

The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution, by Walter Isaacson. New York: Simon & Schuster, 2014. xiv, 543 pp. Illustrated timeline, photographs, notes, index. \$35.00 hardcover.

Reviewer Bill Silag, a former editor-in-chief at Iowa State University Press and a former editor of the *Palimpsest*, the State Historical Society of Iowa's popular history magazine, wrote the entries for John Vincent Atanasoff and his assistant Clifford Berry in *The Biographical Dictionary of Iowa* (2008).

"There are thousands of books celebrating people we biographers portray, or mythologize, as lone inventors," writes author Walter Isaacson in his introduction to *The Innovators*, "but we have far fewer tales of collaborative creativity, which is actually more important in understanding how today's technology revolution was fashioned" (1). Thus *The Innovators* focuses particularly on the men and women involved in the key innovations of the digital age, with an eye to identifying the well-springs of their creative leaps; the skills that proved most useful to them in achieving their goals; and the reasons why some innovators succeeded while others failed.

Ten of the book's twelve chapters are devoted to explications of specific innovations—the computer, programming, the transistor, the microchip, video games, the Internet, the personal computer, software, email and other online services, and the World Wide Web—along with consideration of the incentives driving their originators and the implications of their respective achievements for the field as a whole. The first and last chapters address major conceptual issues that have informed the processes of discovery and invention that constitute the digital paradigm as it has evolved over the past two centuries. Isaacson's lucid prose is a hallmark of *The Innovators* from start to finish, as are his even-handed characterizations of the alliances, feuds, and lawsuits among the principals involved in the development of one digital innovation or another.

Two scientists with Iowa connections figure prominently among the scores of inventive men and women profiled in the course of Isaacson's 500-page narrative—Iowa State College (ISC) physics professor John Vincent Atanasoff (1903–1995), a pioneer in the application of digital electronics to computing, and Intel founder Robert Noyce (1927–1990), an inventor of the microchip, who was born in Iowa and educated at Grinnell and M.I.T. To Isaacson, Atanasoff and Noyce represent distinctly different cultures of innovation. In the early 1940s, Atanasoff and his assistant Clifford Berry had designed and were building a prototype computing device at ISC, but interest in the project was scant among their faculty colleagues and college administrators. Atanasoff

was basically on his own at ISC, says Isaacson, and progress was slow. "He could come up with fresh ideas, but he did not have around him people to serve as sounding boards or to help him overcome theoretical or engineering challenges. Unlike most innovators of the digital age he was a lone inventor" (56). A generation younger than Atanasoff, Robert Noyce was by contrast a gregarious team leader who gathered diverse perspectives—and necessary resources, financial and otherwise—when addressing the challenges of innovation. In the early years at Intel, Noyce's own desk sat in the middle of a large, noisy room containing the desks of everyone else working at the company; there he could draw on ideas and inspiration from all team members regardless of academic credentials or position in a table of organization. Until his death in 1990, Noyce's innovations represented the epitome of the "collaborative creativity" that Isaacson celebrates throughout *The Innovators*.

As for the computer project at ISC, in 1942 Atanasoff and Berry went off to serve in the war effort. At the time they left Iowa, a model of their computer had been built and work had begun on constructing a prototype. Their project material was put in storage at the college, no patent application was ever filed, and neither Atanasoff nor anyone else ever worked on the project again. After the war both Atanasoff and Berry went on to successful private-sector engineering careers. Later, in the mid-1960s, a federal court agreed to hear testimony regarding patent claims on the digital electronics used in computing devices. A ten-year legal battle ensued, ending with the court's 1973 ruling that the technology at issue was the creation of John Atanasoff, and that he should be recognized as the inventor of the electronic digital computer. Isaacson questions the court's decision on several grounds. Atanasoff's computer, he points out, was not fully electronic; nor was it designed to do anything but solve linear equations. Most importantly, the computer at ISC was never fully operational. Isaacson points instead to the computer built with federal funding at the University of Pennsylvania during World War II by John Mauchly and Presper Eckert, co-claimants demanding copyright protection in the court case involving Atanasoff's computer. "Mauchly and Eckert should be at the top of the list of people who deserve credit for inventing the computer, not because the ideas were all their own, but because they had the ability to draw ideas from multiple sources, add their own innovations, execute their vision by building a computer team, and have the most influence on the course of subsequent developments" (84). The sequence of skills thus identified by Isaacson was essential to the success of Noyce at Intel and to many of his corporate neighbors in Silicon Valley, and that approach has since become standard practice in the industry.