ied with sex, age, or religion. By and large the volume fails to address these other avenues and to present a coherent sociological basis for analyzing the reception of scientific ideas. It takes more than a number of excellent separate studies to make up a coherent, comparative whole. In a summary Glick tries heroically, but unsuccessfully, to extract similarities and differences in order to establish a more synthetic view. The reason for the failure is not, I think, that the national histories are too diverse, but rather that the present studies are too undisciplined and too different in approach. Stricter editorial guidelines might have provided the necessary discipline and coherence without violating historical data.

The difficulty of obtaining a synthetic view is illustrated by comparing Lewis Pyenson's essay on Germany with V. P. Vizgin and G. E. Gorelik's on Russia, two studies that seem to have virtually nothing in common. Pyenson deals with almost every conceivable cultural aspect of Wilhelmian Germany, much with the electromagnetic world view, and very little with Einsteinian relativity. Making a rather artificial parallel between political and scientific revolutions, he gives a brilliant and learned (but in my view misleading) interpretation of the Zeitgeist of German science prior to 1914. Vizgin and Gorelik see their task very differently. They deal with the reception of special and general relativity primarily among Russian physicists in the period 1900–1940 and are more interested in reviewing eminent Russian contributions to the field than in interpreting the reception of relativity in sociocultural terms.

In tracing the different layers and aspects of the reception of relativity, the authors make excellent use of a variety of sources, many of which do not belong to the standard sources of intellectual history; local newspapers, pamphlets, and obscure journals, for example, are profitably scrutinized. Other indicators used for evaluating the reception of relativity include the appearance of the first monographs on the subject, the incorporation of relativity into textbooks and syllabi, and the number and fluctuations of publications on relativity and alternative theories.

I find the volume a fine piece of scholarship, living up to the usual high standards of the Boston Studies series. With the reservations mentioned above I recommend it as stimulating reading for all parties who are interested in the historical and social aspects of science.

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Apocalyptic Imagery

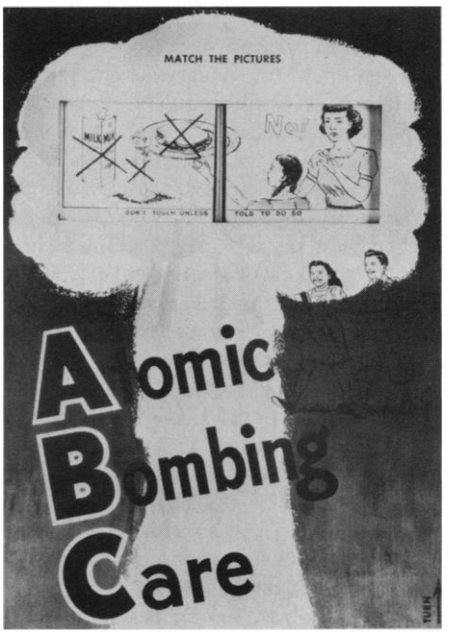
Nuclear Fear. A History of Images. SPENCER R. WEART. Harvard University Press, Cambridge, MA, 1988. xvi, 535 pp., illus. $29.50.

Spencer Weart's stated goal in *Nuclear Fear* is nothing less than a "total history" of the images associated with nuclear energy, taking into account "every force that has mattered, from the known laws of physics to the largely unknown influence of psychology" (p. 433). The potential rewards of such an enterprise are enormous. So are the hazards.

Like a number of other recent works—such as Paul Boyer's *By the Bomb's Early Light*, Paul Brians's *Nuclear Holocausts*, and *Nukespeak* by Stephen Hilgartner, Richard Bell, and Rory O'Connor—*Nuclear Fear* approaches the material history of nuclear weapons and energy through the context of the surrounding cultural history. Weart, however, attempts to set this cultural history in a still larger context, a neo-Jungian framework of universal psychological archetypes which, he argues, attain specific form in images leading to, and evoked by, nuclear devices. He finds the crucial beliefs and symbols associated with nuclear energy to have been present centuries earlier, and throughout a number of civilizations, in a structured cluster centered on the "tremendous concept" of "transmutation—the passage through destruction to rebirth" (p. 421). According to Weart, the discovery of nuclear energy early in the 20th century reifies this ancient cluster of images, which then both redefines and is redefined by the subsequent material and social history of nuclear science and engineering.

Weart's tale boldly sweeps from the futuristic White City of the 1893 Chicago World's Fair and the discovery of radioactivity in 1896 through Hiroshima and Star Wars to his own hoped-for future society when "the citizen will sing with both poets and engineers" (p. 420). The characters and images of the story are familiar: the mad scientist of 19th-century science fiction; the dazzling brave new world to be achieved by technocracy through unlimited energy; death rays; the apocalyptic "atomic bombs" of H. G. Wells's 1913 novel *The World Set Free* with their telling influence on Leo Szilard; the mushroom cloud; mutant monsters; the omnipotent atom pictured as a miniature solar system; President Reagan's pledge to unleash a new technology that will make nuclear weapons "impotent and obsolete"; and so on. But this book asks us to see all these in a new light.

Weart is quite correct to claim that the imagery associated with nuclear energy has



Game to instruct children. [Courtesy Harvard University Press and Library of Congress]

deep, early roots. In fact, 19th-century industrial iconography generated specifically nuclear images earlier than he realizes, even before the discovery of radioactivity, as evidenced in an 1895 novel not discussed by Weart, Robert Cromie's *The Crack of Doom*, in which an atom-splitting scientist points to "a common text-book" on physics where "you will find that one grain of matter contains sufficient energy . . . to raise a hundred thousand tons nearly two miles" (third edition, p. 20). Weart is certainly accurate in asserting that by the 1930s nuclear energy had become a highly charged symbol for the magical transmutation of human destiny—through atomic apocalypse or miraculous peaceful technology or both. He provides a very useful account of how the main images were promulgated by scientists such as Soddy and Rutherford, popular science journalists, and science fiction, though one serious omission is American fiction about radioactive and atomic superweapons prior to World War I.

When it comes to the crucial point at which nuclear energy and weapons move from the realm of the imagination to become central facts of modern existence, *Nuclear Fear* entices but disappoints by not developing in sufficient detail its picture of how the atomic scientists were lured by "the fantasy of setting the world free" and ending war with atomic energy (p. 96). We want to know precisely *how*, as Weart states later, people "projected their feelings onto bombs and reactors," making "our secret thoughts" take "form in metal" (p. 425).

Then the book becomes increasingly problematical, as is suggested by its involuted organization (the middle three of the five main parts are Confronting Reality: 1939–1959; New Hopes and Horrors: 1955–1963; and Suspect Technology: 1956–1986). When he gets involved in the issues of actual nuclear arms and power, Weart seems to lose the distance that allowed him to create an effective overview of nuclear prehistory. For example, he unfairly caricatures scholarship about the decision to use atomic bombs, mocks the mass protests against atmospheric testing, seeks Freudian explanations for popular concern about fallout (though conceding that in a few years the concentration of strontium-90 in the bones of American children doubled), and frequently drifts away from his subject into irrelevant anti-Communist fulminations.

A long apologia for nuclear power is the weakest section of the book, for here the author's shift from historian to partisan skews his analysis. Proponents of nuclear power and weapons are characterized as "calm and refined, intensely civilized," having a "calmer rationality," "tending more to logical analysis," whereas opponents tend more to "intuition," openly display "anger and anxiety," are "preoccupied with individual human feelings," vent "adolescent fantasies about inadequate and destructive adults," and even show hostility toward "all rational knowledge, technical progress, and organized decision making" (pp. 339–40, 348, 351, 359). Though he claims not to perceive all rationality on one side and all emotion on the other, Weart's history of the controversy follows his own extended argument that all objections to nuclear power are irrational or, at best, poorly informed. Even if this is true, his view of the cultural images integral to the controversy is still one-sided, for (as has been demonstrated abundantly by Hilgartner, Bell, and O'Connor in *Nukespeak*) the proponents of nuclear power manipulated mass emotions with comic books, radio, television, and toys that drew directly on powerful, irrational symbols imbedded in the culture. And after all, as Weart discloses in one of the triumphs of his neo-Jungian methodology, the ringed atom promulgated by the Atomic Energy Commission as its official symbol, bearing no resemblance to any real atom, may be best understood as a mandala.

The history of nuclear images is wrapped up with some suggestive but scattered comments on a few literary and other artistic responses to nuclear energy. Unfortunately, Weart omits the very artists whose work speaks most eloquently to his concerns, such as Masuji Ibuse, J. G. Ballard, Theodore Sturgeon, Judith Merril, and Philip K. Dick. Their images and insights would have added considerable substance to the book's conclusion, with its admirable call for synthesis of art and science in a true transmutation that takes us beyond nuclear fear.

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Chemistry at War

Industry and Ideology. IG Farben in the Nazi Era. PETER HAYES. Cambridge University Press, New York, 1987. xxviii, 411 pp., illus. $39.50.

I.G. Farbenindustrie A.G., which came into existence in 1925, comprised the most technologically advanced chemical corporations in Germany. From its inception, the firm's fate was intertwined with that of its native country. Farben executives allegedly paved the way for the Nazi seizure of power. After 1933, the firm profited from Nazi expenditures to rearm Germany (for example by producing explosives) and to make it self-sufficient (for example by manufacturing synthetic petroleum and rubber). But Farben's association with Nazi policies extended beyond mere profit-making: managing board member Carl Krauch assisted in Nazi economic planning; once German arms had overtaken them, I.G. raided its European competitors; and, symbolic of its descent into the worst practices of the Nazi regime, I.G. managers used concentration camp inmates to construct a synthetic rubber plant at Auschwitz. As a result, 23 Farben executives stood trial in Nuremberg after the war; 13 were found guilty on one or more counts. The firm itself was broken up.

Not surprisingly, Farben has figured prominently in analyses of the Nazi period. Such accounts generally rely, however, upon one of two sets of polemical studies: critics of the firm have stressed the identity of Nazi and I.G. policy and practice; its apologists emphasized the inability of Farben executives to oppose Nazi policies. Peter Hayes, in *Industry and Ideology*, provides the first full-length scholarly study of the firm during the Nazi period. His well-written and carefully researched account sets the standard for future examinations of the relationship between business and the state in Nazi Germany.

Hayes uses documentation from industrial archives and the voluminous files of the Nuremberg trials to scrutinize conventional wisdom about Farben. He convincingly overturns the allegation that within the I.G. there was an "ascending curve of support for Nazism from 1930 to 1933"; instead, "the pattern of corporate interest in Nazism resembled a 'fever chart,' which moved in direct relation to the election returns and inverse relation to the economic indicators" (pp. 67–68). In other words, Farben became interested in the Nazis when the economy was on the decline and when they registered electoral gains through mid-1932; with the incipient economic upturn and the apparent cresting of party support, the firm turned away from the National Socialists on the eve of Adolf Hitler's seizure of power.

Once Hitler came to power, however, relations between the firm and the party improved tremendously: Farben profited enormously; the party and state obtained substitute materials that would otherwise remain unavailable. Yet, Hayes argues, this should not be confused with identity of interests between Farben and the Nazi government. The two clashed over location of new factories, with the regime stressing development of new regions and protection from air raids and the firm emphasizing availability of raw materials and transportation. Plans to expand production capacity provoked further disagreement: the state insisted on immediate output and the corporation favored ensuring ultimate competitiveness.

Clearly "relatively traditional commercial and technological considerations . . . underlay the combine's conduct" throughout most of the Nazi period (p. 161). To bolster this contention, Hayes draws numerous parallels between the conduct of Farben and that of its British and American rivals, Imperial Chemical Industries and DuPont. The terms of Farben's 1933 contract with the German state to guarantee synthetic fuel sales were "virtually identical" to those of a contract signed the same year between ICI and the British government (p. 118). Carl Krauch and other Farben personnel who were seconded to government service from 1936 on were analogous to the American dollar-a-year men (p. 158). The militarization of Farben's chemical production during the 1930s and 1940s paralleled developments at ICI and DuPont (pp. 327ff.).

But we all know that the experiences of Farben differed fundamentally from those of other chemical firms, and the difference is symbolized by one word—Auschwitz. Hayes's treatment of this much-discussed and less clearly understood problem is characteristically thorough and balanced. Farben's choice of a site for a massive synthetic rubber facility near Auschwitz was almost surely *not* determined by the presence of the nearby concentration camp; rather, availability of raw materials, fuel, and transporta-