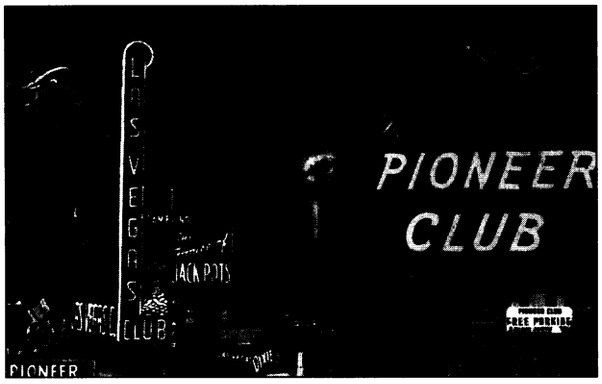

A postcard from Las Vegas. "Though it may seem implausible that nuclear tests could ever have been a tourist event, in fact there was public fascination with the new weapons. . . . The gambling industry found the [bomb] tests profitable. . . . The [Las Vegas] Chamber of Commerce provided tourists with '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.

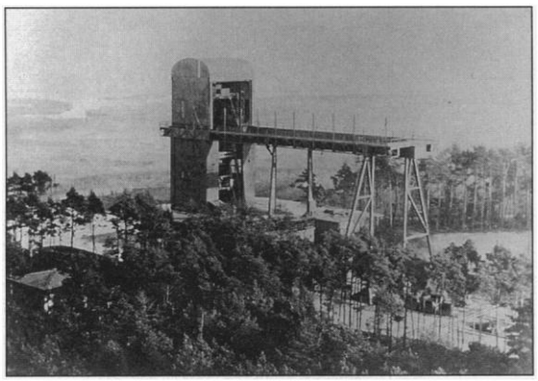
"Max Valier tests his new liquid-fuel rocket-car motor at the Heylandt Company in Berlin, March/April 1930. He was killed in a laboratory experiment soon afterward, due in part to his cavalier attitude toward safety." [From *The Rocket and the Reich*; Imperial War Museum]

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-

Vignette: V-2 Episode

Lacking any way to get quick answers about the appropriateness of his design [Hermann] Kurzweg resorted to homemade improvisations. One weekend he carved a rocket body out of a Peenemünde pine branch, inserted weights into holes to get the proper balance, and made hard rubber fins in the proposed shape, but in three different sizes. To obtain low-speed stability information he tried throwing the model off the roof of his house. When that proved unsatisfactory, the model was mounted on a wire through its center of gravity, and Kurzweg drove down the Berlin-Anklam highway at a speed of 100 km/h.

—From *The Rocket and the Reich*



"Test Stand I at Peenemünde, designed to accommodate engines or missiles with up to 100 metric tons of thrust, was finished in spring 1939. The Army had made a massive investment in ballistic-missile technology since the mid-1930s." [From *The Rocket and the Reich*; Smithsonian Institution]

sources between the mid-1930s and 1945, the rocket program never had a clear strategic concept behind it. Early planners thought of rockets as artillery without the inconvenience of massive (but nevertheless quite sensitive) heavy gun barrels. They also stressed their surprise value. But they never answered the question of how missiles (compared to any alternative weapons system) were to achieve a militarily significant effect. Lack of clear strategic conceptions in combination with enormous and unforeseen technical problems and, later, Allied bombing delayed deployment of the missiles until autumn 1944. When they were used, it was in small numbers, and they were woefully inaccurate. Thus, in the final analysis, the V-2 represented "a unique weapon: More people died producing it than died from being hit by it" (p. 264).

The large number of deaths that resulted directly from missile production (largely through mistreatment and undernourishment of slave laborers in building and operating underground production facilities) is a large part of the reason why the program's history expands our understanding of the nature of National Socialism. Too often, the systematic degradation of human beings that most would agree was central to Nazism and the undeniably impressive technological feats achieved under the regime (among them missiles, jet aircraft, and synthetic oil and rubber) are dealt with in isolation from one another. To his credit, Neufeld tackles the difficult issue of the connections between the two. Missile technology, he argues, had intellectual and social roots independent of Nazism. But the rocket program flourished under National Socialism because of the movement's fundamental commitment to war-making. What is more, in order to realize their dreams, the program's technical personnel compromised themselves severely by accepting (at least implicitly, often explicitly, and sometimes with gusto) Nazi racism and systematic exploitation of human beings.

"After the first A-4 success, Armaments Minister Albert Speer (right, with arm-band) moved to take over missile production. Here he watches a launch with Propaganda Minister Josef Goebbels (center), who dubbed the missile 'Vengeance Weapon 2' (V-2) in 1944." [From *The Rocket and the Reich*; Bundesarchiv Koblenz]

Making such nuanced judgments is a difficult business, but Neufeld's basic method provides a solid basis for doing so. He carefully examines postwar accounts of the program, many written by participants, in light of archival evidence with the aim of demolishing the numerous myths surrounding rocket development in National Socialist Germany. So, for instance, he establishes conclusively that Arthur Rudolph (later project director of the Saturn V rocket program) and others involved in postwar American rocket projects, despite their postwar attempts to foist full responsibility onto the SS, not only were aware of but actively participated in establishing and administering slave labor programs.

Valuable as it is, the method has its drawbacks. Sometimes it is impossible, in spite of extensive documentation, to ascertain the most simple facts, as for instance in dating precisely the arrest of Wernher von Braun by the SS in early 1944 or in explaining fully the motivations for this bizarre action. Furthermore, closely following archival sources also at times entails adopting the heavily bureaucratic language of the documents themselves. Still, whatever its limitations, Neufeld's fundamental method is a vital basis for his interpretations, which in turn require him to transcend the documents. His book succeeds ultimately because he combines empirical reliability with normative judgments and so provides a history of Nazi rocket technology in its full political, social, and moral dimensions.

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Studying the Defeated

Suffering Made Real. American Science and the Survivors at Hiroshima. M. SUSAN LINDEE. University of Chicago Press, Chicago, 1995. xii, 287 pp. + plates. $29.95 or £23.95.

The recent controversy over the Smithsonian Institution's planned display of the Enola Gay, the B-29 that dropped the atomic bomb on Hiroshima 50 years ago, reveals how divided opinion remains over the role of the United States in the Pacific war and its aftermath. The book under review can be viewed as providing a chapter in the saga of the international race to determine the biological effects of radia-