"The Social Security Act of 1935 required that the U.S. government maintain employment records on twenty-six million people, a task that required the processing of a half-million punch cards per day. Conservative editorial opinion maintained that the system 'depersonalized' individuals by treating them as numbers." [From *The Control Revolution*; Courtesy of U.S. Social Security Administration]

work as he applies his analysis to the history of many nations.) Beniger's cheerful affirmation that humankind inevitably adopts anything that strengthens control (technologies and organizations need only be purposive, not purposive to any *particular* end) is a striking manifestation of this historical determinism. If one were a thoroughgoing and reflective determinist, the implications for the future of free societies and free individuals should prove troubling. The work of the political scientist Langdon Winner (*Autonomous Technology*, 1977, and *The Whale and the Reactor: A Search for Limits in an Age of High Technology*, 1986), for example, raises the specter of powerful organizations mindlessly employing out-of-control technics to engineer ever more efficient, more effectively controlled individuals and social systems.

The perspectives of history, however, provide some hope as well as some cause for despair. Despite the power of integrative technologies and organizational structures since the beginnings of what Beniger terms the control revolution, free societies have thus far survived. It also appears that, despite our vaunted organizations and technologies, we are as far from being the masters of our fate as we have ever been. In the Victorian era self-confident optimism reigned about the inevitability of progress based on science and on technology. More recently the horrors of the 20th century have led some to fear an authoritarian technology's power to destroy all life or virtually any life worth living. But we are never as good as we think. Perhaps it is that knowledge that has kept Chandler—if not his most enthusiastic followers—from embracing full-blown historical determinism.

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A Flow of Technology

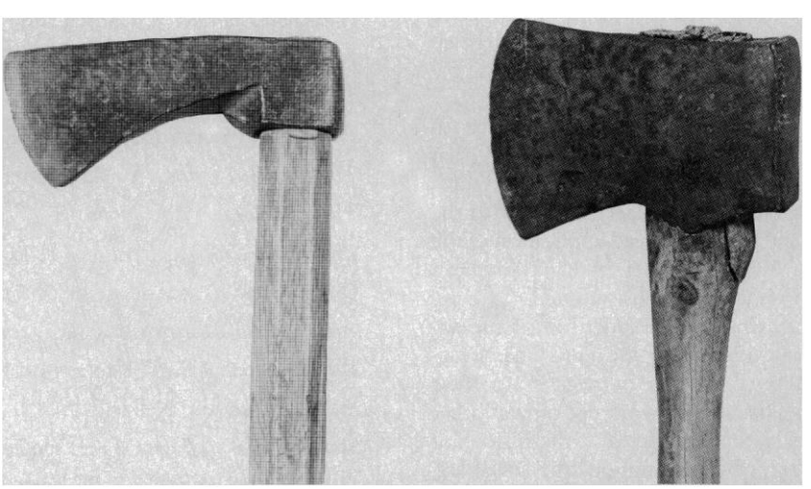
Engines of Change. The American Industrial Revolution, 1790–1860. BROOKE HINDLE and STEVEN LUBAR. Smithsonian Institution Press, Washington, DC, 1986. 309 pp., illus. $29.95; paper, $14.95.

This handsome book is designed to accompany an exhibit at the Smithsonian Institution's Museum of American History but stands alone on its own merit. Growing out of a concern for the interpretation of material culture (the physical objects on display in the exhibit), it uses artifacts to get at the shape and meaning of what the authors call the American Industrial Revolution. Addressed to the general museum-going public, the book represents at the same time a significant step forward for scholarship in the history of American technology, but a step taken to a different, and somewhat old-fashioned, drummer.

The story here told is a familiar one. The Industrial Revolution, arising in Great Britain in the 18th century, spread to the new United States in the years immediately after America's political revolution. Here the new machines, materials, and techniques, imported piecemeal and often in contravention of British laws, found a fertile ground for growth. An abundance of natural resources, an urge to grow, expand, and develop, and what was called a "want of hands" to do the work all pointed to a grateful acceptance of the new industrial technology. Indeed the ease and rapidity, appearing to us as a near inevitability, of the "transfer of technology" from the Old World to the New casts real doubt on contemporary attempts to prevent what the Reagan administration calls a hemorrhage but which may be only a natural flow of technology across the face of the earth.

The book is handsomely illustrated with maps, prints, and photographs of actual industrial sites and machines, many of the last taken from the Smithsonian's marvelous collection. More than most subjects, the history of technology needs well-selected illustrations, and these are used judiciously and effectively to explicate rather than simply supplement the text.

Hindle and Lubar's effort marks the first attempt by professional historians of technology in many years to provide a comprehensive narrative account of the development of American technology over a significant span of years. Furthermore, the authors make frequent mention of women, slaves, Native Americans, and others usually absent



European (left) and American (right) axes. "The best example of anonymous technology [that developed in America] may be the elegant American felling axe. Many different sorts of axes were imported from Europe, but the most critical change occurred in the felling axe, a crucial tool because of the vast effort required to clear woodlands. The American axe was unique in that the bit, or cutting edge . . . , was just about the same weight as the poll or flat edge . . . . In contrast, the European axe had a longer and narrower bit and hardly any poll at all. This difference permitted the American axe to be swung straight and clean, without . . . wavering. In addition, the wooden handle was given a length and curve precisely fitted to the height and swing of the axman. The result was remarkable. A practiced American axman could fell three times as many trees in the same time as a man using a European axe." [From *Engines of Change*]

from studies in a field that seems often to float above race, gender, and class. At the same time, it must be reported that the attempt is only partly successful. The "new social history" and references to race and gender seem uncomfortably out of place in these pages, present but isolated from any real meaning or explanatory power. The story of American technology seen from the vantage point of those left out or done in by its triumphant march might be expected to read differently, but in this book the "exhilaration," as Hindle called it two decades ago, is still the dominant, even solitary, theme. Nevertheless, this is a fascinating book, well written, well illustrated, comprehensive, and showing awareness, if only imperfectly, of social complexities hardly mentioned by previous authors.

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Remedial Acculturation

Cultural Literacy. What Every American Needs to Know. E. D. HIRSCH, JR. Houghton Mifflin, Boston, 1987. xx, 251 pp. $16.95.

E. D. Hirsch, who teaches English at the University of Virginia, attempts in this book to document the appalling lack of cultural knowledge of American high school and college students. His examples, which come from various surveys, interview studies, and anecdotal evidence, are truly amazing. Many students did not know when the Civil War or World War II was fought. A pre-law student thought that Washington, D.C., was in Washington State. Many could not identify Thomas Jefferson, others thought that Latin was spoken in Latin America. When asked the name of an epic poem by Homer one eager respondent volunteered "The Alamo." A junior at the University of California thought that Toronto was in Italy. The illiteracy of American students is indeed frightening. But the solution the author proposes is not an answer but a part of the problem; it partakes of the illness of which it fancies to be the cure.

Hirsch argues that "to be culturally literate is to possess the basic information needed to thrive in the modern world" (p. xiii). "The basic goal of education in a human community is acculturation, the transmission to children of the specific information shared by the adults of the group" (p. xvi). The author seems to presume that culture does not consist of values, beliefs, traditions, and philosophies but is simply a matter of information. This impoverished notion of culture informs and biases the book as a whole, as the author's explicit statement testifies: "It should energize people to learn that only a few hundred pages of information stand between the literate and illiterate, between dependence and autonomy" (p. 143). The gimmickery of this cure for our cultural disarray seems peculiarly American. There are no cultural problems, it seems, that cannot be cured by a quick and almost painless shot of patent medicine.

Educational researchers, sociologists, and cultural analysts have documented in the last few decades that cultural transmission is largely channeled through mechanisms that have a strong class basis. According to a series of studies by the French sociologist Pierre Bourdieu of the Collège de France, "symbolic capital," just like financial capital, is unequally distributed in modern industrialized societies. Those who have cultural resources transmit them to their children. The inequality of such resources within the social structure ensures the continuity of class-based cultural systems even in formally equal educational systems. The British social scientist Basil Bernstein has shown in a variety of studies that the linguistic codes prevalent in the working class prevent its children from acquiring the abstract knowledge that opens the doors to higher levels of education. Hirsch ignores all this evidence and asserts that mainstream culture is not class-based. He even rejects the evidence that in the linguistic culture of contemporary London there are major differences between cockney and Oxbridge, or BBC, English. No wonder he argues that "we should direct our attention undeviatingly toward what the schools teach rather than toward family structure, social class, or TV programming" (pp. 19–20).

Hirsch repeats the often reiterated contention that the trouble with American schools is the newfangled doctrine of Dewey *et al.*, which stresses educational pragmatism, practical social goals, and the development of autonomy and individual competence at the expense of the transmission of the cultural verities. He welcomes what he calls "the counterreform of the 1980s [which] seems bent upon a return to a more traditional curriculum" (p. 125) and wishes his book to be understood as a vital part of this counterreform.

The specific contribution he makes to this cause is a list of some 5000 items, names, phrases, concepts, and technical terms, that, he asserts, can be provisionally taken to be what a literate American is supposed to know. The list, based on his collaboration with a historian and a natural scientist, constitutes an appendix of over 60 pages in this small volume. It is wholly arbitrary and therefore worthless. It includes, for example, Tolstoy and Chekhov but neither Dostoevsky nor Turgenev. Proust is on the list but Gide is not; Giotto is included but Caravaggio is not listed. James Baldwin is omitted but Ralph Ellison is included. And so it goes.

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Image Makers

Selling Science. How the Press Covers Science and Technology. DOROTHY NELKIN. Freeman, New York, 1987. xiv, 225 pp. $16.95.

The signs of popular fascination with science and technology, as well as enthusiasm for realizing the promise of new technologies, surround us. For example, consider the central role that discussion of science is sure to have in the 1988 presidential campaign. No candidate will be able to avoid a position on how to assure the technologic preeminence of the United States and the linkage of science to "economic competitiveness."

Those who are not part of a particular scientific community must rely on the media (daily newspapers, magazines, television, and radio) to learn what is happening. If the news is inaccurate, so is public understanding. Thus Dorothy Nelkin's *Selling Science: How the Press Covers Science and Technology*, with its aim to "explore the images of science and technology that are conveyed to the public through the press, and the characteristics of both journalism and science that contribute to shaping these images" could not be more timely.

This is a book about what science appears to be—not necessarily what it is—and who is responsible for the public image. At its heart is an analysis of the roles and motivations of scientists and science journalists in speaking to the public and how the rules are now changing.

The book raises fascinating questions: What are the popular images of science and technology and how were they formed? How does the press view the scientist, describe ambiguous technologic situations such as Love Canal or the saccharin controversy, and as a result influence public opinion? Recognizing the power of the press, how do scientists try to control the news?

Science journalism has evolved greatly over the past 60 years. Nelkin's description of the culture of science journalism, its historic origins, and its current evolution is