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Aristotle Tympas

Calculation and Computation in the Pre-electronic Era

The Mechanical and Electrical Ages

Springer

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ISSN 2190-6831 ISSN 2190-684X (electronic)
History of Computing
ISBN 978-1-84882-741-7 ISBN 978-1-84882-742-4 (eBook)
https://doi.org/10.1007/978-1-84882-742-4

Library of Congress Control Number: 2017952052

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This Springer imprint is published by Springer Nature
The registered company is Springer-Verlag London Ltd.
The registered company address is: The Campus, 4 Crinan Street, London, N1 9XW, United Kingdom

Preface

The research presented in this book started while I was a doctoral student in the United States, at the History, Technology and Society Department of the Georgia Institute of Technology. It was completed during the first sabbatical year available to me after joining the faculty of the History and Philosophy of Science Department at Greece's National and Kapodistrian University of Athens. It would take one more sabbatical year to turn these two rounds of research into a book. In the meantime, I had the opportunity to appreciate better the historiographical challenge involved in deciding to write a history of computing that would not project the analog-digital demarcation of the 1940s into the preceding history of computing—a history that would turn the analog-digital demarcation into a social question instead of treating it as technically answered. Aiming from the beginning at a history that would fully respect the fact that this demarcation was not there before the electronic era, I eventually had to accept that I would have to explain why and how this demarcation was prepared before the electronic era, through the long run formed by the mechanical era (from the emergence of the steam engine to that of the electric power network) and the electrical era (from the emergence of the electric power network to that of electronic computing). This required attention to the demarcations between (and associated classifications of) computing artifacts during the mechanical and electrical eras. In turn, this invited an emphasis on the history of comparisons of computing artifacts. In the end, it was this emphasis that was proven crucial in liberating from the effects of the projection of the analog-digital demarcation of the electronic era to the mechanical and electrical eras.

The arguments of the book are then developed around retrieving and interpreting a series of representative comparisons. Central here are comparisons involving the slide rule, an artifact with a uniquely rich history throughout the mechanical and the electrical eras. The book introduces it in two chapters, which offer an overview of the history of the use of the slide rule (Chap. 2) and details of its use in the context of electrification (Chap. 3). With the addition of a chapter that includes artifacts that represented the highest and the lowest ratio of machine to human computing capital, like the analyzers (Chap. 4) and the graphs (Chap. 5), respectively, the comparisons of the book open up to the whole range of computing artifacts—tools, instruments,

mechanisms, machines—that have been historiographically devaluated through their a posteriori placement under the allegedly inferior class of analog computers. The book includes a chapter that focuses on comparisons undertaken from the other side, that of promoters of the class of the calculating artifacts—calculating and tabulating machines—that were a posteriori designated as preelectronic ancestors of the digital electronic computer (Chap. 6). By this chapter, all the elements are in place in order to retrieve the key role of the concealment of the laboring with the analog part of computing machines through its encasement (blackboxing), which left on display only a view of the machine as digital (numbers).

It follows that this is not a book about preelectronic analog or digital computers but about the how and why the two emerged as technically different in the electronic era—the one with the concealed analogy, representing, supposedly, an evolution from an inferior to a superior class of computers. Emerging through the long-run history of this book, the analog and the digital are neither alternatives nor complementary. They are inseparable, with their alleged difference having actually to do with a full or restricted view to the computing process. Removing from public view the labor to produce the computing analogy, each special use went hand in hand with presenting the computing artifact as general purpose, universal, independent from labor to adjust it to special uses, and therefore capable of intelligence. Underneath then the demarcations that prepared for the one between the digital and the analog, we find the pursuit of a political economy of computing that devaluated the human capital versus the machine one. A resistance to an extreme version of this pursuit was persistently manifested in the defense of socially situated comparisons of computing artifacts, when the accuracy was not treated in isolation from flexibility and other computing variables and when it was further related to the issue of cost (and, therefore, indirectly, to ownership of the computing artifact). In the book, we see representative instances of the history of the passionate defense of the political economy of a mode of computing production that was based on a combination of an inexpensive slide rule and skillful use.

Opening up historiographically to socially situated comparisons of computing technology opens the history of this technology to the long and widespread use of an understudied universe of computing artifacts. It brings into the fore a myriad of graphs, a multitude of slide rules, and a range of analyzers. The book can be read as a history that exposes to representative samples of all of the above. The main argument from this history is that what we find in the analog-digital demarcation is the outcome of demarcations accumulated through a long series of comparisons, which go back to the beginning of the capitalist mode of production (industrial and, before it, merchant—the book focuses on the industrial one). This suggests that the computing revolution did not start in the 1940s; it did not follow in the industrial revolution. The computing revolution was inseparable from the industrial revolution. It made possible the industrial revolution just as it was made possible by it.

Athens, Greece Aristotle Tympas

Acknowledgments

The first round of support to the work that led to this book came from my former professors at Georgia Tech, especially Steve Usselman, Bruce Sinclair, Jim Brittain, Nancy Nersessian, Steve Vallas, Mark Shields, Ken Knoespel, Phil Scranton, Dan Kleinman, Gus Giebelhaus, John Krige, Allice Bullard, and Greg Nobles. Barney Finn (my host at the Smithsonian), Rik Nebeker (from the IEEE History Center), and, more recently, Tom Misa (from the Charles Babbage Institute) came to add their support. A faculty sabbatical as a visiting scholar at MIT, thanks to David Mindell, made it possible to conclude the research that I had started while a doctoral student at Georgia Tech.

In Greece, the key support by Kostas Gavroglu started while I was searching my way to graduate studies in the field and has continued ever since, through our collaboration as department colleagues at the National and Kapodistrian University of Athens. My department colleagues Theodore Arabatzis, Jean Christianidis, Manolis Patiniotis, and Stathis Araposthathis have supported me in many ways, intellectual and practical. Dionysios Anapolitanos and Costas Dimitracopoulos have also been very supportive. Collaboration with former students who moved on to start their work as postdoctoral researchers and instructors has added one more layer of support. Katerina Vlantoni, Nancy Megremi, Spyros Tzokas, Costas Morfakis, Christos Karampatsos, and Eirini Mergoupi are the ones whom I have had the closest and longer collaboration with. A new generation of doctoral students is following course in supporting me through our collaboration. Costas Raptis, a model of braveness to our community, deserves special mentioning.

Upon my return to Europe, I have also been receiving support through my participation in the ToE (Tensions of Europe) and the ESST (European Studies of Society, Science and Technology) scholarly communities. Johan Schot (earlier at the Technical University of Eindhoven, now with the Science Policy Research Unit at SPRU) and Jessica Mesman (Maastricht University) have been the two most influential persons behind the development of my ties to these communities.

A series of international fellowships and grants allowed me to advance to my research. In reverse chronological order, these came from the Chemical Heritage Foundation (*Doan Fellowship)*, the Dibner Library, the National Museum of

American History, the Smithsonian Institution *(Resident Scholar Fellowship*), the History Center of the Institute of Electrical and Electronics Engineers (*Fellowship in Electrical History)*, the Smithsonian Institution (*Visiting Student Fellowship*), the Hagley Museum and Library (*Residential Fellowship*), the National Science Foundation (*Dissertation Improvement Grant*), and the Georgia Institute of Technology (*Presidential Fellowship*). I want to thank the persons who decided to award these fellowships to me and the administrators, archivists, and librarians who assisted me in my research while I was taking advantage of them.

An early round of help with proofreading and editing by Jeff Sherrill was crucial at the start of the process that led to this book. A more recent round of help with checking various parts of the manuscript that led to this book by Polyxeni Malisova has been very helpful.

I am more than indebted to Springer's Wayne Wheeler and Simon Rees who stood by me repeatedly through the efforts to finish this book amidst unpredictable difficulties. I am also very thankful to the editor and the members of the editorial board of the Springer series that this book is falling under.

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