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

first-rate, as is her examination of how scientists have become advocates for their profession and public relations specialists. Nelkin sees the character of science journalism changing from that of a booster "selling science" to that of a mature critical observer that often challenges the assertions of the scientist. Her text is well written, easy to read, and filled with delightful anecdotes. Yet the book is uneven and often disquieting.

The book suffers from one problem attributed to science journalism—the need to condense and simplify. Nelkin, aware that all branches of the media would be too ambitious a subject, has rightly chosen to focus on the relationship between the print media and the scientific community. But both communities are drawn too homogeneously.

Another grounds for concern is the apparent vacillation about which of several apparently conflicting roles is most appropriate for science journalism. One role for the journalist is as a decipherer, accurately translating technical images into the language of the lay reader. The other is as an arbiter of scientific controversy, providing for the reader not only the different scientific arguments but an assessment of which point of view the reader should credit. In the end, Nelkin seems to favor the latter and even more, calling for journalists to "try to convey understanding as well as information. It is not enough to merely react to scientific events, translating and elucidating them for popular consumption. To understand science and technology, readers need to know their context: the social, political, and economic implications of scientific activities, the nature of evidence underlying decisions, and the limits as well as the power of science as applied to human affairs."

Finally, I am bothered by the lack of sufficient discussion of one feature that distinguishes science and journalism. Science is often self-correcting; that is, the imperative for independent verification of facts forces accountability on scientific reports. In journalism, there is no comparable pressure for accountability. Despite some of Nelkin's suggestions, I doubt that any standards can be imposed by outside groups. Standards for science journalism must come from within the journalism profession.

This is a book that should and will be read. As with much good analysis, more questions are raised than answered, and the discussion this book can provoke may well reveal how to improve science communications.

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# The Manhattan Story Retold

**The Making of the Atomic Bomb**. RICHARD RHODES. Simon and Schuster, New York, 1987. 886 pp. + plates. $22.95.

At first glance, this does not seem to be a book to command the serious attention of *Science* readers. Its author, a journalist, novelist, and nonfiction writer, tells a story whose outlines, at least, are well known to the scientific community; it is based for the most part on well-mined sources; it is novelistic in its treatment of people and events; and it is very long. But to turn away from the book would be a mistake. Because of its comprehensiveness and the framework within which its main story unfolds, it broadens and deepens our understanding of the familiar subject; and it is a very good read.

Chronologically, *The Making of the Atomic Bomb* takes us from the birth of modern physics in the late 19th century to the first tests of hydrogen bombs, by the United States in 1954 and the Soviet Union in 1955. Geographically, though its central locale is America, it ranges across the great European laboratories where modern physics was born, the theaters of operation in both world wars, and the sites of the nascent nuclear bomb projects in Germany, Russia, and Japan. Its cast of characters is as large as its subject; it includes the scientific, political, and military figures who had a hand in making the 20th century the most violent time in human history. Its mode is narrative; yet within that structure the author provides detailed explanations of the physics and engineering that are behind the birth of the atomic age.

Apart from the Leo Szilard papers, which only recently have become available for use, Rhodes's archival sources are standard for the subject, including chiefly the Bush-Conant File in the Office of Scientific Research and Development papers, the Manhattan Engineer District records, the papers of J. Robert Oppenheimer, and interview transcripts at the American Institute of Physics. Rhodes himself interviewed a number of surviving participants in the events he describes and visited many of the institutions in the United States, Europe, and Japan where those events took place. Although one can wonder about some omissions, the bibliography of printed sources, both primary and secondary, is impressively thorough and wide-ranging and gives him a solid foundation for his ambitious book.

The narrative thrust of this book is toward the dawn of the "new age" that was born with the testing and use of atomic bombs, which would render obsolete traditional ideas about warfare and security and the customary conduct of international affairs. But within this theme of novelty Rhodes develops a subtheme of equal importance: from the gassing to death of soldiers in World War I, to the incineration of civilians in massive incendiary raids in World War II, to the blasting and radiating to death of appalling numbers of people with two atomic bombs in Hiroshima and Nagasaki, 20th-century warfare is on a single continuum. The marriage of science and technology has made it possible for the nation-state to deal death to an enemy on an awesome scale. The temptation to realize that possibility proved to be irresistible and was "justified" as a means of saving life by winning (ending) the war, even though all moral inhibitions and legal restraints on the conduct of war were thereby nullified. This observation, of course, has been made before. But by directing our attention to the continuum at the same time as he describes a revolution, Rhodes gives emphasis to what we already know about technology, total death-making, and the inner imperative that drives the technology of total death-making toward an always unattainable perfection. Furthermore, Rhodes describes the experience of human beings who were subject to technological death-making in unforgettable prose.

Rhodes reminds us of the different perspectives of scientists, who were motivated to work on the Manhattan Project out of fear of a thousand-year Reich made invulnerable with atomic bombs, and policymakers, like Franklin Roosevelt, Vannevar Bush, and General Leslie R. Groves, who never were primarily concerned about the possibility of a German atomic bomb. For them the chief considerations were the offensive advantage that such a bomb would confer and the long-range consequences of a new class of destructive weapons. The reminder that in policy-making quarters atomic bombs always had been viewed as another instrument of war helps us to understand the almost perfunctory consideration of alternatives to dropping them on Japanese cities.

Two scientists who from the first recognized that nuclear weapons had revolutionary military and political implications and