"Roberts, Dale & Co. label in notebook of Heinrich Caro. This firm manufactured mauve on a large scale from around 1862, using the copper sulfate–sodium chloride process invented by Caro; the residue of the oxidation reaction afforded a black that was suited to cotton printing. Direct printing of black with aniline in the presence of copper and an oxidising agent was discovered by John Lightfoot of Accrington in 1859. His patent of 1863 and the improved process of Charles Lauth (1864) passed into the hands of J. J. Müller & Co. of Basle, who previously marketed Caro's black. The great success of aniline blacks contributed to the increasing demand for aniline." [From *The Rainbow Makers*; courtesy of the Deutsches Museum, Munich]

synthetic dyestuffs industry as guided by a rough-and-ready empiricism; like Beer, he dates the transition to research guided by structural theory as occurring in the 1870s; and, like Beer, he sees German firms as being far more adept than their rivals at integrating scientific research into their operations. This is not a work that overturns existing scholarship; it is, however, one that supplies texture and resolution to an essentially familiar story. By so doing, it significantly enlarges our understanding of a crucial episode in the relations between science and industry.

Travis's contributions are most evident in his treatment of the decade or so following Perkin's synthesis of mauve. Drawing upon trade publications, patents, and court records, as well as retrospectives and the scientific literature, Travis reconstructs the scientific, engineering, and market uncertainties facing both Perkin and his rivals as they sought to mine colors from coal tar. He emphasizes, rightly I think, the continuities between the young industry and the traditional manufacture of dyes from natural products, showing, for example, how practical chemists could draw upon an existing inventory of reagents and mordants to find new colors, to lower production costs, and to adapt the new dyes to a variety of fabrics. His exploration of the machinery used in dye production illustrates the importance of craft know-how to the new industry; his account of efforts by academic chemists to make sense of the new compounds enlarges our understanding of the history of organic chemistry during the period when the fundamental principles of structural theory were beginning to take shape. Throughout, Travis takes pains to show how retrospective accounts composed in the early 20th century exaggerated the role of formal knowledge, especially of organic chemistry, in the early development of the industry—an exaggeration that Travis bluntly attributes to chemists intent on advancing their professional interests.

Travis gives academic chemists their due when he turns to the exploitation of alizarin, the azo dyes, and the synthesis of indigo—all of which depended upon theories of molecular architecture evolving in university laboratories, especially those of Germany. But, as Travis points out, by the time science truly began to guide product innovation Germany had already emerged as the dominant power in dye production. German supremacy in organic chemistry helped consolidate the nation's control over an industry in which it had already attained leadership. That leadership was won, in Travis's view, not so much through the rational exploitation of formal knowledge as through the painstaking imitation and improvement of foreign methods, aggressive salesmanship, a willingness to assume risks that intimidated French and British investors, and a methodical attentiveness to quality control rooted not so much in national character as in the insecurity of firms lacking the reputations, domestic markets, and raw materials of foreign competitors. Although Travis does not make comparisons with the history of other industries in other times, readers will surely draw their own.

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Unlikely Contrivances

Zipper. An Exploration in Novelty. ROBERT FRIEDEL. Norton, New York, 1994. xiv, 288 pp., illus. $23 or $C29.99.

How can we account for the ordinary and unnecessary gadgetry of 20th-century life? And what does our hesitant embrace of this stream of mechanical novelty reveal about our culture and its values? These are the questions Robert Friedel has posed in his engaging history of the zipper, one of the century's most improbable devices.

As Friedel is at pains to remind us, the zipper has contended with better-known substitutes since its introduction at the beginning of this century. These familiar fasteners did the same job, usually at far lower cost. The button, for instance, has been used in Europe since the 13th century. Strictly speaking, the zipper is superfluous, and today it is everywhere. The firm YKK alone added 1.25 million miles to the world's supply in 1991—enough to zip the planet's girdle 50 times over. Yet the zipper's progress from insight to ubiquity was as chancy as the task of doing up its ancestor, the notoriously unreliable Plako.

Friedel calls his book an exercise in "anonymous history," the name given by architectural critic Siegfried Giedion to the history of the mundane contrivances of modern mass culture. But whereas the heroes of Giedion's book *Mechanization Takes Command* are the artifacts themselves—from the Yale lock to the great American bathroom—Friedel's heroes include an overwrought inventor struggling doggedly through the 1890s to fit a mechanical slider to a fragile row of hook-and-eye clasps and his small-town business partner trying to market this hopelessly fallible device. As an example of the unpredictability of invention, the head of Bell Laboratories in 1943 could do no better than cite the zipper: "I have often thought of how infinitesimally small would have been the chance of any man or group of men, except the one who actually had the idea, planning to invent the common zipper" (p. 75). *Zipper* is a sustained assault on the belief that the imperatives of hardware rule society or that large-scale social and economic forces dictate technological outcomes. Instead, Friedel emphasizes the contingent, almost accidental course of innovation: how a salesman's hucksterism, a small-town Pennsylvanian's boosterism, and a Swedish-American engineer's persistence transformed the hapless hook-and-eye fastener into the symmetrically dimpled zipper. But even after World War I, when these men had protected their ingenious device with patents held by their firm, Talon, their success was by no means assured.

In the Jack Finney novel *Woodrow Wilson*

Dime the protagonist suddenly finds himself trapped in an alternative world where he makes a fortune "inventing" the zipper, Scotch tape, and other trivial amenities never before stumbled on. But invention is only half the story. Finney's protagonist forgets that selling the zipper proved as difficult as inventing it. A niche had to be carved out in the great mass market of fashion emerging in early 20th-century America. Talon had an early success with rubber companies seeking an edge for their venture into galoshes, but decades passed before the zipper found a home in the contentious, competitive, conservative world of Seventh Avenue fashion. In one of the book's most revealing sections, the two sons of the zipper's principal booster made the rounds of the predominantly Jewish fashion entrepreneurs, pitching a product that cost four times the price of buttons, seemed difficult to incorporate into clothing, and had a reputation for popping open at embarrassing moments.

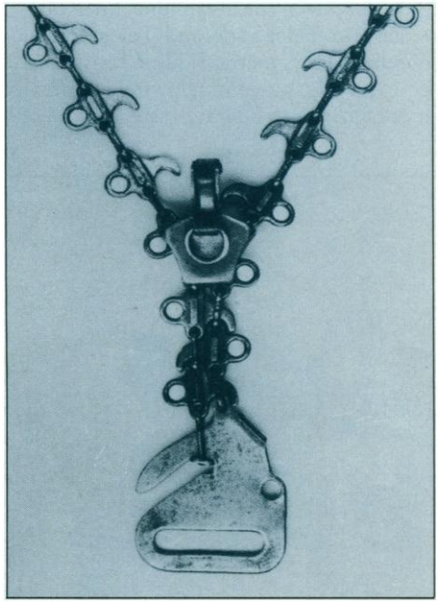
Why then did the zipper triumph? Here *Zipper* takes on its widest significance. To be sure, manufacturers cut costs, improved quality, and diversified their offerings. But Friedel principally attributes their success to a 20th-century fascination with novelty, which the zipper's boosters actively cultivated. The public's association of mechanical devices with efficiency gave the zipper the luster of progressive modernity. In one brilliant ploy, manufacturers redesigned the zipper to tap the burgeoning market for ready-to-wear children's clothing, adapting their product to the prevailing gospel of "Self-Help," which held that children who dressed and undressed themselves developed a healthy psychological independence. In a more familiar vein, advertisers teased consumer anxieties, as in the sly "Gap-osis" campaign of the 1930s, which advised men and women to look out for those unsightly gaps between buttons—"the carelessness that kills glamour" (p. 170).

Needless to say, the zipper's efficiency had a counterpoint in sexual allure. Writers from Aldous Huxley to Erica Jong exploited its ease of operation as a metaphor for effortless and anonymous sex. For other commentators, the zipper's incomprehensibility—how *does* the damn thing work?—symbolized our increasing reliance on untrustworthy mechanical servants.

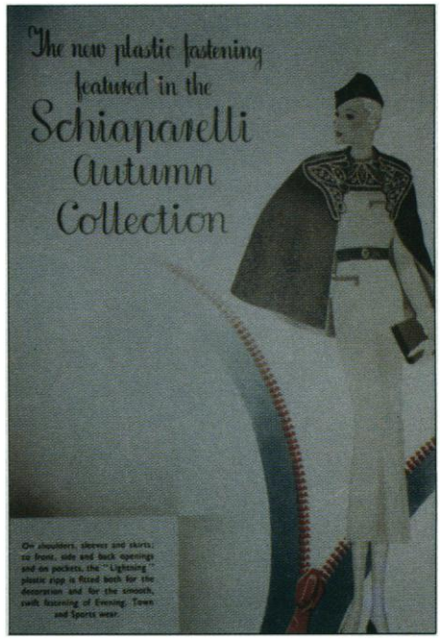
Throughout the book, Friedel weaves the story of how technology shapes cultural values with the story of how social interests shape the design of technology. In between, he leaves room for the passionate efforts of ordinary people to shape their own history. Perhaps a fuller account—one consistent with Friedel's admirable approach—would have included the story of the workers (mostly women) who actually assembled the zipper and whose interests made possible the continual adaptation of this delicate and intricate device to its many markets. The social dimensions of technology do not stop at the level of product design but include the constraints and possibilities that flow from the conditions of production.

Friedel's triumph, however, is that his tale of the zipper also recounts the complex history of our uneasy embrace of technology, and of novelty in general. This sort of meticulously researched study of the ordinary has recently begun to bear fascinating fruit, notably in Henry Petroski's book *The Pencil*. Friedel, too, knows how to tell a good story and writes a clear and lively prose. He says he had fun writing the book, and it shows. A sign of the growing maturity of the discipline of the history of

"Open, Closing, Closed." Advertisements for "The Fastener" included such such series of photographs featuring its application in gloves, gaiters, skirts, boots, and the like. [From *Zipper*; Talon Collection, CCHS]



"The first slide fastener to be manufactured was this design of 1896. It is often depicted as the original 1891 design, but a glance at the earlier patents shows the radical difference. While far easier to manufacture than the earlier designs, it still did not function well. The item shown here is almost certainly a later replica." [From *Zipper*; Talon, Inc.]



"Elsa Schiaparelli was not the first haute couture designer to experiment with zippers, but she was the most flamboyant. Her use of brightly colored plastic zippers, especially, encouraged wider experimentation with the fasteners, leading to their general acceptance by the late 1930s. [From *Zipper*; courtesy of Lightning Fastener, Ltd.]

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).

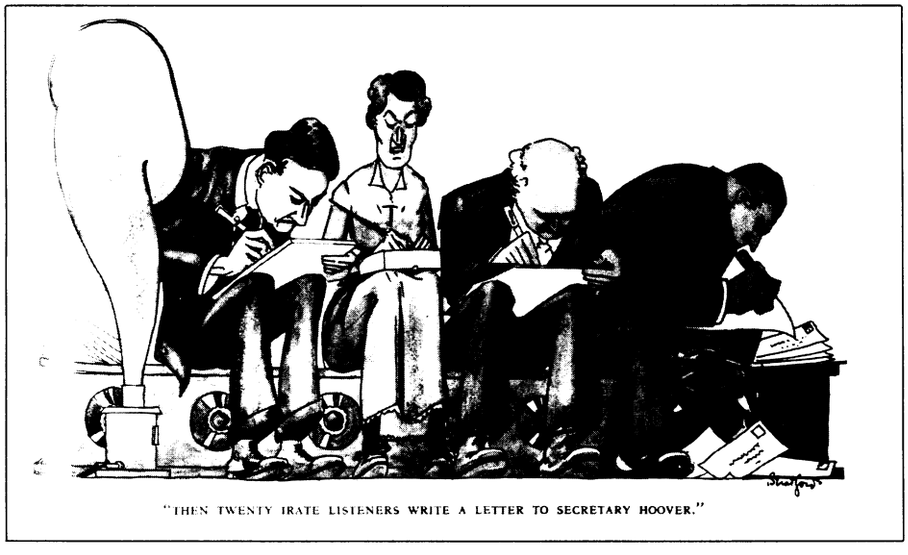
"This 1923 photograph, probably a publicity stunt, shows the importance to farmers of up-to-date information." [From *Selling Radio*; Prints and Photographs Division, Library of Congress]

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]