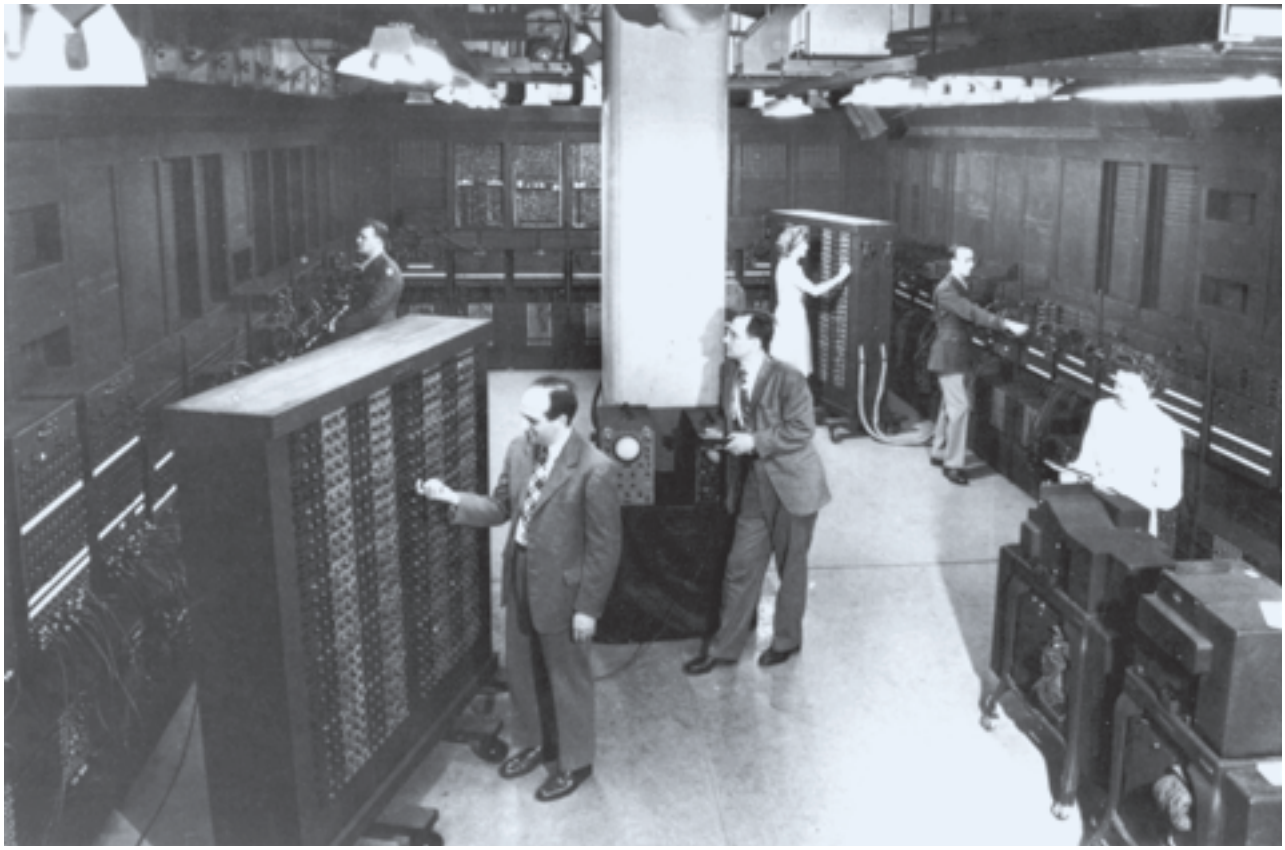
ORIGINS OF CYBERSPACE

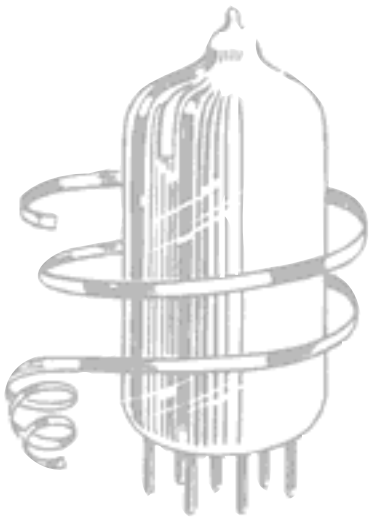
A Library on the History of Computing, Networking, and Telecommunications

By Diana H. Hook and Jeremy M. Norman

With Contributions by Michael R. Williams



Pres Eckert (center left) and John Mauchly (center right) working with the ENIAC, the first large-scale general-purpose electronic digital computer, from which all later electronic digital computers descend. Also visible in the photograph (left to right) are Pfc. Homer Spence, Elizabeth Jennings, Herman H. Goldstine and Ruth Lichterman. First operational in May 1945, the ENIAC was announced to the public in February 1946. From 1945 to 1948 it was the only operating electronic digital computer in the world. It weighed 30 tons, contained 18,000 vacuum tubes, 70,000 resistors, 10,000 capacitors, 6000 switches, and 1500 relays, and required 174 kilowatts to run. (Photograph used by permission of the University of Pennsylvania's School of Engineering and Applied Science.)



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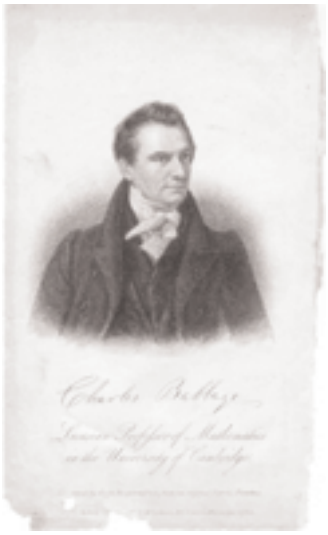
This book describes a library of technical reports, books, pamphlets, ephemera, letters, typescripts, manuscripts, prints, photographs, blueprints, and medals on the history of computing, networking, and related aspects of telecommunications. The material it describes ranges chronologically from 1613 to about 1970. There are 1411 annotated entries.

Few of the bibliographies of scientific and technological classics consulted by twentieth-century science collectors included any representation of computing. Harrison Horblit's *One Hundred Books Famous in Science* and *Printing and the Mind of Man* cited only the seventeenth century invention of logarithms by John Napier relative to the history of computing. Bern Dibner's *Heralds of Science* also cited that and Napier's *Rabdologiae*. *En Français dans le texte* ignored the topic of computing entirely. Hook and Norman's catalogue of *The Haskell F. Norman Library of Science and Medicine* also included the writings of Napier and a few works by Charles Babbage. Haskell Norman's *One Hundred Books Famous in Medicine* cited one computer-related reference. *Morton's Medical Bibliogra-phy*, fifth edition, edited by Jeremy Norman, included a handful of references to computing in medicine. Dibner, *Printing and the Mind of Man*, and Hook and Norman also contained a few references to the telegraph and the telephone.



One reason why the traditional reference works for collectors of the history of science ignored computing is that most of these were written around the middle of the twentieth century before computing was pervasive. Dibner first published *Heralds of Science* in 1955. Horblit based his book on an exhibition at the Grolier Club held in 1958. The *Printing and the Mind of Man* exhibition was held in 1963. Though we published the catalogue of the Haskell F. Norman library in 1991, Dr. Norman began forming his library around 1955. In book selection he was profoundly influenced by the works just mentioned, and also by William Osler's *Bibliotheca Osleriana*, posthumously published in 1929, but describing a library formed before Osler's death in 1919. Another work equally influential on Dr. Norman was the catalogue of the library of Harvey Cushing. Virtually the only books relevant to computing in the Osler and Cushing libraries were also the writings of John Napier.

Collecting new subjects such as computing, networking and telecommunications involved collecting types of documents that had not typically been included in private libraries of rare science books. To describe a library that broke new paths, combining manuscripts, typescripts, and photographs with printed and duplicated material produced by a wide variety of methods, from traditional letterpress to mimeograph, blueprint, ditto, and photocopying, we found it necessary to employ a variety of bibliographical and organizational techniques that had not typically been combined in this way. These techniques included traditional descriptive bibliography, biobibliography, and what might be called descriptive or annotation techniques found in some catalogues of museum or rare book library exhibitions. Throughout the diversity of *Origins of Cyberspace* we employed an elaborate system of cross-references that was only possible in a work of this complexity because the software maintained the integrity of the cross-references throughout the editorial process.

When we wrote this book the convergence of electronic media and computing technologies through the Internet had begun so recently that there had been no previous bibliographic effort to document this development for rare book collectors. Nor had there been documented efforts to collect the history of these subjects before the Internet was established. The only significant bibliographies of private collections of rare books concerning aspects of computing or telecommunications were the catalogues of the libraries of Sir Francis Ronalds and Latimer Clark, which were formed before the end of the nineteenth century. Both of these libraries collected the history of electricity, magnetism, and telegraphy. Yet convergence of electronic media through the Internet drew our attention to historical relationships between electronic media. One of the most basic was that telegraph networks were the first data networks for the communication of information. The Morse code may be viewed as the first widely used data code. Around the time that the world began to be fully wired for telegraphy, Hertz in 1887 theorized the possibility of wireless transmission. In 1895, having read Hertz's work, Marconi invented wireless telegraphy, later called radio. Initially what was transmitted over radio was telegraph code.

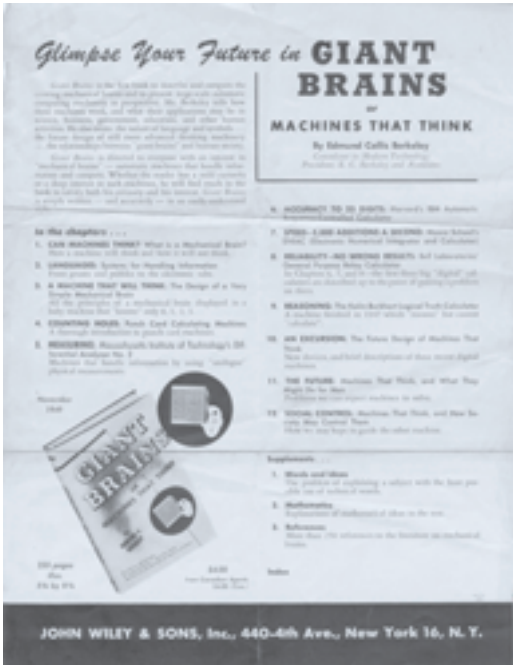
The merging of wireless transmission and information processing was made about one hundred years after the invention of wireless telegraphy, when the Internet enabled computers to evolve into personal communication devices. For this to occur a complex series of technological advances had to take place, only the most basic of these could be briefly summarized here. The telephone, an analog device, had to be invented (1878), and telephone network technology had to evolve. The electronic digital computer had to be invented (1943–45), and computing technology had to develop for about fifty years. Data networks using telephone lines had to advance in parallel with computing, leading to the formation of of the first national network of mainframes, ARPANET, in 1969. This would eventually lead to development of the Internet in the 1980s. From their beginning in 1977, cellular telephone networks had to be developed. About fifty years after the invention of electronic digital computing, wireless handheld information processors with Internet connections had to be invented. Digital telephone networks had to be built in addition to traditional analog telephone networks, enabling the invention of wireless digital telephones with web browsers.

Through these, and many other necessary complex technical developments, such as increases in bandwidth and satellite communications, and a multitude of advances in software, overall features of the wired and wireless Internet could be traced back through the history of computing and telephone to telegraphy. It was a coincidence, and a remarkable demonstration of the extent to which these major fields had been ignored by collectors and descriptive bibliographers, that approximately one hundred years before this bibliography was written, the history of telegraphy had been the subject of the only two bibliographies of major private libraries that contained more than a few items relevant to the *Origins of Cyberspace*. It was also amazing, but most probably true, that prior to *Origins of Cyberspace* the only published catalogue of a private library that focused on subjects directly concerning the history of computing, rather than the history of mathematics, except for the auction catalogue of the Weinreb sale in 1999, was the auction catalogue of the library of Charles Babbage published in 1872.

81/2 x 11 inches. x, 670pp. mostly printed in two columns. 284 illustrations. Printed in two colors throughout on Fortune Matte 80 pound acid-free paper. Bound in heavy cloth with silver stamping. ISBN 0-930405-85-4. Edition limited to 500 copies. Price: $500.

Besides the regular limited edition fifteen copies, numbered from 1-15 in binary, signed by the co-authors, the designer, and the binder, have been bound in full leather, all edges gilt, in a cloth slipcase. The first nine of these include an original vintage print of the ENIAC duplicated in the Pres Eckert papers. Price: $1650.

Copies 10 through 15 do not include the vintage photograph and cost $1250.



ABOUT THE AUTHORS

Diana Hook received her BA in classical literature from the University of California at Santa Cruz in 1977, and her MLS in 1978 from Columbia University, where she participated in Dr. Terry Belanger's Rare Books Program (now at the University of Virginia). She began her career at the Library Company of Philadelphia, then moved to the Bay Area to take a cataloguing position at John Howell – Books, the venerable Dickensian antiquarian bookshop that used to exist near Union Square in San Francisco. In August 1984 she was hired by Jeremy Norman to compile *The Haskell F. Norman Library of Science and Medicine*, a bibliographical catalogue of his father's library of rare scientific and medical books (2 vols., 1991).

Jeremy Michael Norman began his career in the antiquarian book trade at the age of nineteen, working as the assistant to the packing clerk at John Howell – Books. He worked at Howell's while attending University of California at Berkeley, where he received his BA in history in 1970. He started his own antiquarian book business the following year, and is now one of the world's leading specialists in rare books and manuscripts in the history of medicine, science, and technology. He is also the editor of the fifth edition of *Morton's Medical Bibliography* (1991), and the co-author, with Diana Hook, of *The Haskell F. Norman Library of Science and Medicine* (1991).

Michael R. Williams earned a BSc in chemistry from the University of Alberta and a PhD in computer science from the University of Glasgow. He is the author of *A History of Computing Technology* (2d ed. 1997), as well as numerous articles and papers on the history of computing. After 30 years as a professor of computer science at the University of Calgary, Williams recently became head curator at the Computer Museum History Center in Mountain View, California.

Page from the annotated timeline that runs from 1599 to 1990
(reproduced at actual size).

1832 Babbage publishes his *On the Economy of Machinery and Manufactures*, the first work on operations research, partially based on data he accumulated in order to build his Difference Engine [*see no.* 42]. Babbage orders construction of a small working portion of his Difference Engine no. 1, approximately one-ninth of the full machine. This will be the only portion of his "calculating engines" that he ever completes [*see no.* 84].

1833 Wilhelm Eduard Weber and Karl Friedrich Gauss construct an electric telegraph at Göttingen.

1834 Babbage conceives of the Analytical Engine, a general-purpose machine that embodies in its design most of the features of the programmed digital computer. The same year Dionysius Lardner publishes, with Babbage's assistance, the most detailed technical account of the Difference Engine no. 1 [*see no.* 51].

1837 Samuel F. B. Morse invents a practical form of electromagnetic telegraph using an early version of his "Morse code."

1839 Louis-Jacques Daguerre invents daguerreotypes, the first photographs.

1842 The British government abandons financial support for the construction of Babbage's Difference Engine no. 1.

Luigi Federico Menabrea, later to be prime minister of Italy, publishes the first description of the functional organization and mathematical operation of Babbage's Analytical Engine, including the first published computer programs [*see no.* 60].

1843 Augusta Ada King, Countess of Lovelace, daughter of Lord Byron, translates Menabrea's paper, adding annotations that provide further insight into Babbage's proposed Analytical Engine, a machine that incorporates many of the concepts of the programmed digital computer [*see no.* 61].

The Scheutzes, inspired by Lardner's account of Babbage's Difference Engine [*see no.* 51], construct the first working difference engine.

1844 May 24 Samuel F. B. Morse transmits the first message on a United States telegraph line (Washington to Baltimore) using the "Morse code" that will become standard in the United States and Canada [*see no.* 178].

1844 The anonymous author of the sensational evolutionary treatise *Vestiges of the Natural History of Creation* includes a lengthy quote from Babbage's discussion of programming the Difference Engine from the *Ninth Bridgewater Treatise* to explain how evolutionary change might occur through time. This is one of the earliest references to computing within the context of biology [*see no.* 55].

1845 The Atlantic Cable is proposed.

William Fothergill Cooke and Charles Wheatstone perfect a single-needle telegraph apparatus, soon adopted throughout England.

1025. WILKES and RENWICK, WILLIAM. The EDSAC. In *Report of a Conference on High Speed Automatic Calculating-Machines, 22–25 June 1949:* 9–11. [1950.] See no. 1019.

A brief review of EDSAC's design and programming characteristics, read at the 1949 Cambridge conference on computers and published in the proceedings of the conference the following year (see no. 1019). Renwick was Wilkes's chief collaborator on the design of EDSAC.
Randell 1982a, 524–25.

1026. WILKES and RENWICK. The EDSAC (Electronic Delay Storage Automatic Calculator). Offprint from *MTAC* 4 (April 1950). Unbound. Signed by Wilkes on the first text leaf. Boxed.

61–65pp. Plate; text diagrams. 229 × 154 mm.

A slightly revised version of no. 1023.

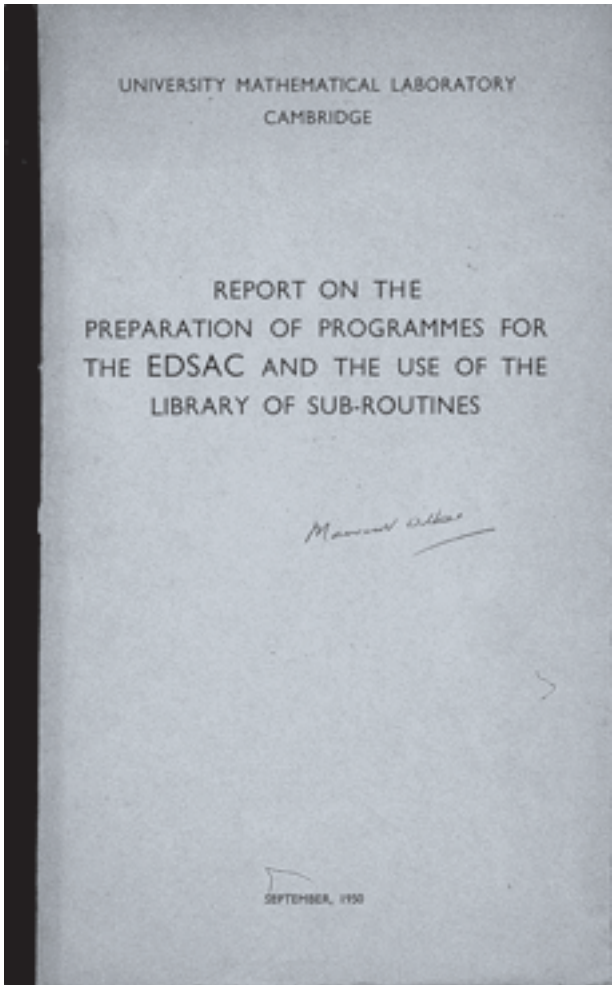
Randell 1982a, 525. Wilkes 1999, no. 20.

1027. WILKES *et al.* Report on the preparation of programmes for the EDSAC and the use of the library of subroutines. N.p., 1950. Dittoed document in two colors. Original tan printed wrappers, cloth spine. Signed by Wilkes on the front wrapper. Boxed.

[3], 40, [2], 26, 39, xi ff. Laid in are a single dittoed errata sheet and a two-sheet dittoed and stapled document titled "University Mathematical Laboratory, Cambridge. Applications of the EDSAC, to 1st September 1950," describing supplementary material. 323 × 201 mm.

PROVENANCE: Andrew D. Booth (see nos. 489–502).

This was the first report on how to program an operational stored-program computer. It was prepared by Wilkes and a fifteen-man team of researchers at Cambridge's University Mathematical Laboratory, and distributed to no more than one hundred people—"everyone we thought would be interested, both in the United Kingdom and abroad" (Wilkes 1985, 149). The material in this dittoed report was published with very few changes in Wilkes, Wheeler, and Gill's *Preparation of Programs for an Electronic Digital Computer* (1951; see no. 1030).



NO. 1027. Signed copy of the first report on how to program an existing electronic digital computer.

When this bibliography was written this report was not cited in OCLC or NUC, and RLIN noted only the Harvard Library copy.

1028. WILKES. The best way to design an automatic calculating machine. In *Manchester University Computer. Inaugural Conference* (Bolton: Tillotson's, 1951), pp. 16–18. See no. 774.

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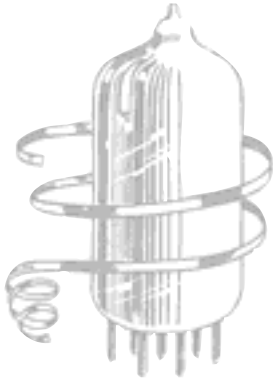

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