technology is that a book about so ordinary a subject can take up such intriguing questions.

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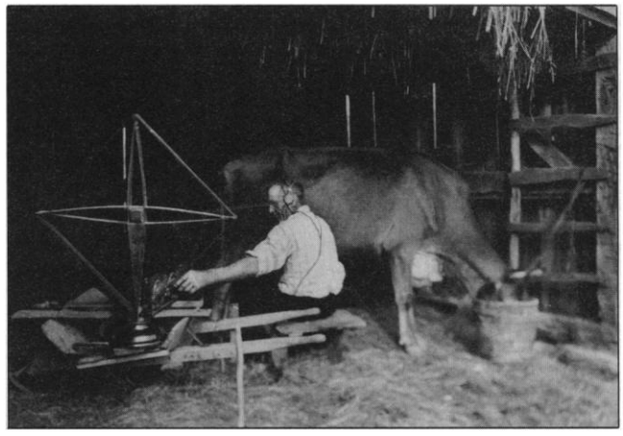
Airwave Accommodations

Selling Radio. The Commercialization of American Broadcasting, 1920–1934. SUSAN SMULYAN. Smithsonian Institution Press, Washington, DC, 1994. viii, 223 pp. + plates. $24.95 or £19.50.

At the Third National Radio Conference in 1924, Secretary of Commerce Herbert Hoover warned in a much-quoted speech, "The quickest way to kill broadcasting would be to use it for direct advertising. . . . If a speech by the President is to be used as the meat in a sandwich of two patent medicine advertisements there will be no radio left" (p. 41). Hoover expressed a common concern about the new medium. Like Thomas Edison, who hoped his invention of the motion picture would be used for science and education, most people invested utopian hopes in radio. It was to do everything: restore a lost national political and moral consensus, stem the decline in religious observance, advance high culture, cure rural isolation, and even bring world peace. Few people supported the commercial hijacking of radio, yet within a few years the ether became a vast advertising outlet. Susan Smulyan's bright, incisive monograph explains how a promising new technology was diverted to commercial ends.

No one knew how to make radio pay in its early years. Some people hoped philanthropists would finance it; Hoover thought businesses might sponsor it simply for good will; a few universities and city governments ran stations (notably New York and WNYC). Anticipating today's appeals for public broadcasting stations, some outlets tried to corral subscribers for an "invisible theater." Smulyan writes, "Before the advent of the networks, advertising stood out among the financing options only because it elicited the loudest protests and had the fewest supporters" (p. 68).



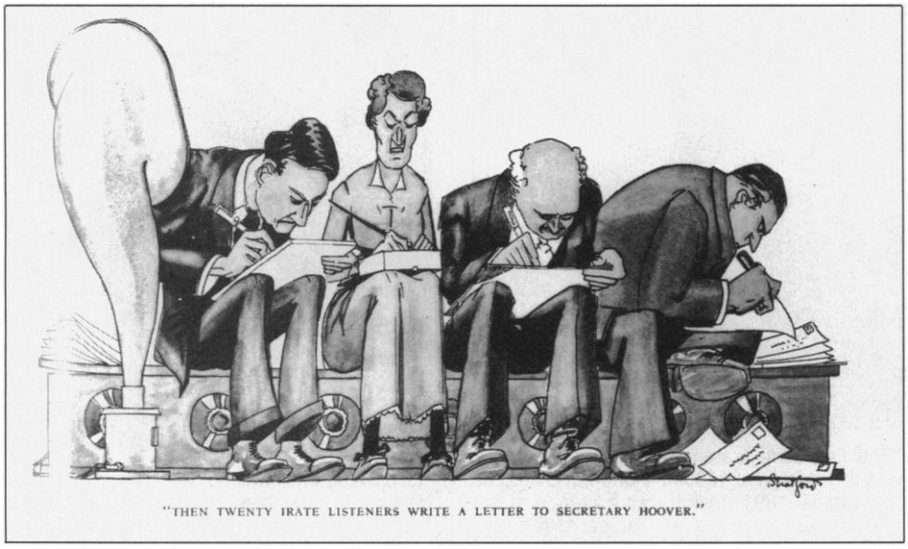
"This 1923 photograph, probably a publicity stunt, shows the importance to farmers of up-to-date information." [From *Selling Radio*; Prints and Photographs Division, Library of Congress]

The inauguration of the National Broadcasting Company and the Columbia Broadcasting System in the late 1920s changed everything. Technology and monopoly fit hand in glove to determine the outcome of the financing struggle, with momentous implications for control of the airwaves and program content. The most feasible technology proved to be sending programs over the telephone lines of the American Telephone and Telegraph monopoly. This method also boasted the political advantage of allowing an array of local stations to operate instead of having them drowned out by a few superpower stations, which was one of the principal alternatives.

But to pay AT&T's high costs the networks desperately turned to the only obvious source: advertising. To attract advertisers at salable rates, the networks had to centralize programming in order to save production costs and deliver the widest possible national audience. Diversity, whether regional, ethnic, or political, tended to be sacrificed as networks aimed at the broadest market. Nostalgic, rural-oriented performers like the "Happiness Boys" (Ernie Hare and Billy Jones) were supplanted by more hard-edged, urban stars, many of them vaudeville veterans. By 1932 Rudy Vallee, Eddie Cantor, Ed Wynn, George Burns and Gracie Allen, Jack Benny, George Jessel, Jack Pearl, and Fred Allen had become staples. Women were targeted with special programming, particularly the afternoon soap opera, which provided a showcase for selling the domestic ideal.

Radio's commercial settlement was ratified in the Communications Act of 1934, which with mild amendments remains the basis of American broadcast law to this day. Legislators applied the analogy of regulating "natural monopolies" like railroads and telephone service. Congress created the Federal Communications Commission, which has usually enjoyed cozy relations with big broadcasters and has contributed to the marginalization of noncommercial broadcasting.

Smulyan provides a lively, well-researched, persuasive account of how commercialized network radio came to be. She provides ample evidence of the tireless work of radio executives, notably David Sarnoff, to commercialize the medium. She is less clear, however, on alternatives to this peculiarly American system. Smulyan's analysis would be enhanced by more extensive



"This cartoon from a 1926 issue of *Radio Broadcast* magazine shows a variety of listeners seated on a receiver while writing angry letters about broadcasting to the Secretary of Commerce." [From *Selling Radio; Radio Broadcast* 8, March 1926]

analysis of Western European alternatives, which typically involved fewer stations and considerably more government control. It would be bolstered, too, by comparison with the American motion-picture industry, which underwent a similar process of consolidation. Almost simultaneously with the networking of radio, a handful of film companies knit once-independent theaters into vast chains. Their products, emanating from a central source, became glossier and more cosmopolitan, and, using some of the same stars as radio, reflected reduced diversity in programming. The two dominant media of American popular culture are prime examples of the consolidation of national economic institutions in the 1920s and '30s.

Smulyan's welcome book reminds us that the instigation and durability of media hegemony owe as much to conscious corporate strategies as to technological inevitability. Enveloped in a world of commercialized media, we might, as she suggests, "consider whether the cost is too high" (p. 168).

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The Chemical Past

The Norton History of Chemistry. WILLIAM H. BROCK. Norton, New York, 1993. xxx, 744 pp., illus. $35; paper, $15.95. Published in the United Kingdom by HarperCollins as *The Fontana History of Chemistry*; paper, £8.99.

Ideas in Chemistry. A History of the Science. DAVID KNIGHT. Athlone, Cambridge, U.K., and Rutgers University Press, New Brunswick, NJ, 1992. vi, 213 pp. $47 or £38; paper, $18.

The History of Chemistry. JOHN HUDSON. Chapman and Hall, New York, 1992. x, 285 pp., illus. $59.95; paper, $24.95.

Histoire de la Chimie. BERNADETTE BENSAUDE-VINCENT and ISABELLE STENGERS. Éditions de la Découverte, Paris, 1993. 360 pp., illus. Paper, F180.

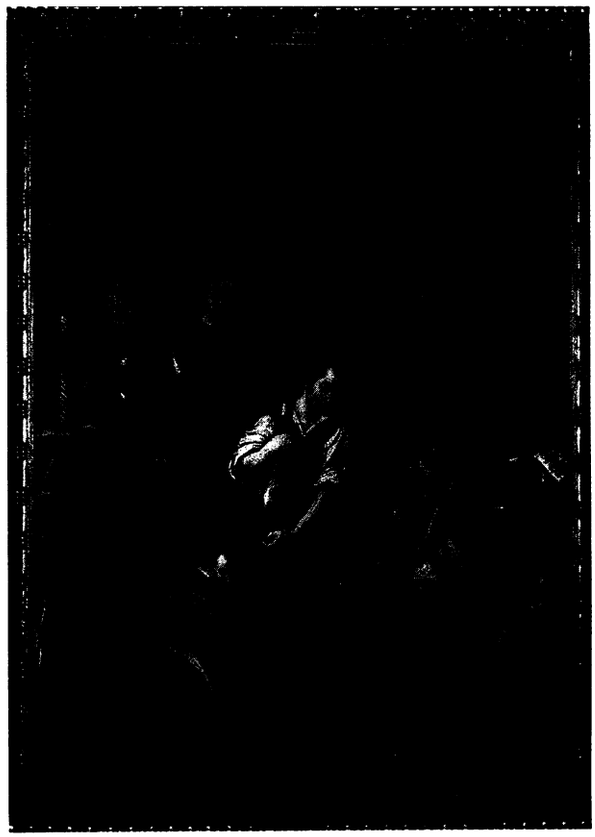
Throughout the 19th century and until the Second World War the history of chemistry was routinely part of the chemical curriculum in the United States and other countries. Many of the founders of the history of science as a discipline (for example, James Bryant Conant), as well as the most distinguished historians of chemistry (for example, James R. Partington and Aaron J. Ihde), have been chemists. Yet the history of chemistry began to disappear from the post-war, post-Sputnik university curriculum.

Some developments described by William Brock in *The Norton History of Chemistry* suggest at least two reasons. For example, Brock comments on the importance of Linus Pauling's 1947 undergraduate textbook *College Chemistry*. Since the early 19th century, chemistry textbooks largely had been organized in a sequence more or less corresponding to the historical development of the description and classification of elements, compounds, and their reactions, with some attention to apparatus and analytical methods. In contrast, Pauling's text opened with up-to-date theoretical principles based in quantum chemistry and thermodynamics. A result was an erosion of the traditional historical approach to chemistry.

In another context, Brock discusses how the curriculum reform that was an important focus of science education in the United States in the 1960s played itself out in chemistry. One approach, initiated by Laurence Strong and O. Theodor Benfey at Earlham College, became the basis for a high-school curriculum called the "Chemical Bond Approach" (CBA), emphasizing chemical concepts or systems, as distinct from chemical facts. A rival was the "CHEM Study" curriculum sponsored by the American Chemical Society, less theoretically demanding and more descriptive than CBA but also differing from CBA by removing the "dead wood" of the history of chemistry. The CHEM Study approach soon became widely extended, again eroding history in the chemical curriculum.

During the postwar period, professional philosophers and historians of science for their part demonstrated very little interest in chemistry apart from Lavoisier and the so-called Chemical Revolution of the 18th century. As David Knight notes in *Ideas in Chemistry*, giving us another insight into the decline of the history of chemistry, most philosophers of science took physics as their exemplar, as did most historians of science. They assumed that the history of physics best illuminates the progress of scientific ideas and the nature of scientific method.

Why now the appearance of these four general accounts of the history of chemistry? The texts and their authors are contributors to a renewal in the history of chemistry after a decline over several decades. Though Knight, as does Brock, gently disparages some (not all) influences on the history of science from the fashionable sociological approach emphasizing the "construction" of scientific knowledge, the approach is fully employed by Bernadette Bensaude-Vincent and Isabelle Stengers in their history of chemistry. In fact, it is precisely research—by no means all of it "constructionist" or sociological—emphasizing the history of scientific societies, science education, social networks, laboratories, language, rhetoric, gender, and the



"The Alchemist" by Johannes Stradanus (1523–1605); Palazzo Vecchio Studiolo, Florence. [From the dust jacket of *The Norton History of Chemistry*; Scala/Art Resource]