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DEPARTMENT: REVIEWS

Review of *Milestones in Analog and Digital Computing, 3rd ed* by Herbert Bruderer

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Herbert Bruderer taught informatics and the history of computing at the ETH Zurich (the first university in central Europe with a functional program-controlled computer in 1950), and in this voluminous work presents the fruits of extensive archival and historical research. The book was first published in German in 2015, followed by a significantly expanded two volume edition in 2018, and the third edition boasts added material and is now also available in English. Even before this welcome translation (which comprises both German volumes) Bruderer offered a lengthy glossary of over 5000 technical terms in English and German, and this translated edition also grew by an additional 280 illustrations.

Bruderer exhaustively covers mechanical calculators, historical automata, and scientific instruments. In its detailed account of analog computing, this volume is surely unrivaled—the book discusses many groundbreaking analog devices, from the Antikythera (the first known astronomical calculator) to the Curta (the smallest mechanical parallel calculator), before venturing into the electronic era. The reader finds a very expansive list of achievements here—what was the world's oldest well-preserved keyboard adding machine, the world's largest commercial cylindrical slide rule, an early model of the world's first commercially successful mechanical calculating machine? But Bruderer not only compiles a historical guide to computing, he also offers detailed lists and tables that classify machines systematically: according to their function, their national origins, or according to where extant machines are collected or exhibited. The more recent past of digital computing is similarly more complex than it may at first appear. Who built the first computer? Who created the first stored-program calculator? What was the first compiler? Computer history continues to debate such deceptively simple questions, beyond the superficial consolations of listicles and timelines.

A main strength of Bruderer's work are archival insights, drawing on European collections and museums, but also on newspaper archives, academic libraries, patent registers, and multiple government archives. A central part of his research concerns machines constructed in Switzerland or nearby countries, so this publication supplements books that tend to foreground Anglophone developments in computing. Earlier titles covering similar terrain—say, Herman Goldstine's *The Computer from Pascal to von Neumann* or Georges Ifrah's *The Universal History of Computing*—also tend to be less lavishly illustrated: indeed Bruderer complains about how expensive full-color image rights have become. Other computer history books tend to refer mainly to collections of the Smithsonian in Washington DC, the Science Museum in London, or the Babbage Institute in Minneapolis, but Bruderer provides a welcome corrective to perspectives pivoting mainly on Anglophone computing. His meticulous study also helps correct some popularizations of the impact of calculating devices and computers on society—though sometimes his local patriotism also leads to whimsical moments, as when he emphasizes that Eckert and Mauchly were of Swiss descent (1218ff).

Once one pushes beyond simplistic "great man" or "great machine" accounts of computer history, there are distinct strands to the current debate, as some prefer to emphasize an engineering history, others a social and economic history of computing; some foreground the inventors and others the developers. The significant cultural patrimony of calculators and computers has only recently begun to be commemorated and more systematically musealized outside of industry archives, and Bruderer's hefty tome is a virtual museum in its own right, with similar didactic aspirations. There is no master narrative hiding among the copious documentation here; Bruderer instead opts for a philological exactitude that asks questions instead of presenting a neat

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teleological account. Alongside significant machines, Bruderer also presents various operating instructions to reduce the intimidating aura of rare devices. Just as importantly, the book lists museums, collections, and academic institutions that own and display certain devices; and Bruderer's bibliography of over 6000 entries weighs in at over 200 pages.

This is not to say that the encyclopedic survey on offer here satiates every kind of interest in data processing and calculating devices or computers. The book refers to the history of mathematics and informatics, but it is neither a treatise on the history of mathematics nor on the academic history of computer science. Moreover, when it comes to the development of code making and code breaking, Bruderer's treatment of cryptologic history does not provide much biographical or algorithmic background in the development of cipher devices, so again readers looking for historical or mathematical context will need to supplement the information found here with scientific or historical accounts found elsewhere.

That said, the information Bruderer compiled does contextualize a number of issues in the history of computing. For example (Bruderer 1076ff), when Konrad Zuse received an offer after World War 2 for the use of his Z4 by the ETH Zurich, that contract not only helped restore his pioneering computer but it also helped foment the global reputation of Swiss software development (associated with Niklaus Wirth and others). It should be emphasized also that Bruderer does not present a history of programming or of software—the accent remains firmly on hardware. Yet this book is addressed not only to the historians of technology or of science, archival curators or restoration experts, but also to anyone generally interested in the history of information processing and computer technology. The book is itself a milestone in computer history, and a much needed corrective to the tendency, both in industry and in academia, to see computing almost exclusively in terms of the near future.

BIBLIOGRAPHY

[1] H. Bruderer. *Milestones in Analog and Digital Computing*, 3rd ed, New York, NY, USA: Springer, 2021.