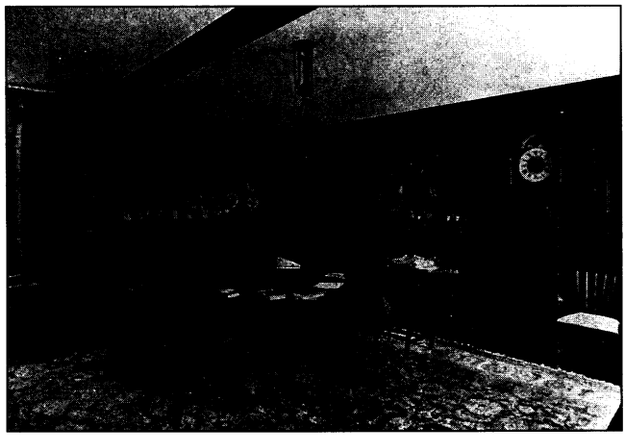
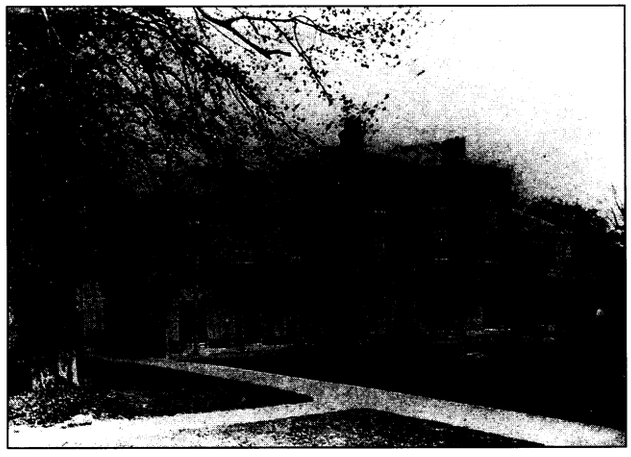


"The interior of Darwin's college rooms, photographed in 1909." [From *Charles Darwin*; *Christ's College Magazine*, 1909]

"Darwin spent most of his time [as a student] collecting beetles and shooting. These sketches were made by Albert Way, an undergraduate who went out beetling with him." [From *Charles Darwin*; Darwin collection, courtesy of the Syndics of Cambridge University Library]

for his doctrine, which has comforted and indeed intoxicated so many theorists since his time, came from Lamarck and was added to Darwinism by Herbert Spencer, as were the free-trade nostrums of "Social Darwinism." Darwin himself took none of these drugs. Nor, of course, was he the kind of Nietzschean immoralist who could cheer himself up by reveling in the sheer destructiveness of his work. Nor did he take refuge—as some of his successors do—in congratulating himself that at least he had got everything right. All these comforting kinds of complacency were foreign to him.

Accordingly, what with one thing and another, it is really not surprising that Darwin sometimes felt extremely ill. On the much-discussed question of his bad health, Browne takes no dramatic line. She attributes it mainly to nervous indigestion exacerbated by the irritant medicines of the day (purgatives and calomel), by conscientiousness, and by a punishing work schedule. She does not mention recent suggestions about nervous hyperventilation, but these proposals seem to fit quite well with this general approach. About his marriage she is perceptive, seeing it as happy on the whole but limited by the somewhat narrow notions of sex roles shared by the partners. Though Emma was a positive, intelligent kind of woman and though there was real love and sympathy between them, she was largely excluded from his work and saddened by his irreligion.



Down House in Kent, where Charles Darwin and his family moved in 1842, "very solid throughout though oldish and ugly." [From *Charles Darwin*; Darwin collection; courtesy of the Syndics of Cambridge University Library]

It is surely interesting that Darwin, who had been expressly warned by his father that unbelief shocks women and must be kept from them, made no effort to find a less religious partner, although his quest for a wife was calculated and deliberate. He seems to have shared his father's view of religion as probably an unavoidable sex-linked characteristic, a necessary part of the female role. No doubt he saw it, more widely, as part of a whole emotional fluency suited to women, a fluency which—as he sadly said in his *Autobiography*—he felt had dried up in himself over the years, leaving him somewhat arid.

Many of these themes will no doubt be taken up in another volume. Meanwhile, this is surely a very good biography. It is thoroughly scholarly, but the scholarship does not obtrude. It is not, like some fat biographies, a mere welter of references. Details are kept well in place within the plan of the whole, which is clear without being oversimplified into a one-sided scenario. Appropriately, the story is of *development*—of a steady, gradual growth both in the man himself and in the problems that confronted him, to a climax of the utmost importance. What help we can get from it for dealing with our own problems must come from following that development further.

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Magnificence Lost

American Technological Sublime. DAVID E. NYE. MIT Press, Cambridge, MA, 1994. xxii, 362 pp., illus. $35 or £31.50.

Historians of technology are currently interested in *sublimity*, a term 18th-century writers used to describe their response to magnificent but terrifying natural wonders such as precipices and torrents. In her excellent *Notes on the Underground: An Essay on Technology, Society, and the Imagination* (MIT Press, 1990), for example, Rosalind Williams notes that the language of sublimity shifted esthetic focus away from formal properties of the object to the moral and emotional reactions of the observer. When Europeans of the mid-1800s began to characterize industrial sprawl as sublime, says Williams, they wrote as outsiders astonished by vistas from which large-scale technology had banished nature. In this respect, sublimity points toward postmodernism, which holds that all environments are artificial, that experience is socially constructed, that individuals are subsumed by groups and institutions, and that visualization has undermined the cultural authority of text.

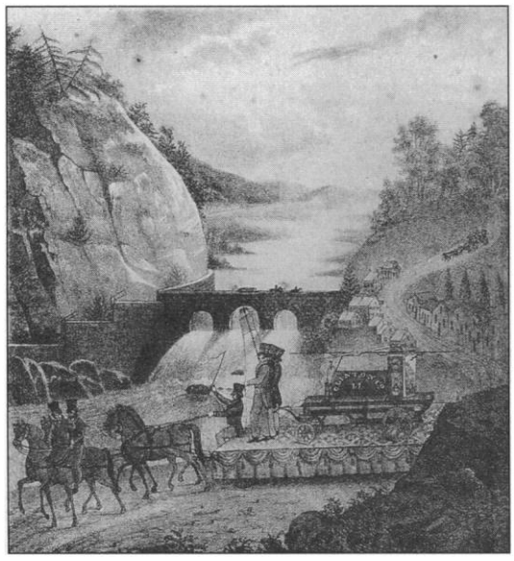
In contrast to Europeans, says David E. Nye, author of *American Technological Sub-*

lime, Americans thought that large-scale feats of engineering *completed* nature and revered the monuments of both as sublime. Moreover, Nye continues, Americans linked technology with national destiny, religion, and social cohesion and thus embraced artifice as an element of democracy. Although sublimity so construed cannot account for Americans who urinate into the Grand Canyon or spray graffiti on the Hoover Dam, it does indeed prefigure post-modern tropes. Nye's narrative—a Baedeker of bridges, skyscrapers, and industrial exhibitions—argues that the conviction that technology is sublime has transformed American observers from colonists to tourists, participants to spectators, and builders to consumers.

Nye's examination of the industrial experience focuses on "the politics of perception" (p. xvi). To gauge the politics, he analyzes public rituals from the opening of the Erie Canal (1825) to the centennial of the Statue of Liberty (1986). These are charming devices; nearly every chapter whistles up civic marchers. The successive parades graph the cycle of *Gemeinschaft* and *Gesellschaft*: the early ones "inscript" technology as the incarnation of work, ingenuity, and community, whereas the later ones "represent" commerce. As decades pass, the local craftsmen who built the canal, the bridge, or the power station cease to march; in their places strut federal bureaucrats and corporate chieftains. For readers acquainted with Max Weber, the significance of technology's co-option rests less on its fact than its inevitability. For Nye, however, 20th-century capitalism is villainous because it commodifies everything. Only the parades rescue this argument from banality.

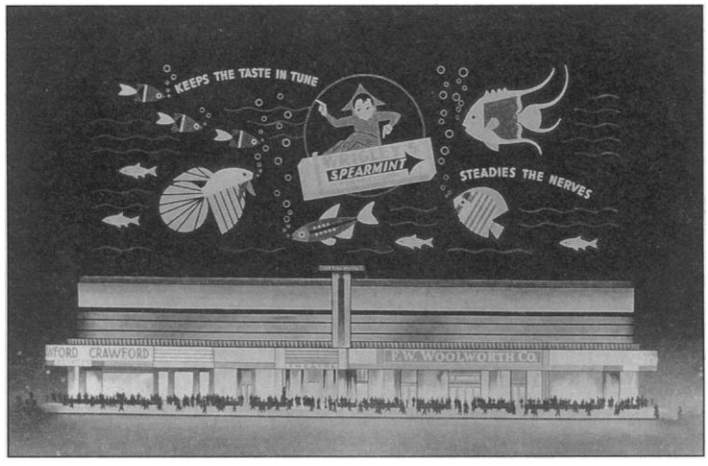
The pull of the technological sublime remains strong though the atomic bomb should have destroyed its appeal, says Nye, who emphasizes the complicity of science by calling the atomic scientists self-promoters and by rewarming chesnuts about bombs as metaphors for masculinity. Since the detonations were not civic events, there were no parades (although many readers will be relieved that nuclear blasts scare social constructionists). A mushroom cloud is sublime, all right, Nye admits, but the terror is real, not an esthetic category; it is too evil to inspire, too lethal to instruct. Few would argue.

On the other hand, perception, political or otherwise, is tricky. For Nye the true menace of industrialization, sublime or not, lies in its epistemological, almost ontological revisualization of the landscape, not just in its penchant for turning attractions as diverse as Niagara Falls and nuclear power plants into postcards. A fine writer, justly praised for his earlier *Electrifying America* (MIT Press, 1990), Nye here deftly outlines the disorienting visual effects of both skyscrapers and electricity. The view from the Woolworth and Empire State buildings shrank New York to grids bereft of detail. Similarly, streetlights "dematerialized" the urban night by erasing old coordinates, and neon advertisements reedited the meaning of space. Such sublimity subordinates community to naked power, and in these metropolitan abstractions humans have little presence. They disappear entirely in the book's centerpiece, a perfect metaphor for social construction. This is the diorama of the future featured at the 1939 World's Fair, an enormous miniature city that revealed the technological sublime in its true guise of a landscape totally controlled and sanitized. Nye does not mention that the same World's Fair first demonstrated television for Americans, but notes later that mass media trivialize and diminish the authenticity of experience. Today, sublimity has degenerated into performance enjoyed by McLuhanesque mobs hungry for images rather than the Word. This appealing condescension forgets that language, too, is a technology and that print deposed kings and realigned forces of church and state.



A depiction of the ceremonies marking the opening of the Erie Canal, 1825. According to a Utica, New York, newspaper, the project presented "proof . . . to all mankind of the capabilities of a free people, whose energies, undirected by absolute authority, have accomplished, with a sum insufficient to support regal pomp for a single year, a work of greater public utility, than the congregated forces of Kings have effected since the foundations of the earth." [From *American Technological Sublime*; Library of Congress]

Why is the sublimity of Las Vegas—to use Nye's concluding example—less authentic than the sublimity of Niagara Falls? Nye cites Immanuel Kant, for whom a huge waterfall first provoked awe or terror at human insignificance, and then a rational, universal, and moral appreciation of the beauty and power of nature. Without distorting Kant overmuch, early American orators could attribute sublimity to railways and factories because engineers and inventors thought technology had moral purpose. By contrast, Nye maintains, Las Vegas or the space shuttle program, another of his examples, cannot lead to spiritual refreshment; the power visible in both is rational and political, but nobody calls their economic complexity moral, and any universality they inspire is just a matter of packaging. Besides, the sublimity of artifacts lasts only until another novelty comes along. This argument would be more convincing were Nye to exempt natural phenomena from the distortions of social construction or indicate whether Americans have ever been able to apprehend nature directly, without cultural mediation. If *all* experience is socially constructed, then authenticity is irrelevant.



Wrigley Chewing Gum sign, Times Square, New York, 1930s. The sign "had 1084 feet of neon tubing, bent and fastened by hand, and an elaborate wiring system for 29,508 bulbs, mounted on a 110-ton structure. Even today, only highly skilled workers can produce such complex machines." [From *American Technological Sublime*; Hall of History Foundation, Schenectady, NY]

Nye's book revises the thesis of his mentor, Leo Marx, one of the first to identify the New World's neurosis as technological trauma. When the locomotive invaded Eden,

A postcard from Las Vegas. "Though it may seem implausible that nuclear tests could ever have been a tourist event, in fact there was public fascination with the new weapons. . . . The gambling industry found the [bomb] tests profitable. . . . The [Las Vegas] Chamber of Commerce provided tourists with 'shot calendars' and road maps to the best vantage points. Even the *New York Times'* travel section advised people on the fine points of 'the honorable pastime of atom bomb watching.' " [From *American Technological Sublime*; Special Collections, University of Nevada]

said Marx in *The Machine in the Garden* (1964), the cultural antidote was an act of textual rather than spatial reimagination called the "middle landscape," a place metaphorically situated between pastoral fantasy and technological nightmare. Here, Marx observed, the Transcendentalists thought nature and machine could coexist in harmony. The Civil War destroyed such illusions, and the middle landscape survived only as literary nostalgia. Reading 19th-century Fourth of July speeches may have persuaded Nye that Americans accepted the machine *as* the garden, but it also guaranteed that he would not like the landscape a century later. Nye's own nostalgia draws the line at the Brooklyn Bridge (1883), which he thinks still can astonish and ennoble. After that, still more magnificent technological "discontinuities" have seduced our vision and drawn huge crowds to boot, but he thinks the effect can never be the same. Though the rhetoric of technological sublimity is still audible, the parade's gone by.

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The V-2 Enterprise

The Rocket and the Reich. Peenemünde and the Coming of the Ballistic Missile Era. MICHAEL J. NEUFELD. Free Press (Macmillan), New York, 1994. xiv, 368 pp., illus. $25.

Colorful characters, high technology, close association with German National Socialism, direct links to the U.S. moon shot—rocket development in Nazi Germany has ingredients to fire any writer's imagination. Not surprisingly, the story has inspired a range of treatments, from popular overviews of the program and biographies of its key personalities to Thomas Pynchon's poetic characterization of the flight path described by the V-2 rocket as "gravity's rainbow." What has been missing to date, though, is an account of the Third Reich's rocket program based on thorough and critical examination of archival sources. Michael Neufeld's *The Rocket and the Reich* fills that gap admirably. His account is a definitive historical analysis of the organization and technological development of the rocket program from its inceptions in the 1920s into the period immediately after the end of the Second World War in 1945.

The story begins in 1920s Berlin, where rockets—future-oriented, high-tech, and somehow mysterious—captured the imagination of a wide segment of the Weimar German population. Among the enthusiasts, visionaries, charlatans, showmen, and hangers-on was not only film-maker Fritz Lang, who popularized rockets with his 1929 film *The Woman in the Moon*, but also the young Wernher von Braun, who would later perform a vital role in rocket programs in both Nazi Germany and the postwar United States. Von Braun and his cohorts seriously underestimated the cost of trying to fulfill their dreams and the range of technical difficulties they would encounter along the way, but their early work also provided a range of experience in areas such as fueling and cooling systems and general rocket design that lay the basis for later breakthroughs.

As the Weimar Republic started to crumble in the early 1930s and the National Socialists began their seizure of power in 1933, the capabilities of rocket builders remained ludicrously limited. Test models were small and fragile; they often exploded or suffered burn-throughs instead of lifting off; and when they lifted off they frequently went astray. Still, even before the Nazi seizure of power, a new phase in the program began when German Army Ordnance developed an interest in it. After January 1933, and especially after January 1935, that interest took on new dimensions. Funding increased dramatically as the proponents of the program managed to convince key policy-makers that it would serve a central role in the next war. The result was a secret massing of Germany's best aeronautical engineering talent at Peenemünde on a small island in the Baltic Sea. Supported by skilled staff, massive resources, and, eventually, slave labor for mass underground production, the engineers developed a usable liquid-fuel ballistic missile, the V-2, first "fired in anger" against Allied targets in September 1944.

"Max Valier tests his new liquid-fuel rocket-car motor at the Heylandt Company in Berlin, March/April 1930. He was killed in a laboratory experiment soon afterward, due in part to his cavalier attitude toward safety." [From *The Rocket and the Reich*; Imperial War Museum]

Neufeld's story represents a paradox of sorts: for Germany in the Second World War, the new rocket technology was almost entirely beside the point militarily; at the same time, it is critical to our historical understanding of the nature of the Nazi regime. Consuming enormous quantities of scarce re-