To the Digital Age: Research Labs, Start-Up Companies, and the Rise of MOS Technology. *By Ross Knox Bassett.* Baltimore: Johns Hopkins University Press, 2002. xii + 421 pp. Index, notes, bibliography, figures. Cloth, $44.95. ISBN 0-801-86809-2.

Reviewed by James W. Cortada

Metal-oxide-semiconductor (MOS) transistors are the technical hearts of today's computer chips. They are the building blocks of the microprocessors that make modern computers possible, regulate the use of gasoline in our cars, and make most home appliances work. Ross Knox Bassett has written a history of how that technology came into being and stimulated the creation of a group of "high-tech" American firms. In the process, he provides a case study of how complex products are developed in a modern commercial setting. The earliest transistors were created in the 1940s; MOS transistors came into their own in the 1960s. Basset takes their history to 1975 but appends a chapter that briefly surveys their evolution to the present.

On the one hand, this is a chronicle of a technology; on the other, it is a history of several firms that developed and manufactured computer technology. As technical history, it is a clear, precise discussion of the decades of struggle to miniaturize transistors, package them into smaller platforms, and endow them with greater capacity. Bassett illustrates how the corporate culture of a company's R&D organization, and the values of a firm's senior executives, launched technological trajectories that influenced the direction of their products. Thus, for example, Fairchild and Intel quickly designed products they could sell immediately to generate cash and profits with which to fund other innovations. IBM, which used all the transistors its internal plants could produce in its own computer products, operated with different priorities and at a slower pace. This book is a major contribution to the history of the semiconductor and the only one devoted to its most important variant, the MOS transistor.

However, this is also a business history. Bassett traces the evolution of MOS technology through a series of case studies of companies that developed the technology and turned it into commercial products. He begins the story with Bell Labs, where the original transistor was built in the 1940s, then follows the evolution of semiconductors at IBM, Fairchild, and Intel. He demonstrates how the technology influenced the creation and growth of important firms in the semiconductor industry as they broke away from Fairchild and moved west to set up shop in Silicon Valley, where their operating styles soon diverged from those of East Coast firms, like IBM and RCA. West Coast producers, for example, operated in the short term, incrementally

developing new products, while East Coast firms tended to introduce innovations more slowly and within a grander strategic template.

The author relies on contemporary technical literature to demonstrate how information about the technology spread rapidly within the research community. Researchers moved easily from firm to firm in the early days of semiconductors, thereby transferring information from one enterprise to another. The corporate archival material he has unearthed sheds new light on the technological activities of firms like Fairchild, ATT, IBM, Intel, and RCA. The result is an authoritative, comprehensive history of semiconductor technology and the underlying economic and business events that made possible its appearance and fostered its success.

This book fits neatly into a recent trend in business history of integrating economics, technology, and business to describe the emergence of new products and industries. Histories of semiconductors, and computers have traditionally been written by engineers, who not surprisingly have what we can call a technocentric view. Increasingly, however, we are learning that economic and business forces (such as corporate culture) have at least as profound an influence on the nature of a new technology and its product forms, and Bassett's book exemplifies this new historical direction. In addition to its being a good history of an important technology, *To the Digital Age* offers a model description of the nexus of technology, research, and business practices in American corporations in the second half of the twentieth century. Bassett demonstrates that he is both a competent technologist and a good business historian. Because his style is straightforward, the reader is not required to be knowledgeable about the technology. Technical issues are explained clearly, along with their implications. His book joins a rapidly growing body of valuable research on the emergence and role of computer technologies in American society.

James W. Cortada works at IBM and is the author of two dozen books on information technology industry, most recently, Making the Information Society *(2002). His most recent book,* The Digital Hand: How Computers Changed the Work of American Manufacturing, Transportation, and Retail Industries, *will be published this year*.