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★Leibniz on binary—the invention of computer arithmetic.

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This book contains Leibniz's published and unpublished writings on binary arithmetic. There is an English translation for each paper (most being in Latin and a few in French or German), with an editorial introduction and detailed critical notes. The introduction to the book provides an overview of Leibniz's work and examines its reception in the eighteenth and nineteenth centuries. There is also discussion of Leibniz's legacy for the development of modern computers.

This book is a substantial scholarly resource and contains a wealth of mathematical material. It is fascinating to follow Leibniz's various ruminations on the dyadic, the twist and turns of his thinking as he returned to the subject again and again. The writings assembled here are of intrinsic mathematical and historical interest and may be a source of much stimulation for the engaged reader.

In one sense, this is a book for specialists. Leibniz's unpublished writings were, perforce, of limited historical import. Notable then is the material that was published and became part of the established heritage of mathematical science. A selection that is noteworthy in this respect is a 1705 paper that was published in the memoirs of the Paris Academy of Sciences. In addition to providing some details about binary numeration, Leibniz called attention to the dyadic character of the hexagrams that appear in the Yijing (or I Ching) of the ninth-century Chinese philosopher Fuxi (or Fu-Xi). This last aspect of Leibniz's memoir was the focus of much subsequent historical discussion, although as time went by there was a growing interest among commentators in more purely mathematical matters.

Leibniz built a calculating machine for multiplication and gave a detailed account of it in an unpublished paper of 1685. The existence of the paper was noted in 1897 and an English translation was published in 1929. The numeration system is decimal. However, in some of his unpublished writings, Leibniz considered the possibility of a calculating machine based on binary numeration and provided an outline of how one might be constructed.

In his [*The computer from Pascal to von Neumann*, Princeton Univ. Press, Princeton, NJ, 1972 (p. 9); MR0389497], H. H. Goldstine identified Leibniz's contributions to the subject as his decimal calculating machine and his efforts to develop formal logic. No mention is made of his writings on binary arithmetic. Twentieth-century computer pioneers who introduced binary numeration such as John Atanasoff and John von Neumann seem to have been unfamiliar with or unaware of Leibniz's writings on binary. (It is not clear what exactly they would gotten from these writings if they had known about them.) The authors show that Konrad Zuse in the 1930s could have been acquainted with Leibniz's ideas. However, his comments about Leibniz appeared only in writings composed almost fifty years after his pioneering work. Even there Zuse highlighted Leibniz's contributions to symbolic logic. Zuse himself was a somewhat isolated figure, and the ascendancy of base-two numeration in computers occurred in the United States in developments that were apparently only distantly related to the legacy of Leibniz.

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