

point of offering as fact Terman's judgments of those with whom he had conflicts, which often suggested that his antagonists lacked intelligence, temperamental fitness, or mental stability. For example, in his discussion of the relationship between Stanford's physics department and Depression-era patron Sperry Gyroscope, Gillmor states that Terman, William Hansen, and Russell and Sigurd Varian had no significant conflicts with Sperry; clashes with the company are attributed to physics chairman David Locke Webster, who is described variously as paranoid and temperamental. This interpretation (which was also Terman's) shows a surprising lack of understanding of the issues regarding professional autonomy and scientific patronage that were at stake in the Sperry-Stanford conflict, which was colored by, but is not reducible to, a clash of personalities.

Gillmor is strangely uninterested in these broader issues. For example, on page two, he dismisses those historians of science who have argued that patronage influenced the shape of academic disciplines during the cold war, writing that "there is no such thing as a free lunch, even at a university." But those who have studied the history of academic patronage do not claim otherwise; rather, they have sought to understand what compromises were made to attract support, who did the compromising, and what the ramifications were—for professors, the academic disciplines, the university, and the larger society. Readers interested in these matters—in which, by the way, Terman himself took considerable interest—should look elsewhere.

Even judged as hagiography, *Fred Terman at Stanford* is uneven and repetitive. For example, within eleven lines of text on page 313, Gillmor mentions three times that Walter Vincenti joined the Stanford faculty. It also is needlessly detailed, providing, for example, Terman's undergraduate course grades and discussing his overuse of Metamucil in old age. And yet it is oddly silent about significant issues, such as Terman's complicated relationship with his father, the noted psychologist and Stanford professor Lewis Terman. Among the better parts of the book is the discussion of Terman's work as an engineer, something Gillmor seems to know something about.

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Territories of Profit: Communications, Capitalist Development, and the Innovative Enterprises of G. F. Swift and Dell Computer.

By Gary Fields. Stanford, Calif.: Stanford University Press, 2003.

Pp. xviii+281. \$24.95.

Historians of technology have a tendency to make grand comparisons across decades or even centuries, either to mark moments of discontinuous technological revolution ("the new electrical/petrochemical age!") or to illus-

trate periods of convergent technological evolution (“the second industrial age!”). Although the value of such comparisons is always limited, they can help us reconceptualize both the times and the technologies that we explore in an intellectually productive way. Gary Fields has made such a fruitful comparison in *Territories of Profit*, arguing for important parallels between the late nineteenth century and the late twentieth in the ways in which “business users of transport and communications systems learn to reorient their competitive strategies and operational routines,” ultimately enabling them to “reshape the geographical territory of profit making” (p. 1). However, this fascinating and well-crafted comparative study is grounded more on organizational research and economic geography than on recent technological history and social theory, and for that reason may be of more interest to scholars of management than to historians of technology.

Fields’s book is based on his dissertation in city and regional planning at the University of California. It juxtaposes “new” information-communication-transportation (ICT) technologies of the nineteenth century with those of the present day through a comparison of two “system building” entrepreneurs who figured out how to use those technologies to gain decisive advantages over their competitors: the 1870s–80s purveyor of precut frozen beef Gustavus Swift, and the 1980s–90s manufacturer of customized personal computers Michael Dell. For each man, Fields argues, success meant “both the processing of enormous amounts of real-time information and the manipulation of high-volume flows of goods” (p. 6).

Fields’s argument is grounded firmly in recent theories from business history (especially following Alfred Chandler and William Lazonick) and economic geography (the work of Manuel Castells and AnnaLee Saxenian). Both the “visible hand” of management organization and the careful siting of production and distribution nodes in existing “industrial districts” were crucial to the success of Swift and Dell. Surprisingly, however, Fields only briefly mentions theoretical work that deals with the dual nature of technological systems as *social* systems. He sees success stories in which managers were able to “learn by using” new ICT infrastructures. Such learning fueled a round of capitalist “creative destruction” as both firms decreased production turnover time, reduced risk in procurement and distribution, and removed opportunities for profit and control by intermediate firms. What emerges is a fine set of historically grounded management lessons, but a limited narrative of the relationship between technology and culture.

The most worrying limitation of Fields’s firm-centered approach is the near-total removal of three sets of actors who are crucial to his historical analogy: workers, consumers, and the state. Fields focuses on the innovative “learning” of only one historical agent (the firm); the actions of any other historical agents are assumed to be part of the environment that the firm must “learn” about. But workers, consumers, and the state are affected by “communications revolutions” as well, and may be acting in new ways—

even “learning” in their own right. For example, both Swift and Dell innovated not only in commodity distribution, but also in the organization of work, each scaling-up a huge low-wage and (presumably) low-skill workforce which had a set of time-space characteristics all its own. Even a cursory glance at the history of ICT infrastructure firms themselves (from Western Union to Microsoft) shows that the responses of workers, customers, and regulator groups matter when trying to plan out a new technological system or construct a new technological landscape—whether for social progress, or owner profit, or both.

All this is not to deny that firms matter; as Fields reminds us, both Swift and Dell grew in size and scale to lead their respective industries—Swift becoming “the largest meatpacking firm in the country and even the world” in 1903, Dell ascending “to the position of the largest PC firm in the world” in 2002 (p. 22). But even the largest firms are social as well as economic entities. How is such power perceived by consumers, by employees, and by the state? Fields mentions the popular disapproval, strikes, and antitrust suits involving Swift in a scant few pages, and offers even less insight into such factors in the case of Dell. In ending his narrative, he makes a final claim across the centuries: since the railroad and the telegraph were “technologies truly without precedent,” then “the entire period from the mid-nineteenth century to the present day is arguably a single communications revolution” (pp. 231, 132). Perhaps; I myself and many other historians of ICT infrastructure have argued similarly. But revolutions are made—and experienced—by more than just capitalist firms.

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The Government Machine: A Revolutionary History of the Computer.

By Jon Agar. Cambridge, Mass.: MIT Press, 2003. Pp. viii+554. \$50.

This book traces the history of the British government as a “machine” in itself, and its use of machines in order to fulfill its functions. Jon Agar analyzes the development of ideas of government and the (ideal) ways it should function while simultaneously charting the evolution of organization, systems, office machinery, and ultimately the computer in carrying out the tasks of government. One of his central premises is that the idea of the machine-driven government precedes the actual uses of machinery, and indeed fosters and promotes the development of machinery.

The Government Machine begins with a survey of the ways in which the technical aspects of government developed in the nineteenth century and the ways in which ideas of mechanization began to be put forward. Agar