Tessa Morrison

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Foreword

Architecture is certainly not a field that comes to mind when we think of Isaac Newton. This is precisely why this present volume is so important. It not only shows us a little known side of one of the greatest minds in human history, but also helps us understand entire areas of inquiry that have fallen into oblivion, those of "chronology" and "ancient wisdom".

Because we are all intelligent beings, intelligence itself is of interest to us. Genius, which is superlative intelligence, is greatly interesting to us. But because genius is not always accessible, myth takes over. This is as true for historical figures like Newton and Leonardo da Vinci, as it is for more recent geniuses, like Einstein: the scientist is obscured by the myth. In the case of Leonardo, the myth grew to such proportions that the tendency is to credit Leonardo with the invention or prototype for almost everything, in spite of the fact that in many cases careful study of his notebooks demonstrates that, even when he correctly observed the phenomena he was studying, he drew the wrong conclusions, or when, in the attempt to build his "inventions", they are discovered to have irremediable flaws. The case of Newton is just the opposite. Newton's myth was forged by neglecting or denying the activities that actually occupied the largest part of his intellectual life. Recent interventions have aimed at restoring to Newton the parts of this work that earlier periods had deemed unimportant or even scandalous. This present work falls in that category.

Uncovering and making accessible the work of scientists and scholars of the past is much more difficult than it might appear to be. Newton himself knew that: had these challenges been easy, he needn't have spent a lifetime working on ideas surrounding chronology, ancient wisdom or Solomon's Temple.

One of the obstacles is language. In order to interpret the biblical passages he was interested in, Newton had to grapple with the Hebrew. But for many of today's scholars, a Latin text presents equal difficulties. Latin was, of course, the language of scholars. Not having had an education of the kind reserved to young noblemen, Leonardo da Vinci found that many mathematical and scientific treatises remained closed to him because of the Latin, but they are equally closed to today's scholars. In our present age, knowledge of Latin is limited almost exclusively to specialists. Even Newton recognised the limits of Latin. He himself was interested in the creation of an international language that could more accurately interpret the prophets that concerned him.

However, knowledge of the language is only one of the requisites for accurate translation; the other is knowledge of the subject. All translations are essentially interpretations. If the translator is not knowledgeable in the field, we are likely to find every genre of mistake.

Another obstacle to retracing lost ideas is related to the cultural changes that separate one epoch from another. According to one theory, we can never completely understand an earlier age, because we must inevitably filter what we read about that age through our own cultural alignment, that is, it is impossible for us to "unlearn" what we know so that we can approach the ideas that came before us, and therefore all of what we think about earlier ages is contaminated by our own. If we carry that to its logical extreme, of course, it makes no sense to study history because we can't know what ideas meant in an earlier age. This would doom us to a perpetual present, flattening out our experience. But we can't go to the other extreme either, taking it for granted that there are no cultural gaps. In the case of the seventeenth century, for instance, it is almost impossible for us to grasp how thoroughly Christianity permeated all aspects of culture and society. But in order to understand Newton, we must try to understand what that must be like, even if we are all the more surprised that religion would have such an overwhelming influence on the very mind we hold to be the paradigm of scientific thinking.

Culture also determines what areas of inquiry are deemed to be of the greatest importance. Our scientific age nods in agreement with Newton's contemplation of mathematics and physics, but finds it harder to countenance inordinate amounts of time and effort given to alchemy and interpretation of the prophets. We apparently agree with Newton that history is important, but we may disagree with just what about it is important. Newton concerned himself with "chronology", that is, the science of computing time or periods of time (not to be confused with measuring time), an area of inquiry that began to fade around the turn of the eighteenth century. In an age that was famous for its scientific disputes, Newton was perhaps the most polemic figure of all. His dispute with Leibniz over the discovery of calculus is legendary. His efforts to take revenge on Robert Hooke and consign him to oblivion are also well known. So it comes as no surprise to read that his results in "chronology" were hotly contested as well.

By now, however, you can see how many layers have to be gone through to reach some kind of understanding of Newton and his more esoteric interests. Tessa Morrison may well be the only scholar knowledgeable enough in both the Latin and this particular material to make her way through it. In having made the effort, she has given us back a part of Newton that we were seriously in danger of losing altogether.

If this book were merely a translation, however, it would be rather a dry academic exercise. What makes it especially significant is the commentary, which inserts Newton's manuscript into its proper context within the ongoing discussion about relationships between architecture and mathematics. While the Bible does contain some information about measurements, it is not one of the most precise documents in this respect. It is fascinating to learn that Newton was at pains to determine the exact length of the cubit. Even more fascinating is that Newton studied Vitruvius and

derived his own Vitruvian man. Thus Newton is given his rightful place in the tradition of architectural thinkers such as Alberti and Leonardo. Further, his criticism and revision of Villalpanda's reconstruction of Solomon's temple shows him to be an acute architectural analyst.

As a translator and commentator, Dr. Morrison does a remarkable job of keeping herself off the page. But Newton scholarship, as well as that on architecture and mathematics, is greatly enriched by efforts such as these, and we can be grateful that she has dedicated her time and attention to bring this present work to our notice.

Editor in Chief, *Nexus Network Journal* Kim Williams
Turin, Italy

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Callaghan, NSW, Australia Tessa Morrison

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Introduction

In Michael White's biography of Isaac Newton he states, "According to a list of the most influential people in history, *The 100*, Isaac Newton ranks number 2 – after Muhammad and ahead of Jesus Christ".[1] An extraordinary statement written at the close of the twentieth century; a century of turmoil and rapid technological change, a century in which scientific changes and development have brought about the contrast of extreme misery and poverty, with massive prosperity and wealth. Moreover, in 1999, *The Sunday Times* named Newton its "Man of the Millennium".[2] For a scientist who died in the early eighteenth century to be considered so influential despite the duration of time and change, not only in science but also in attitude and thought, is unique. Of Newton and his time, Albert Einstein claimed that

> Newton's age has long since passed through the sieve of oblivion, the doubtful striving and suffering of his generation has vanished from our ken; the works of some few great thinkers and artists have remained, to delight and ennoble us and those who come after us. Newton's discoveries have passed into the stock of accepted knowledge (Einstein, 1952).[3] It was, however, Albert Einstein who demonstrated that the science of Newton was insufficient to describe the quantum world of sub-atomic particles. There is no doubt that Newton did play a most significant role in the history of science and mathematics. His achievements alone define him as one of the greatest scientific geniuses in history, but the myths that surround his memory redefine him not as a great mathematician or physicist but as an inspired dreamer.

In the collected memory of the public, Einstein is associated with the mathematical equation $E = mc^2$. Although most people would not understand the full implication of this equation, at least Einstein, a scientist, is associated with an important contribution to science. Newton could equally be associated with the mathematical expression $1/r^2$ – the relationship of the inverse-square law – in which Newton suggested that the force of gravity that acts between any two objects is inversely proportional to the square of the distance between the centres of these objects. Yet Newton is more likely to be associated with an apple tree, the (mythical) inspiration of his genius, rather than the ingenious work that resulted from that inspiration.

The image of the inspired genius, devoutly religious and working in isolation for the betterment of mankind, has been propagated throughout the centuries.[4] His early biographers such as William Stukeley[5] in the eighteenth century and David Brewster[6] from the nineteenth century, and many others, often glossed over manuscripts, letters and events that did not fit into this image of the pristine inspired dreamer.

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This may have been an image that the ageing Newton wanted to project, for the apple story originated from Newton himself, late in his lifetime. In William Stukeley's *Memoirs of Sir Isaac Newton's Life,* he related how, in 1726, Newton told him that one warm day sitting under an apple tree at his home Woolsthorpe in the summer of 1665

> The notion of gravitation came into his mind. It was occasioned by the fall of an apple, as he sat in a contemplative mood. Why should that apple always descend perpendicularly to the ground, thought he to himself. Why should it not go sideways or upwards, but constantly to the earths centre? Assuredly, the reason is, that the earth draws it. There must be a drawing power in matter: and the sum of the drawing power in the matter of the earth must be in the earth's centre, not in any side of the earth. Therefore does this apple fall perpendicularly, or towards the centre. If matter thus draws matter, it must be in proportion of its quantity. Therefore the apple draws the earth, as well as the earth draws the apple. That there is a power, like that we here call gravity, which extends itself through the universe.[7] It was another twenty-two years before that 'inspiration' was fulfilled with the publication of the *Philosophiae Naturalis Principia Mathematica* in 1687.

The image of the dreamer appears to have appealed to the ageing Newton for he perceived his life's work as a very romantic discovery. He claimed

> I do not know what I may appear to the world; but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me.[8]

This image projected Newton not only as a romantic dreamer, but also as tolerant, patient and devoted to pets. There is a story of a fire in Newton's laboratory that took place sometime between 1677 and 1683. According to the story, Newton's dog, Diamond, knocked over a candlestick, which had resulted in the fire. Newton lost many manuscripts including his work on the *Philosophiae Naturalis Principia Mathematica* and *Opticks*, and he is said to have "worked them over again".[9] Despite this devastating loss, Diamond was only rebuked by Newton, who exclaimed "Oh Diamond! Diamond! Thou little knowest the mischief thou hast done".[10] However, according to Newton's amanuensis Humphrey Newton (no relation), Newton never had any pets.[11] Although in his scientific work, Newton did suggest that diamonds might be made to burn, because of their unique optical properties[12] (perhaps indicating that the myths of Newton stemmed from his generally misunderstood scientific work). Despite the lack of truth in having Diamond the dog, the myth of the romantic dreamer image is still perpetuated to this day and a favourite question at trivia night quizzes is "What is the name of Isaac Newton's dog".

The nineteenth century images of Newton show him lost in his thoughts. The epitome of this image is *Isaac Newton at the age of Twelve* by Frederick Newenham.[13] The 12-year-old Newton is pensively gazing out into space reflecting on the man he will became, this engraving was executed with all the splendour of Victorian romanticism. Equally important are the depictions of Newton's religious devotion. In 1820, an English painter Benjamin Robert Haydon unveiled what is considered to be his masterpiece, *Christ's Entry into Jerusalem*; Newton is in the crowd, along with other notable figures such as John Keats and William Wordsworth, admiring the figure of Christ.[14]

But throughout his life Newton was not this figure of a romantic dreamer. The depth of his life's work is revealed by his two great scientific texts: *Philosophiae*

Naturalis Principia Mathematica, generally truncated to *Principia*, **which was** first published in 1687 (with a further two revised editions in his lifetime in 1713 and 1726) and *Opticks,* first published in 1704. In addition, there were hundreds of unpublished manuscripts. The depth and scope of his life's work is astounding, and reveals him to be a true polymath and genius.

The Unpublished Manuscripts of Isaac Newton

Newton died on 20th March, 1727 leaving hundreds of unpublished manuscripts; some of which date back to his arrival at Trinity College, Cambridge in 1661. His heirs invited Thomas Pellett to examine the manuscripts and report on their suitability for publication. After just three days of examining these hundreds of manuscripts, Pellett, a qualified physician and member of the Royal Society, dismissed the majority of the manuscripts as being "not fit to be printed",[15] "of no scientific value" and "loose and foul papers".[16]

Pellett only found two sets of manuscripts suitable for publication. The first was a set of manuscripts on chronology and the second were two manuscripts on prophecies. Although Pellet claimed that the text on prophecy was imperfect, they were nevertheless worthy of publication. The other manuscripts, which included drafts of the *Principia*, mathematical and scientific papers, his correspondence and works on prophecy, chronology, alchemy and theology were passed on to his niece Catherine Conduitt. With the marriage of Catherine's daughter into the Portsmouth family, the manuscripts become part of the Portsmouth Collection.

In 1872, the papers were offered to the University of Cambridge, which only accepted the scientific papers, refusing the other papers on topics that Newton was not famous for.[17] The remaining non-scientific manuscripts were offered to the British Library, which also refused them on similar grounds. These manuscripts remained in the Portsmouth Collection until 1936, when they were auctioned and dispersed into collections all around the world.

The auction was held in July in 1936 at Sotheby's. The manuscripts were divided up into three-hundred and thirty lots and sold to thirty-three buyers.[18] Thus Newton's manuscripts were scattered all over the world. It is surprising that these manuscripts were allowed to leave England. Josè Faur considered that the reason for this was because of the contents of the manuscripts. Manuscripts on prophecy, alchemy and Newton's unorthodox theology did shock some scholars. It was "to protect Newton's 'good name,' [that] the importance of the manuscripts were denied".[19]

One of the buyers was the famous economist John Maynard Keynes, who bought a significant number of manuscripts which he bequeathed to King's College, Cambridge. He made a study of these manuscripts and found

> that Newton was different from the conventional picture of him. But I do not believe he was less great. He was less ordinary, more extraordinary than the nineteenth century cared to make him out. Geniuses *are* very peculiar.[20]

The nineteenth century, in their adulation of Newton, had rendered him quite bland. After poring over the contents of the box of manuscripts he had purchased, Keynes claimed:

> Newton was not the first of the age of reason. He was the last of the magicians, the last of the Babylonians and Sumerians, the last great mind which looked out on the visible and intellectual world with the same eyes as those who began to begin to build our intellectual inheritance rather less than 10,000 years ago.[21]

This very famous quote was written by Keynes in 1942. The paper "Newton the Man" was written for the tercentenary celebration of Newton's birth, but the Second World War intervened and the paper was not presented until 17 July 1946, after Keynes' death in April of that year. These tercentenary celebrations were conducted on an international scale and ran for five days culminating in a garden party at Buckingham Palace.[22] Keynes' paper was read to the Royal Society by his brother, Geoffrey. It had not been revised by the author, who had written it some years back.[23] Keynes was the first to publicly consider Newton as more than the orthodox image of the romantic dreamer scientist. He considered Newton's faults and also what appeared from an early twentieth century perspective to be unorthodox practices such as alchemy, his style of theology, his interest in chronology and church history and his argumentative nature, in conjunction with his great scientific achievements. These were aspects of Newton's character that had been ignored or glossed over by previous commentaries and biographies.

These discoveries in *Newton the Man* by Keynes did not lessen his admiration for Newton. He considered that the box of papers that he was studying showed Newton to be a man with great power of mind, who attempted to understand all aspects of God and nature. Newton's experiments were not undertaken for mere discovery, but to verify what he already knew, and to confirm his strong belief in God. Keynes wrote:

> Why do I call him a magician? Because he looked on the whole universe and all that is in it *as a riddle*, as a secret which could be read by applying pure thought to certain evidence, certain mystic clues which God had laid about the world to allow a sort of philosopher's treasure hunt to the esoteric brotherhood. He believed that these clues were to be found partly in the evidence of the heavens and in the constitution of elements (and that is what gives the false suggestion of his being an experimental natural philosopher), but also partly in certain papers and traditions handed down by the brethren in an unbroken chain back to the original cryptic revelation in Babylonia. He regarded the universe as a cryptogram set by the Almighty – just as he himself wrapt the discovery of the calculus in a cryptogram when he communicated with Leibnitz. By pure thought, by concentration of mind, the riddle, he believed, would be revealed to the initiate.[24]

As more and more of Newton's papers became available to scholars, Keynes' words seem increasingly insightful and revealing. Keynes considered that there were two sides to Newton's character they were "Copernicus and Faustus in one"[25]. Scientist and magician were the same man working to one purpose and whose achievements were seemingly beyond his era but at the same time founded in the knowledge of the ancients.

Later biographies have assumed that the works on theology, chronology and prophecy were the works of an ageing Newton. That there were two Newtons; the

great scientist of his youth and the ageing Newton who had lost his taste and ability for science and turned to the study of chronology, prophecy and religion as a result of the nervous breakdown he suffered in 1693.[26] However, these two separate and diverse personas are not supported or divided by any such date and Newton did continue to research and add to the science of his day. Furthermore, his papers and interest in chronology and prophecy date back to his earliest days in Cambridge in the 1660s.

Newton's deeply held religious convictions led him to search for the mystic clues which he believed that God had laid about the world. This search had resulted in his scientific research in the form of the *Principia* and *Opticks;* both are landmarks in science. Alchemy, chronology, theology and prophecy as well as natural philosophy were all parts of these clues which Newton attempted to unravel or decrypt. It is unclear whether there was a dividing line in the mind of Newton between these topics; however, all of these topics confirmed his belief in the supreme design of the universe.

Argument from Design

In the *Principia,* Newton had established the foundations of classical mechanics and the law of universal gravitation that enforced the notion of a clockwork universe. But for Newton, these laws of physics revealed that the universe was designed by a Supreme Being. He stated in the *Principia*

> 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.[27]

This designed universe could not arise from "purely mechanical" causes. In the "General Scholium" of the *Principia,* Newton had a Biblical interpretation of God's role in universal physics. He asserted that

> This Being governs all things, not as the soul of the world, but as Lord over all; and on account of the dominion is wont to be called *Lord God*, or *Universal Rules*. . . 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. . .. And from his 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 presence from infinity to infinity; he governs all things, and knows all things that are or can be done. He is not eternity and infinity, but eternal and infinite, he is not duration or space, but he endures and is present. He endures forever, and is everywhere present; and, by existing always and everywhere, he constitutes duration and space . . .. It is allowed by all that the Supreme God exists necessarily; and by the same necessity he exists always and everywhere. . . We know him only by his wise and excellent continuance of things and final causes; we admire 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. . . Since every