single person propounded might be of more note & moment then the whole body of men he stands in competition with, or some other material circumstance might make more for a single person then a multitude.

6. To make the parts of a vision succeed one another according to the order of the narration without any breach or interfering unless when there are manifest indications of such a breach or interfering. For if the order of its parts might be varied or interrupted at pleasure, it would be of no certain interpretation, which is to elude it and make it no prophesie but an ambiguitie like those of the heathen Oracles.

7. In collaterall visions to adjust the most notable parts & periods to one another: And if they be not throughout collaterall, to make the beginning or end of one vision fall in with some notable period of the other. For the visions are duely proportioned to the actions & changes of the times which they respect by the following Rule and therefore they are duely proportioned to one another. (2) But yet this Rule is not over strictly to be adhered to when the visions respect divers kingdoms or one vision respects the Church & another the state . (1) An instance of this you have in suiting the Dragon to all the seals the Beast to all the Trumpets and the Whore to the Wo Trumpets.

8. To choose those constructions which without straining reduce contemporary visions to the greatest harmony of their parts. I mean not onely in their proportions as in the precedent rule, but also in their other qualities, principally so as to make them respect the same actions For the design of collaterall visions is to be a key to one another & therefore the way to unlock them without straining must be fitting one to the other with all diligence & curiosity. {This} is true {opening} scripture by scripture. An instance of this you have in the comparison of the Dragon's history with the seales & Trumpets in Prop, & of the Trumpets with the Vials, in Prop &c

9. To choose those constructions which without straining reduce things to the greatest simplicity. The reason of this is manifest by the precedent Rule. Truth is ever to be found in simplicity, & not in the multiplicity & confusion of things. 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 God's works that they are all done with the greatest simplicity. He is the God of order & not of confusion. And therefore as they that would understand the frame of the world must indeavour to reduce their knowledg to all possible simplicity, so it must be in seeking to understand these visions. And they that shall do otherwise do not onely make sure never to understand them, but derogate from the perfection of the prophesy; & make it suspicious also that their designe is not to understand it but to shuffle it of & confound the understandings of men by making it intricate & confused.

10. In construing the Apocalyps to have little or no regard to arguments drawn from events of things; because there can scarce be any certainty in historicall interpretations unless the construction be first determined.

11. To acquiesce in that construction of the Apocalyps as the true one which results most naturally & freely from the characters imprinted by the holy ghost on the severall parts thereof for insinuating their connexion, & from the observation of the precedent rules. The reason of this is the same with that of the fift rule.

Hence if any man shall contend that my Construction of the Apocalyps is uncertain, upon pretence that it may be possible to find out other ways, he is not to be regarded unless he shall show wherein what I have done may be mended. If the way which he contends for be less natural or grounded upon weaker reasons, that very thing is demonstration enough that they are fals, & that he seeks not truth but the interest of a party. And if the way which I have followed be according to the nature & genius of the Prophecy there needs no other demonstration to convince

it. For as of an Engin made by an excellent Artificer a man readily beleives that the parts are right set together when he sees them joyn truly with one another notwithstanding that they may be strained into another posture; & as a man acquiesces in the meaning of an Author how intricate so ever when he sees the words construed or set in order according to the laws of Grammar, notwithstanding that there may be a possibility of forceing the words to some other harsher construction: so a man ought with equal reason to acquiesce in the construction of these Prophecies when he sees their parts set in order according to their suitableness & the characters imprinted in them for that purpose

Tis true that an Artificer may make an Engin capable of being with equal congruity set together more ways then one, & that a sentence may be ambiguous: but this Objection can have no place in the Apocalyps, becaus God who knew how to frame it without ambiguity intended it for a rule of faith.

But it is needless to urge with this general reasoning the Construction which I have composed, since the reasons wherewith I have there proved every particular are of that evidence that they cannot but move the assent of any humble and indifferent person that shall with sufficient attention peruse them & cordially beleives the scriptures. Yet I would not have this so understood as to hinder the further search of other persons. I suspect there are still more mysteries to be discovered. And as Mr Mede layed the foundation & I have built upon it: so I hope others will proceed higher untill the work be finished.

Rules for interpreting the Apocalyps.

12. The Construction of the Apocalyps after it is once determined must be made the rule of interpretations; And all interpretations rejected which agree not with it. That must not be strained to fit history but such things chosen out of history as are most suitable to that.

13. To interpret sacred Prophecies of the most considerable things & actions of those times to which they are applied. For if it would be weakness in an Historian whilst he writes of obscurer actions to let slip the greater, much less ought this to be supposed in the holy Prophecies which are no other then histories of things to come.

14. To proportion the most notable parts of Prophecy to the most notable parts of history, & the breaches made in a continued series of Prophecy to the changes made in history And to reject those interpretations where the parts and breaches of Prophecy do not thus bear a due proportion to the parts & changes in History. For if Historians divide their histories into Sections Chapters & Books at such periods of time where the less, greater & greatest revolutions begin or end; & to do otherwise would be improper: much more ought we to suppose that the holy Ghost observes this rule accurately in his prophetick dictates, since they are no other then histories of things to come. Thus by the great breaches made between the sixt & seventh seal by interposing the vision of the sealed saints, & between the sixt & seventh Trumpet by interposing the vision of the little book, that prophesy is divided into three cardinal parts, & the middle part subdivided by the little breach between the fourth & fift Trumpet made by interposition of the Angel crying Wo, & all the other seals & trumpets are as it were less sections. And therefore to these breaches & sections, according to the rule, must be adapted periods of time which intercede & disterminate proportional revolutions of history. Again if a Historian should use no proportion in his descriptions but magnify a less thing above a greater or attribute the more courage to the softer of two persons &c.: we should count it an argument of his unskilfulness. And therefore since the dictates of the Holy-Ghost are histories of things to come, such disproportions are not to be

allowed in them. Thus in Daniel's vision of the four Beasts, it would be grossly absurd to interpret, as some Politicians of late have done, the fourth Beast of Antiochus Epiphanes & his successors; since that is described to be the most terrible, dreadful, strong, & warlike Beast of all the four, & the Prophet dwells far longer upon the description of that than of all the others put together: whereas the kingdom of Antiochus Epiphanes & his successors was both less & weaker & less warlike than any of the three before him.

15. 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. As he that would interpret the letters or actions of a very wise states man, so as thence to know the council wherewith they are guided & the designes he is driving on, must consider the main end to which they are directed & suppose they are such as most conduce to that end & argue the greatest wisdom & providence of the States-man in ordering them: so it is in these Prophecies. They are the counsels of God & so the most wise, & fittest for the end to which they are designed: And that end 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, as they that will consider them may easily perceive. Hence may appear the oversight of some interpreters whose interpretations if they were true would make the Apocalyps of little or no concernment to the Church. Perhaps what follows may be better inserted in the preface.

Yet I meane not that these Prophecies were intended to convert the whole world to the truth. For God is just as well as merciful, & punishes wickednes by hardening the wicked & visiting the sins of the fathers upon the children. But 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. And for this end it is that they are wrapt up in obscurity, & so framed by the wisdom of God that 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 or other prejudices, & all they who, of how pregnant natural parts soever they be, yet cannot discern the wisdom of God in the contrivance of the creation: that these men whose hearts are thus hardned in seeing should see & not perceive & in hearing should heare & not understand. For God has declared his intention in these prophecies to be as well that none of the wicked should understand as that the wise should understand, Dan: 12.

And hence I cannot but on this occasion reprove the blindness of a sort of men who although they have neither better nor other grounds for their faith then the Scribes & Pharisees had for their Traditions, yet are so pervers as to call upon other men for such a demonstration of the certainty of faith in the scriptures that a meer naturall man, how wicked soever, who will but read it, may judg of it & perceive the strength of it with as much perspicuity & certainty as he can a demonstration in Euclide. Are not these men like the Scribes & Pharisees who would not attend to the law & the Prophets but required a signe of Christ? Wherefore if Christ thought it just to deny a signe to that wicked & adulterate generation notwithstanding that they were God's own people, & the Catholique Church; much more may God think it just that this generation should be permitted to dy in their sins, who do not onely like the Scribes neglect but trample upon the law and the Prophets, & endeavour by all possible means to destroy the faith which men have in them, & to make them disregarded. I could wish they would consider how contrary it is to God's purpose that the truth of his religion should be as obvious & perspicuous to all men as a mathematical demonstration. Tis enough that it is able to move the assent of those which he hath chosen; & for the rest who are so incredulous, it is just that they should be permitted to dy in their sins. Here then is the wisdom of God, that he hath so framed the Scriptures as to discern between the good and the bad, that they should be demonstration to the one & foolishness to the other.

And from this consideration may also appear the vanity of those men who regard the splendor of churches & measure them by the external form & constitution. Whereas it is more agreeable to God's designe that his church appear contemptible & scandalous to the world to try men. For this end doubtles he suffered the many revoltings of the Iewish Church under the Law, & for the same end was the grand Apostacy to happen under the gospel. Rev. If thou relyest upon the externall form of churches, the Learning of Scholars, the wisdom of statemen or of other men of Education; consider with thy self whither thou wouldest not have adhered to the scribes & Pharisees hadst thou lived in their days, & if this be thy case, then is it no better then theirs, & God may judg thee accordingly, unless thou chance to be on the right side, which as tis great odds may prove otherwise so if it should happen yet it would scarce excuse thy folly although it might something mitigate it.

The Proof.

Now although these interpretations by their analogy with one another & resemblance to the things signified, may seem plain enough, yet that nothing be wanting to establish them, I shall further show 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. For since these nations anciently bordering upon the Hebrews, had great affinity with them both in language & manners, & therefore we scruple not to learn from them the use of words & phrases in translating the scriptures, 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. For the Prophets without doubt spake in a dialect then commonly known to the more understanding sort of men, & 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. Wherefore next 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 I proceed on these grounds to the proof of the interpretations.

Appendix 5

“General Scholium” from the *Mathematical Principles of Natural Philosophy* (Volume 2, 1729)

The hypothesis of Vortices is press'd with many difficulties. That every Planet by a radius drawn to the Sun may describe areas proportional to the times of description, the periodic times of the several parts of the Vortices should observe the duplicate proportion of their distances from the Sun. But that the periodic times of the Planets may obtain the sesquuplicate proportion of their distances from the Sun, the periodic times of the parts of the Vortex ought to be in the sesquuplicate proportion of their distances. That the smaller Vortices may maintain their lesser revolutions about Saturn, Jupiter, and other Planets, and swim quietly and undisturb'd in the greater Vortex of the Sun, the periodic times of the parts of the Sun's Vortex should be equal. But the rotation of the Sun and Planets about their axes, which ought to correspond with the motions of their Vortices, recede far from all these proportions. The motions of the Comets are exceeding regular, are govern'd by the same laws with the motions of the Planets, and can by no means be accounted for by the hypothesis of Vortices. For Comets are carry'd with very eccentric motions through all parts of the heavens indifferently, with a freedom that is incompatible with the notion of a Vortex.

Bodies, projected in our air, suffer no resistance but from the air. Withdraw the air, as is done in Mr. Boyle's vacuum, and the resistance ceases. For in this void a bit of fine down and a piece of solid gold descend with equal velocity. And the parity of reason must take place in the celestial spaces above the Earth's atmosphere; in which spaces, where there is no air to resist their motions, all bodies will move with the greatest freedom; and the Planets and Comets will constantly pursue their revolutions in orbits given in kind and position, according to the laws above explain'd. But though these bodies may indeed persevere in their orbits by the mere laws of gravity, yet they could by no means have at first deriv'd the regular position of the orbits themselves from those laws

The six primary Planets are revolv'd about the Sun, in circles concentric with the Sun, and with motions directed towards the same parts and almost in the same plane. Ten Moons are revolv'd about the Earth, Jupiter and Saturn, in circles concentric with them, with the same direction of motion, and nearly in the planes of the orbits of those Planets. But it is not to be conceived that mere mechanical causes could give birth to so many regular motions: since the Comets range over all parts of the heavens, in very eccentric orbits. For by that kind of motion they pass easily through the orbs of the Planets, and with great rapidity; and in their aphelions, where they move the slowest, and are detain'd the longest, they recede to the greatest distances from each other, and thence suffer the least disturbance from their mutual attractions. 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 <389> 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 one from another.

This Being governs all things, not as the soul of the world, but as Lord over all: And on account of his dominion he is wont to be called Lord God παντοκράτωρ or Universal Ruler. For God is a relative word, and has a respect to servants; and Deity is the dominion of God, not over his own body, as those imagine who fancy God to be the soul of the world, but over servants. The supreme God is a Being eternal, infinite, absolutely perfect; but a being, however perfect, without dominion, cannot be said to be Lord God; for we say, my God, your God, the God of Israel, the God of Gods, and Lord of Lords; but we do not say, my Eternal, your Eternal, the Eternal of Israel, the Eternal of Gods; we do not say, my Infinite, or my Perfect: These are titles which have no respect to servants. The word God usually [1] signifies Lord; but every lord is not a God. It is the dominion of a spiritual being which constitutes a God; a true, supreme or imaginary dominion makes a true, supreme or imaginary God. And from his true dominion it follows, that the true God is a Living, Intelligent and Powerful Being; and from his other perfections, that he is Supreme or most Perfect. He is Eternal and Infinite, Omnipotent and Omniscient; that is, his duration reaches from Eternity to Eternity; his <390> presence from Infinity to Infinity; he governs all things, and knows all things that are or can be done. He is not Eternity or Infinity, but Eternal and Infinite; he is not Duration or Space, but he endures and is present. He endures for ever, and is every where present; and by existing always and every where, he constitutes Duration and Space. Since every particle of Space is always, and every indivisible moment of Duration is every where, certainly the Maker and Lord of all things cannot be never and no where. Every soul that has perception is, though in different times and in different organs of sense and motion, still the same indivisible person. There are given successive parts in duration, co-existent parts in space, but neither the one nor the other in the person of a man, or his thinking principle; and much less can they be found in the thinking substance of God. Every man, so far as he is a thing that has perception, is one and the same man during his whole life, in all and each of his organs of sense. God is the same God, always and every where. He is omnipresent, not virtually only, but also substantially; for virtue cannot subsist without substance. In him [2] are all things contained and moved; yet neither affects the other: God suffers nothing from the motion of bodies; bodies find no resistance from the omnipresence of God. 'Tis allowed by all that the supreme God exists necessarily; and by the same necessity he exists <391> always and every where. Whence also he is all similar, all eye, all ear, all brain, all arm, all power to perceive, to understand, and to act; but in a manner not at all human, in a manner not at all corporeal, in a manner utterly unknown to us. As a blind man has no idea of colours, so have we no idea of the manner by which the all-wise God perceives and understands all things. He is utterly void of all body and bodily figure, and can therefore neither be seen, nor heard, nor touched; nor ought to be worshipped under the representation of any corporeal thing. We have ideas of his attributes, but what the real substance of any thing is, we know not. In bodies we see only their figures and colours, we hear only the sounds, we touch only their outward surfaces, we smell only the smells, and taste the favours; but their inward substances are not to be known, either by our senses, or by any reflex act of our minds; much less then have we any idea of the substance of God. We know him only by his most wise and excellent contrivances of things, and final causes; we admire him for his perfections; but we reverence and adore him on account of his dominion. For we adore him as his servants; and a God without dominion, providence, and final causes, is nothing else but Fate and Nature. Blind metaphysical necessity, which is certainly the same always

and every where, could produce no variety of things. All that diversity of natural things which we find, suited to different times and places, could arise from nothing but the ideas and will of a Being necessarily existing. 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. And thus much concerning God; to dis <392> course of whom from the appearances of things, does certainly belong to Natural Philosophy.

Hitherto we have explain'd the phænomena of the heavens and of our sea, by the power of Gravity, but have not yet assign'd the cause of this power. This is certain, that it must proceed from a cause that penetrates to the very centers of the Sun and Planets, without suffering the least diminution of its force; that operates, not according to the quantity of the surfaces of the particles upon which it acts, (as mechanical causes use to do,) but according to the quantity of the solid matter which they contain, and propogates its virtue on all sides, to immense distances, decreasing always in the duplicate proportion of the distances. Gravitation towards the Sun, is made up out of the gravitations towards the several particles of which the body of the Sun is compos'd; and in receding from the Sun, decreases accurately in the duplicate proportion of the distances, as far as the orb of Saturn, as evidently appears from the quiescence of the aphelions of the Comets, if those aphelions are also quiescent. But hitherto I have not been able to discover the cause of those properties of gravity from phænomena, and I frame no hypothesis. For whatever is not deduc'd from the phænomena, is to be called an hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy. In this philosophy particular propositions are inferr'd from the phænomena, and afterwards render'd general by induction. Thus it was that the impenetrability, the mobility, and the impulsive force of bodies, and the laws of motion and of gravitation, were discovered. And to us it is enough, that gravity does really exist, and act according to laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea.

And now we might add something concerning a certain most subtle Spirit, which pervades and lies hid in all gross bodies; by the force and action of which Spirit, the particles of bodies mutually attract one another at near distances, and cohere, if contiguous; and electric bodies operate to greater distances, as well repelling as attracting the neighbouring corpuscles; and light is emitted, reflected, refracted, inflected, and heats bodies; and all sensation is excited, and the members of animal bodies move at the command of the will, namely, by the vibrations of this Spirit, mutually propogated along the solid filaments of the nerves, from the outward organs of sense to the brain, and from the brain into the muscles. But these are things that cannot be explain'd in few words, nor are we furnish'd with that sufficiency of experiments which is required to an accurate determination and demonstration of the laws by which this electric and elastic spirit operates.

Acronyms and abbreviations used

OP: Newton, I. *Observations Upon the Prophecies of Daniel and the Apocalypse of Saint-John* (1733).

Principia: Newton, I. *Mathematical Principles of Natural Philosophy* (1687).

RP: *Regulae Philosophandi* as published in the third volume of Newton's *Principia*.

TLC: Newton, I. *Theory about Light and Colours* (1671-1672).

UT: Newton, I. *Untitled Treatise on Revelation MS.1*(1670s).

Some quotes from the *Observations Upon the Prophecies* are not referenced (no pagination) because I sometimes had to use the online resource available at *The Newton Project* rather than the hardcover book. Indeed, the book being only available by request at the library (it is stored in a restricted area due to construction work), it was at times much easier for me to use the online resource.

Similarly, quotes from the *General Scholium* are not referenced given that I used the online resource, the book being not available at the library.

Glossary

- Apocalypse: The end of time as described in the Book of Revelation. According to the *New Encyclopedia Britannica*, the Apocalypse refers to “a sudden, dramatic, cataclysmic event intervention of God in history; the judgement of all men; the salvation of the faithful elect; and the eventual rule of the elect with God in a renewed heaven and earth” (p.482, Volume I).
- Empiricism: Method of investigation in which scientific conclusions can only be drawn from evidence obtained through experimentation on empirical facts, that is to say phenomena observable in nature. In empirical science, the origin of knowledge comes from sensory experiences.
- Inductive method: Scientific method of reasoning in which general laws about how things work are *inferred* from observation and experimentation on empirical facts. Because the inductive method is based on *induction* rather than on *deduction*, it is supposed to prevent scientific propositions from relying on hypotheses which cannot be sustained empirically.
- Mechanism: Also known as the clockwork universe theory, mechanism is the doctrine that holds that the order of nature (and of the universe as a whole) is comparable to the working of a machine or engine governed by fixed mechanical laws. This implies that nature is made of inert matter since each part of the machine performs its function without being conscious of it.
- Millennium: “In Christian theology, the 1,000 year period when Jesus Christ will return and establish his kingdom on Earth. According to the account of the Book of Revelation, Satan was bound and thrown into a pit for 1,000 years. Martyrs were resurrected and reigned with Christ for the millennium. At the end of the period, Satan was loosened for a time to deceive the nations but he was subsequently defeated. All the dead were then gathered for the final judgement” (*New Encyclopedia Britannica*, Volume 8, p.133).

- Natural Philosophy: “The task of natural philosophy, therefore, is to account for all natural phenomena by describing the motions and changes of motion in which they consist, and exhibiting those processes of motion and change of motion as consequences of such fundamental principles [mechanical principles]” (I. Bernard Cohen, George E. Smith, p. 257).
- Predestination: Calvinist belief according to which the role of each component in the universe has been pre-ordained by God at the time of the creation. This implies that men have no control over their lives (the fate of every individual is decided before his birth) and that human efforts and good deeds accomplished on earth are useless in changing God’s plan for the human race.
- Providence: God’s intervention in the universe. In the 17th century, a split occurred between the supporters of “general providence” and “special providence”. While supporters of “general providence” argued that God’s intervention in the physical world is limited to the original act of creation and the upholding of the mechanical laws He promulgated, those in favour of “special providence” claimed that God can transcend and reverse the order of nature at will by altering the course of events.

Résumé / Synopsis

Ce mémoire se penche sur les travaux scientifiques et théologiques d'Isaac Newton (physicien et mathématicien anglais du 17^{ème} siècle) et a pour ambition de montrer comment ses convictions religieuses et points de vue théologiques ont conditionné sa vision de la science. Il s'inscrit donc dans la lignée des travaux les plus récents sur Newton qui supportent la thèse en faveur de l'unité de la pensée newtonienne. En effet, la nouvelle génération d'intellectuels (M. Mamiani, S. Hutton, J.E Force) a souhaité mettre l'accent sur le fait que, bien qu'on ne puisse nier l'influence de l'esprit scientifique de Newton sur son interprétation des textes bibliques, ses convictions religieuses (son protestantisme, son antitrinitarisme, son arianisme) ont certainement contribué à forger sa manière de concevoir la science et sont sans doute à l'origine de ses croyances dans tous les autres domaines d'étude. Dans cette optique, la thèse défendue par ce mémoire est que le germe de la méthode inductive telle qu'elle ait défini dans les *Principes Mathématiques de la Philosophie Naturelle* publié en 1687 apparaît clairement pour la première fois dans un traité théologique (*Untitled Treatise 1.1*) rédigé dans les années 1670 par Newton et non dans l'un de ses premiers traités scientifiques. Ainsi, ce mémoire est une expansion de l'essai de Maurizio Mamiani (« Newton on prophecy and the Apocalypse ») et de son tableau de comparaison entre les règles du *Regulae Philosophandi* et du *Untitled Treatise*. En cherchant à montrer les similitudes entre la méthode herméneutique et inductive de Newton, ce mémoire soutient que la pensée newtonienne n'est pas unilatérale mais complexe, le résultat de l'interaction constante entre les différents domaines d'étude (dont la science et la théologie) sur lesquels Newton s'est penché.

This dissertation focuses on the theological and scientific writings of Isaac Newton (17th century English mathematician and physicist) and aims to show how his religious beliefs and theological views conditioned his conception of science. It is therefore in the line of the most recent essays on Newton which support the thesis in favour of the unity of Newton's thought. Indeed, the new generation of scholars (M. Mamiani, S. Hutton, J.E. Force) has laid emphasis on the fact that, though there is no denying that Newton's scientific mind influenced the manner by which he interpreted prophetic texts, his religious beliefs (his Protestantism, his Anti-Trinitarianism, his Arianism) have certainly contributed

to shape his conception of science and are most likely at the origin of his beliefs in all the other fields of knowledge he studied. Thus, the thesis this dissertation tries to defend is that the seeds of the inductive method as defined in *The Mathematical Principles of Natural Philosophy* first published in 1687 are clearly visible for the first time in a theological treatise (*Untitled Treatise MS.1*) that Newton wrote in the 1670s and not in one of his early scientific writings. Consequently, this dissertation expands on Maurizio Mamiani's essay on "Newton on prophecy and the Apocalypse" and his chart comparing the rules of method of the *Regulae Philosophandi* and the *Untitled Treatise*. By showing the similarities between Newton's hermeneutic method and inductive method, this dissertation propounds that the Newtonian thought was complex and multi-determined, the result of a constant intermingling between the various fields of knowledge (including science and religion) he studied.

Mots clés

Isaac Newton

Physicien et mathématicien anglais (1642-1727), Isaac Newton est sans doute l'une des figures les plus emblématiques de la révolution scientifique du 17^{ème} siècle. Ses *Principes Mathématiques de la Philosophie Naturelle* et son *Optique* ont pendant longtemps influencé les théories des scientifiques les plus renommés et cela plus de deux siècles après sa mort. Newton est particulièrement reconnu pour sa théorie de la gravité (qui n'a été remise en cause qu'au début du 20^{ème} siècle par Einstein) et la création du calcul infinitésimal. Cependant, la découverte de ses écrits théologiques dans la première moitié du 20^{ème} siècle a révélé que Newton a en réalité écrit bien plus sur la religion que sur la science et qu'il se considérait lui-même plus comme un théologien que comme un scientifique.

La méthode inductive (inductive method)

La méthode inductive est une méthode de raisonnement scientifique selon laquelle les principaux généraux qui régissent le fonctionnement de l'univers sont induits à partir d'expériences sur des faits empiriques (c'est-à-dire des phénomènes naturels observables à l'œil nu ou avec un microscope) et de l'observation qui est faite de leurs résultats. La méthode inductive est souvent associée à Newton puisque c'est lui qu'il l'a développée et amenée à son apogée avec la publication de ses *Principes Mathématiques*. Pour Newton, l'utilisation de la méthode inductive est le meilleur moyen d'éviter que les théories scientifiques soient basées sur des hypothèses ou des spéculations qui ne peuvent pas être vérifiées empiriquement et donc être inexactes.

Les Principes Mathématiques de la Philosophie Naturelle (Principia)

Œuvre maîtresse d'Isaac Newton, les *Principes Mathématiques de la Philosophie Naturelle* est un ouvrage en trois volumes publié pour la première fois en 1687 à Londres. Il contient les lois du mouvement de Newton ainsi que les lois de l'attraction universelle (théorie de la gravité). Le *Principia* se divise en plusieurs parties, dont deux importantes pour la thèse traitée dans ce mémoire, le *General Scholium* – qui est à la fois une attaque de la théorie des vortex et des comètes de Descartes, un traité en faveur de la méthode inductive, et une discussion sur Dieu – et le *Regulae Philosophandi* qui établit les règles d'interprétation à suivre dans l'étude de la philosophie naturelle.

Untitled Treatise MS.1

Méthode herméneutique que Newton conçut dans les années 1670 pour interpréter les textes prophétiques de la Bible. Le *Untitled Treatise* est l'un des premiers écrits théologiques de Newton et montre l'influence de ses convictions religieuses (son hyper-protestantisme par exemple) dans son analyse des textes bibliques. Il est aussi intéressant de noter que cette méthode d'interprétation adopte une démarche scientifique qui est très proche de celle que Newton utilise dans ses écrits scientifiques et particulièrement le *Principia* alors que ce dernier a été publié vingt ans plus tard. Le *Untitled Treatise* fut en partie appliqué par Newton dans les *Observations Upon the Prophecies of Daniel and the Apocalypse of Saint John* publié à titre posthume en 1733.