

Review of *Newton and the Origin of Civilization*, by Jed Z. Buchwald and Mordechai Feingold, (Princeton U. Press, 2012, 528 pps.)

In 1728, a year after Isaac Newton's death, his book *The Chronology of Ancient Kingdoms Amended* was published. Like much else in Newton's career, the circumstances of the publication were mired in unedifying controversy. It was published largely at the urging of William Whiston, Newton's successor as Lucasian Professor of Mathematics at Cambridge, once an acolyte, now a bitter enemy, in order that he could respond with a crushing refutation. Three years earlier, an unauthorized, abridged version of the book had been published in France together with a short refutation; the aged Newton was, reasonably, furious.

In the course of the inevitable controversy over the pirated edition, Newton minimized his own work, saying that he "had occupied himself agreeably with history and chronology when fatigued with other work." In fact, he had had a serious interest in chronology from a fairly early age, and since about 1700 had applied himself intensely to it. The subject constitutes a significant fraction of the immense body of manuscript notes that he left behind. He compiled a large library of both primary and secondary sources. Besides Latin, he had a good knowledge of Greek and some knowledge of Hebrew. He analyzed the sources critically, taking into account reliable information would have been available to the author, and what the author's biases would have been. And, of course, Newton was a genius.

Nonetheless, viewed with 20/20 hindsight from nearly 300 years later, the *Chronology* made no useful contribution whatever to historical research, either contentive or methodological. As far as I can determine, the *Chronology* had nothing new in it that is right; and it made major errors that practically no one else, before or since, has made. Most egregiously, Newton claimed, on the flimsiest of grounds and in the face of massive contrary evidence, that Pharaonic Egypt was not a kingdom of major significance until after the time of King Solomon. The *Chronology* is also extremely dull and inhuman; people live and die, cities are founded and are destroyed, kingdoms rise and fall with no trace of individuality or character, only intricate argumentation about dates.

How did Newton go so far off course? To begin with, in the early eighteenth century, a scholar trying to determine reliably any date prior to about 600 or 700 B.C. faced formidable, perhaps insuperable, obstacles. There was no archeological evidence, except for a few undatable monuments, like the Pyramids; the only evidence was textual. The surviving histories of the early period were all written many centuries after the events they described; they combined history, myth, and sheer fiction; and they were often polemics or propaganda aimed at establishing the antiquity or early supremacy of whichever group the author favored. It was essentially impossible for Newton or his contemporaries to establish a clear history. Viscount Bolingbroke, a generation younger than Newton, worked avidly on ancient chronology for a while, and then gave up in despair, writing "Who can resolve to build with great cost and pain when he finds, how deep soever he digs, nothing but loose sand?" What *is* surprising is Newton's extraordinary confidence; he claimed that all the dates in his history were reliably accurate to within 10 or 20 years.

The argumentation in the *Chronology* is so intricate and so intertwined that it is hard to separate out one error from another, but a few particular points stand out. Newton was a firm believer in the Euhemerist theory of mythology, that posits that mythological figures all derived from historical persons. This was a dangerous starting point for a chronologer, because it put a premium on the vain pursuit of dates for the originals of Hercules, Osiris, and so on. Much worse, Newton tried to identify historical and mythological figures one with another; for instance, Saturn was Noah and Jupiter was Shem. In particular, the identification of the Egyptian Pharaoh Sesostris with Osiris, Dionysus, and the Biblical figure Sesak placed a huge strain on the chronological structure.

Newton was entirely convinced that ancient civilization essentially derived from the Israelites; and he geared his entirely chronological system toward proving that fact. This, it may be noted, has

nothing to do with Biblical literalism; on the contrary, it is entirely clear in the Hebrew Bible that the Egyptian Pharaohs predated the Israelite kings by at least several centuries. It derived, rather, from a mixture of Jewish and Christian writers, ancient, medieval, and contemporary, and clearly assumed a large significance in Newton's own religious views.

The deluge of Noah also got Newton into trouble. The earlier chronology of Bishop Ussher had dated the flood to 2349 BC, following Biblical chronology, and dated the foundation of the Egyptian kingdom to 2188, following the chronology of Manetho, an ancient historian of Egypt. Since only eight people survived the deluge, the obvious question arises how the population could have increased enough in 160 years to create anything worth calling a kingdom. This was an additional motivation for Newton to date the creation of significant kingdoms as late as possible.

Newton was quite skeptical of the written sources; Buchwald and Feingold argue that he became more so after, as Master of the Mint, he had to conduct investigations into forgery cases and to sift the lies that both the culprits and the witnesses told with abandon. But his skepticism deserted him at exactly the wrong times. He threw out the Manetho's entire chronology of Egypt, together with many other historical texts, as unreliable; but he was entirely confident of his own ability to discern the hidden truths behind supernatural myths. He was willing to reinterpret some parts of the Biblical text; but he took the Flood of Noah at face value.

Since texts and textual analysis were unreliable, Newton put his faith in astronomical arguments. He had a number of these, but the most important for his system was this. The Greek astronomer Hipparchus quotes a passage from the earlier astronomer Eudoxus that lists the constellations that lie on the great circles that connect the poles with the equinoxes and with the solstices. Hipparchus states that Eudoxus' list is in error. Newton conjectured that Eudoxus was in fact describing a celestial globe created by the much earlier astronomer Chiron, who was a contemporary of the Argonauts, and that, moreover, what Hipparchus had thought was a mistake was entirely a result of the change in the position of the equinoxes and solstices due to precession, in the centuries between Chiron and Hipparchus. A straightforward astronomical calculation allows one to determine the date at which the description in Eudoxus' text would have been accurate. Newton concluded that the sphere was constructed about 939 B.C. and that the Argonauts' voyage was about a generation earlier; the standard date given for the voyage in chronologies, based on Greek historical texts, was three hundred earlier than that.

The mythological figure of Chiron was a centaur, but that was no problem for Newton, given his Euhemeristic interpretations of such things. The other weaknesses in the argument were more serious, and were gleefully picked apart by his opponents in the years following 1728. First, the text of Eudoxus only states that the great circles pass through the constellations, not where they pass through. Different placement of the great circles within the specified constellations would change the results of Newton's calculations by centuries. Newton arbitrarily decided that the great circles went through particular stars, which he chose in order to make the dates come out the way he wanted. Second, the association of the hypothetical celestial globe with Chiron was pulled out of thin air. (This is a simplification; the eighteenth century debate over this argument generated thousands of pages of controversy.)

*Newton and the Origin of Civilization*, by Jed Z. Buchwald and Mordechai Feingold analyzes the whole of Newton's chronological work in the context of Newton's life, his scientific work, contemporary chronology, and contemporary thought. The authors' erudition is staggering, and their labors have been Herculean. They have read all of Newton's manuscripts on the subject, which involves deciphering documents that Newton first wrote right to left, and then wrote over top to bottom, and that mix chronological notes with whatever else Newton was working on at the time. They have read and analyzed everything with the remotest bearing on the chronology. They seem to have reworked, not only all the calculations that Newton and the other chronologers actually did do, but all the calculations that they could have done instead. They even analyze the way that Newton

dog-eared pages of the books in his library, and they provide a photograph.

The book makes little accomodation to the non-expert reader. The ideal reader of this book would be effortlessly familiar with the *Chronology*; with Newton's biography; with all of the sources, primary and secondary, that Newton used; and with the whole state of chronological science in Newton's time. That is not me, by a long shot. I advise any reader whose knowledge falls short of this to start by reading the first major study of Newton's chronology, *Isaac Newton: Historian* by Frank Manuel (1963), which is much less daunting.

Even for less learned readers like myself, however, Buchwald and Feingold's book is full of remarkable details, insights, and incidents. There are detailed discussions of Newton's pioneering use of computing an average in order to combine unreliable data, as opposed to trying to decide on the best value; of the contemporary theories of vision and knowledge; of the debates over the best technique for measuring celestial angles; of the manufacture of telescopes and of celestial globes, both ancient and contemporary; of the way in which the pictures associated with the constellations were placed over the corresponding stars, a critical question when you need to interpret phrases like "the end of the jaw" and "the tip of the nostril" of the constellation Cetus, which occur in Ptolemy's star catalogue; and much else. Certainly the book is essential reading for anyone with a serious interest either in Newton or in the study of ancient history in the 17th and 18th centuries.

Very recently, Newton's *Chronology* has been taken up by fundamentalist Christians, since it fits with the Biblical account, and it bears the imprimatur of the great scientist. (One review on amazon.com of a recent reprint recommends it for home schooling.) My first thought, on seeing this, was that Newton would roll over in his grave. My second thought was that my first thought was historically unjustifiable, merely projecting my own feelings onto a very strange man, of a very different viewpoint, who lived in a very different world, and who died almost 300 years ago.