PRINT

The tangled debate over who invented the first computer.

BY MARK WILLIAMS

Howard Aiken: Portrait of a Computer Pioneer
By I. Bernard Cohen
329 pages, $35, MIT Press

ENIAC: The Triumphs and Tragedies of the World's First Computer
By Scott McCartney
262 pages, $23, Walker

THE MEN in the '30s photographs in *Howard Aiken: Portrait of a Computer Pioneer* are dressed much as they would have been for industrial labor during H.G. Wells's youth. What they're doing—as they manually screw, solder, and bolt mechanical drives, brass terminals, and wires onto panel mountings—is assembling a computer from technology whose essential aspects would have been familiar to Thomas Edison.

Howard Aiken was a forceful character who originally worked as an electronics engineer. While researching for his Ph.D. in physics (received from Harvard in 1937), he encountered a large range of mathematical calculations that he believed could be mechanized. After his proposal met with resounding indifference from Harvard's physics faculty, reports his biographer, I. Bernard Cohen, he learned that a lab technician had groused about not being able to see why in the world Aiken wanted to do "anything like this....[Harvard's physics department] already had such a machine and nobody used it." Astonished, Aiken asked to see the mechanism. He was shown a fragmentary set of wheels from Charles Babbage's Difference Engine, a quixotic attempt to build a computer using gears, levers, camshafts, and steam power that the English mathematician began in 1812.

Concerning his own first computing machine—the Harvard Mark I, or the IBM Automatic Sequence Controlled Calculator, depending on which side one takes in the dispute between Aiken and IBM's Thomas J. Watson Sr.—Aiken explained, "If RCA had been interested, it might have been electronic. It was made out of tabulating machine parts because IBM was willing to pay the bills."

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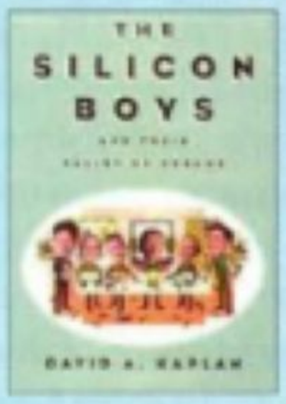
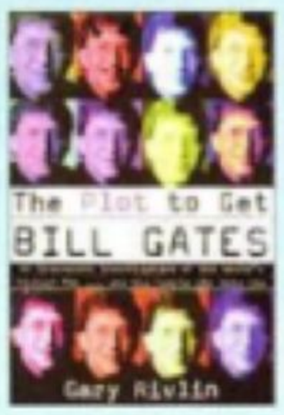
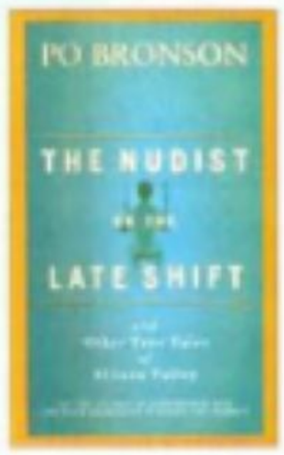
Was the Mark I actually a computer? It lacked conditional branching (the ability to reach a point in its calculations and "choose" a course), and Aiken distrusted the stored-program concept. Though it's hard to believe now, this idea—that you

SHELF LIFE



Wall Street in the '80s had *The Bonfire of the Vanities*: the definitive summation of an era of excess. Late-'90s Silicon Valley is still looking for its Tom Wolfe. The *Newsweek* writer David A. Kaplan's **The Silicon Boys** *and Their Valley of Dreams* (William Morrow, $27) veers into well-charted history too often on its way to Yahoo's ages-ago public debut (Nasdaq: YHOO)—that is, when it's not moralizing about how the high-tech community is more greedy than ever. The anecdotal bombardment will only bewilder Valley freshmen. The reporter Gary Rivlin's **The Plot to Get Bill Gates:** *An Irreverent Investigation of the World's Richest Man...and the People Who Hate Him* (Times Books, $25) takes a more balanced but narrower approach to Valley history. The book's central metaphor is Microsoft's CEO as Moby Dick, evading the harpoons of would-be Ahabs like Sun's Scott McNealy and Oracle's Larry Ellison. It's a well-written, often hilarious portrait of an industry obsessed with the world's most ruthless businessman. Portraits are what novelist (and *Wired* writer) Po Bronson does best, and his latest book, **The Nudist on the Late Shift** *and Other True Tales of Silicon Valley* (Random House, $25), is full of nuanced vignettes of technology's cast of characters, both minor and Moby-size. Sometimes, however, the authorial presence is just a little too...present.

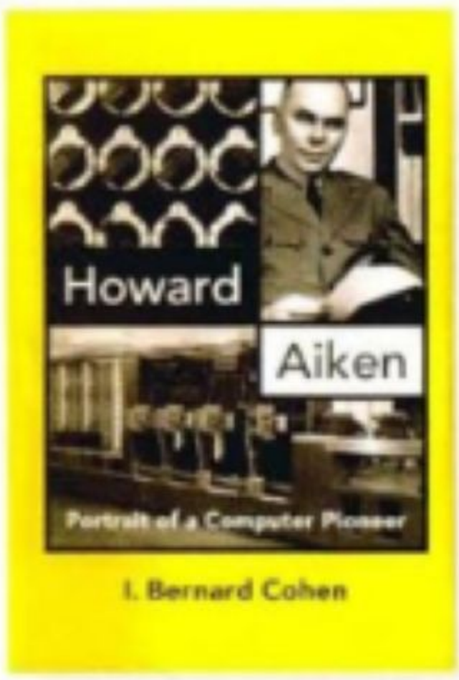




—*Bonnie Azab Powell*

wouldn't control a machine externally by throwing switches or replugging cables, but instead might risk letting its instructions be contained among the electrical pulses coursing through its circuits—required a leap that Aiken remained unwilling to make.

This biography, and a companion volume of essays and reminiscences edited by Mr. Cohen, *Makin' Numbers: Howard Aiken and the Computer* (MIT, $40), give a fine picture of Aiken's contributions to computer history. Still, these books don't tell you that, when the mathematician John von Neumann came from the Los Alamos National Laboratory to run a problem on the Mark I, he found the machine impossibly slow.



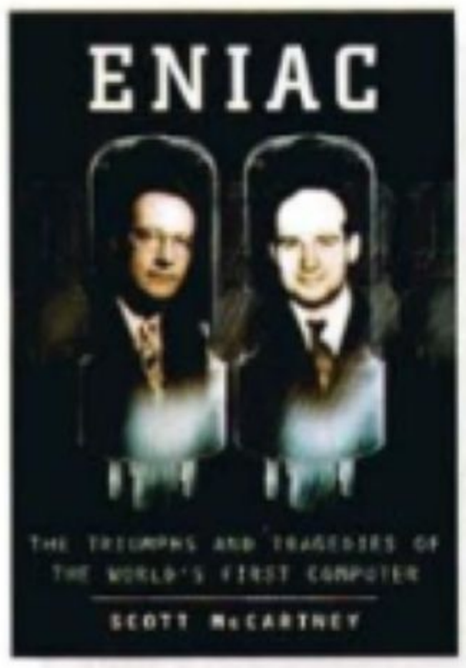
Having devised the implosion lens used to set off the A-bomb for the military's top-secret Manhattan Project, von Neumann was concerned with mathematically modeling the ensuing detonation and fireball. He was referred to the Mark I and to AT&T's Bell Labs, which had an electromechanical calculator that used telephone relays. Both machines proved inadequate. But in August 1944, on a railroad platform outside the U.S. Army's Ballistics Research Laboratory in Aberdeen, Maryland, von Neumann encountered Herman Goldstine, a young mathematics-professor-cum-military-officer who described another computing project that nobody had thought worth mentioning.

TUBAL LITIGATION

Which brings us to Scott McCartney's unfortunate *ENIAC: The Triumphs and Tragedies of the World's First Computer.* Stylistically, this book is a clunky effort. Furthermore, it tries to drum up interest in ENIAC's creators, John Mauchly and Presper Eckert, by simplistic dramatization, distortion, and outright omission—possibly due to ignorance—of well-known facts about computer history's longest-standing debate.

Here's the background. Mauchly, a physics teacher at a small college, wanted to build a calculator using vacuum tubes for weather prediction. In 1942 the U.S. war effort needed electronics workers. Mauchly duly attended the University of Pennsylvania's Moore School of Electrical Engineering, where he interested Eckert, his young lab instructor, in building such a machine. With 18,000 vacuum tubes, the Electronic Numerical Integrator and Computer could run 1,000 times faster than a machine using electromechanical relays. But given those tubes' unreliability, ENIAC could be reckoned to have 1.8 billion chances of failing each second. And because it was programmed using manually configured plugboards, ENIAC would take twice as long as Aiken's Mark I to set up for a problem. So nobody in the Army had bothered to tell von Neumann about it.

In 1944 von Neumann arrived in Philadelphia to discuss with ENIAC's creators their proposed next-generation Electronic Discrete Variable Automatic Computer, or EDVAC. Eckert was the true talent of the two: with ENIAC he had implemented a mercury delay line that functioned as a crude internal memory, and he intended to expand that technology in EDVAC. In early 1945, back in Los Alamos for final work before the first A-bomb test, von Neumann wrote the "First Draft of a Report on the EDVAC" and sent it to Goldstine. Putting only von Neumann's name on it, Goldstine typed the report and circulated 24 copies, first to von Neumann's colleagues and then—as requests came in—to several hundred others. The "First Draft" was a virtuoso synthesis of engineering principles, programming language, and architecture, and it deployed a symbolism of "neurons" and "hierarchy of memory" to explicate the stored-program concept—the leap that Aiken hadn't made.



Mauchly and Eckert, belatedly realizing that "First Draft" was a recipe for making high-speed, stored-program electronic computers, produced their own report three months later. It was, Mr. McCartney allows in ENIAC, "not nearly as eloquent as von Neumann's."

PATERNITY SUIT

So should von Neumann or Mauchly and Eckert get credit?

The latter argued that, based on Eckert's implementation of delayed-line memory, the stored-program idea was theirs. In 1946 they were fired by the University of Pennsylvania because they insisted on patenting EDVAC, which the school claimed was a public project developed under a wartime contract. Von Neumann and Goldstine (who'd become von Neumann's disciple) immediately filed their own patent application. A year later, the Army patent office judged that "First Draft" constituted prior publication, but the material therein, with its murky authorship and sourcing, was unpatentable. Mr. McCartney calls the ensuing litigation "a major lawsuit...avoided, but at a very high cost. Both parties lost, though history has credited authorship [of the computer] to von Neumann."

Indeed, von Neumann clearly won everything he had wanted. Mr. McCartney doesn't seem to know that in the month before gaining clearance to see ENIAC, von Neumann had been on the Ballistics Research Laboratory board that gave preliminary agreement to the EDVAC proposal and all it contained. Also, the author doesn't mention Alan Turing, whose 1936 paper "On Computable Numbers" competes with "First

Draft" as computer history's most influential document. Turing had been working on his doctoral thesis at Princeton University in 1937 when von Neumann offered him a position as personal assistant. And Turing's paper, which von Neumann urged the supervisor of computation at Los Alamos to read, hypothesized a "universal computing machine" that could replicate any other machine's behavior by encoding functions as a string of digits—implying software and stored programs.

Mr. McCartney's book, in other words, tells a simplistic story of Mauchly and Eckert as heroes robbed of intellectual property. Yet von Neumann arrived in Philadelphia already aware of much of EDVAC's basic design and with many thoughts about what electronic computers might do. The real story is more interesting—and darker, in its way—than the one Mr. McCartney paints when he suggests that von Neumann was "simply a scientist with a big reputation who enjoyed the limelight and saw an important opportunity to further his own legend." It seems unlikely that von Neumann still cared that much about enhancing his already inflated legend. In the '20s he had supplied the mathematical underpinnings of quantum mechanics. His foundation work on game theory contributed to the United States' Mutual Assured Destruction strategy during the Cold War years, which was born of the bombs he worked on. Von Neumann came to Philadelphia, took what he needed, improved it, and combined it with other things he'd thought about.

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Mauchly and Eckert—merely bright men who hadn't even heard of Babbage, let alone Turing—really thought they had invented the stored program. Near his life's end, the perennially unsuccessful Mauchly complained to his diary, "So much has been taken away." Eckert, who had some success in his career, nevertheless brooded after retirement, "If it wasn't for this damn luck."

Yet there was little that was random about what happened. "I am thinking about something much more important than bombs. I am thinking about computers," von Neumann stated in 1946. Seeing the tidal wave of computational power near to breaking over the world, he turned all his powers toward ensuring that such power advanced without restrictions. Mauchly and Eckert simply remained in his shadow.

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