# Lloyd Strickland and Harry Lewis: "Leibniz on Binary: The Invention of Computer Arithmetic" Cambridge (Mass.): MIT Press, 2022. 228 pages

This is an authoritative collection of Gottfried Wilhelm Leibniz's manuscripts, letters and notes dealing with his attempts to establish a binary system of computation. Strickland has translated many of Leibniz's earliest works into English (see https://www.leibniz-translations.com) and with Lewis presents the historical context of how his binary notation was formulated.

The work connects Leibniz with thinkers in Paris and his home of Hanover in Germany when he moved into mathematical fields for the first time, and contextualizes his writings, reports on meetings and in some cases private memoirs, through until his death. It seeks to establish what works were truly his own invention and engages with other scholarship as to the theories about how much credit Leibniz should be given.

They establish their position in saying that 'If the question is, "Who gave binary computer arithmetic to the modern world?" the answer is Leibniz." (15)

What is most impressive to those researching the history of binary mathematics or computation in general is the sheer scale of manuscript research presented in this book. Rather than a narrative, the book is a manuscript collection in chronological order to demonstrate the development through Leibniz's own workings. Each manuscript features detailed explanations of its background and other scholars who were in dialogue with Leibniz. Several gaps in the historical record are filled with their new manuscript material.

One interesting gap in the literature that has been addressed is the controversy over whether the Yijing arrived at binary first, as noted in Bouvet. No journal devoted to Leibniz or Early Modern Philosophy has reviewed this book because of its mathematical and technical emphasis, something that mainstream Leibniz scholarship has thus far avoided. This story is fascinating and requires no mathematical sophistication to understand it, hence broadening the appeal of this book. The Yijing was viewed as evidence of the idea that the ancient Chinese had indeed discovered the binary; a nice story that Leibniz was willing to accept for several reasons that would not undercut his genuine belief that he indeed discovered it. Using the letters between Leibniz and Bouvet, you can tell the story briefly of why it made a strong impression on Leibniz. Bouvet's reasons for believing in the Yijing were mostly nothing that Leibniz would subscribe to. Despite the controversy that came with Bouvet's writing, the Yijing is a code for how to divine certain oracular messages by throwing down yarrow sticks and using the code to see which one should be chosen. Thus, the Yijing is a tool for divination, reflecting certain metaphysical beliefs and has no mathematical value. I appreciated this exploration's contribution to the Leibniz literature.

As is to be expected, there is a great deal of mathematical notation and explanation. While the authors attempt to understand the mind of a master mathematician, they also endeavour to make Leibniz's work as accessible as possible. They also include Leibniz's religious and epistemological motivations and his quest for a mathematical understanding of the divine nature to the world.

Leibniz's vision of a creative force underlying nature is expressed in the binary system. Creation ex nihilo is envisaged in 0 and 1. His religious sensibilities, his sense of revelation and calling, may well be at the origin of binary computational arithmetic. Strickland and Lewis probe deeper into the importance of the doctrine of creation and its binary confirmation. Creation (of any substance let alone the world) for Leibniz was technically considered a miracle (i.e. as something out of nothing) and therefore considered by him as a "mystery" of the faith. He was, therefore, excited by the fact that there was a solid rational (i.e. mathematical) basis for this Christian dogma. The medal he proposed to his patron is an example of this. Whilst speculation as to the possible religious inspiration for this discovery is potentially conjecture, and other Leibniz scholars such as Professor Daniel Cook believe it to be wrong, it is interesting to explore how the discovery of the binary excited him because it gave a mathematical belief in creation, which clearly fortified this Christian belief.

This work will benefit scholars in historical or philosophical research on technology, mathematics, and computers science, but will also suit those who are interested in the theological or sociological origins of Leibniz's work.

**Samuel McKee**, Associate tutor in history and philosophy of science at Manchester Metropolitan University. Currently working in the history of interwar physics.