those at the forefront of nuclear research to convey a sense of urgency regarding the international danger to the president. Later, after the war, the haste with which the Truman administration dismantled the Office of Scientific Research and Development (OSRD) and other wartime agencies left even such leading scientific spokesmen as Vannevar Bush and James Conant without any significant voice as to the postwar organization of atomic energy. At the end of the 1940s Truman virtually ignored the opposition of the scientific advisory committee of the Atomic Energy Commission (AEC) in making his decision to proceed with the H-bomb, listening much more seriously to the opinions of the Joint Chiefs of Staff and what Herken calls the "H-bomb lobby" led by Edward Teller.

Eisenhower, despite a sincere desire for more public candor about the developing arms race, was severely handicapped at the beginning of his administration by Robert Oppenheimer's fall from grace (the result of unsubstantiated charges) and by his enforced reliance on the extremely cautious Lewis Strauss, chairman of the AEC but a nonscientist who mirrored the views of Teller's Livermore Laboratory. By mid-decade, however, the shock of the Soviet H-bomb (November 1955), ICBM (August 1957), and Sputnik (October 1957) had reopened the door to those critical of Teller's pessimism and prompted the president to rethink the role of scientists in his government. The creation of PSAC and appointment of James Killian as science adviser (November 1957) signaled the arrival of a new dispensation, an arrangement in which the president and Killian consciously expected PSAC to serve as a counterbalance to the AEC, the national labs, and the military. Ike and the "president's scientists" set their sites on a new goal—a comprehensive nuclear test ban—and for the remainder of Eisenhower's second term the battle raged between those who believed this a manageable risk (the PSAC group) and those (like Teller) who were determined to block it.

The 1963 Limited Test Ban Treaty, though a compromise on the part of the Kennedy administration in the face of significant opposition to a comprehensive treaty in Congress, the Pentagon, and the labs, marked the culmination of a six-year effort by PSAC and three science advisers to win the public to a reformist course. Nevertheless, such newfound activism became a two-edged sword when it subsequently led scientists to oppose LBJ on such issues as defoliation, bombing, and the ABM. With the departure of Secretary of Defense Robert McNamara in 1968, PSAC lost its last real audience in the Johnson inner circle. By this time the administration was relying for advice almost entirely on professional military scientists and those in the aerospace industry.

The author's treatment of the Nixon, Ford, Carter, and Reagan years is somewhat hurried, but he makes his case nonetheless. Though Henry Kissinger talked on occasion to scientists from the civilian world, the fact is that the president's science adviser (Lee DuBridge) and PSAC were almost entirely excluded from the debate on Safeguard, MIRV, and SALT. What is more, following PSAC's demise in 1973, its alumni played little or no part in the major revision of American nuclear strategy that took place under Defense Secretary James Schlesinger. Things were not much better under Jimmy Carter, who by making his secretary of defense (Harold Brown) his "physics adviser" and selecting a science consultant who did "everything but defense" robbed himself of the institutional weight he needed to force through a Comprehensive Test Ban (CTB) or to resist a decision in favor of the land-based (rather than the smaller, air or sea-based) MX missile. With Reagan the situation was even worse, his distrust of the scientific community leading him, first, to select (at Teller's instance) a relatively unknown scientist (George Keyworth) as adviser and then, alternately, to forget about him and to expect him to act as cheerleader for such programs as the MX "densepack" deployment and "Star Wars" (SDI).

One of the most fascinating revelations of Herken's study is the way in which Edward Teller repeatedly turns up at critical moments in the history of America's involvement in the Cold War. To judge from the material here, it is not too much to describe Teller as one of the truly central personalities in perpetuating international tension between East and West during the last half century. His career and role in shaping United States foreign policy cry out for intensive investigation.

In *Cardinal Choices* Gregg Herken has produced a thoughtful and comprehensive survey of a significant relationship and at the same time a convincing plea for change. To be sure, this study is quite consistently presented from the standpoint of the "excluded" scientists; it is their testimony that Herken relies on and not the papers of, or interviews with, the "political" leadership of the successive presidential administrations. Still, it is hard to quarrel with the author's essential argument: that the expertise of independent scientists is badly needed by statesmen not only with regard to domestic issues (where George Bush would prefer to get his scientific advice) but also on matters affecting national security and defense. One must hope that there will be a clearer recognition of the need to institutionalize in an effective fashion the process by which this knowledge is proferred.

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Missile Defender

Teller's War. The Top-Secret Story Behind the Star Wars Deception. WILLIAM J. BROAD. Simon and Schuster, New York, 1992. 350 pp., illus. $25.

Edward was "just being himself." Repeated by friend and foe alike, this phrase seems to capture the essence of the brilliant, influential, and, more times than not, controversial nuclear scientist Edward Teller. Today in his mid-80s, Teller seems to be more active than ever, throwing out ideas at a rapid-fire rate. Taken back a bit by the revolutions of 1989 and 1991, Teller—the staunch anticommunist and technological enthusiast—now appears to have gotten his bearings in the post–Cold War world. In the past months, he has made headlines by promoting the old Baruch Plan for the international control of atomic energy, supporting increased technical trade with and economic support for the FSU (one favorite new acronym used by U.S. government officials to refer to the former Soviet Union), and postulating that nuclear explosions might be used to deflect the path of asteroids threatening the earth.

But, as William Broad points out in his entertaining, well-researched, and sometimes enlightening volume, Teller does not give up easily on some of his favorite ideas and projects. Certainly falling into this category is the primary subject of *Teller's War*, the use of promising new technologies to promote missile defense. Broad, a science reporter for the *New York Times* since 1983 and before that a writer for *Science*, is well trained to deal with such esoteric topics. Using his extensive experience and contacts, Broad has done an outstanding detective job in describing the origins and development of the Strategic Defense Initiative (SDI), or "Star Wars," as it is popularly called, and the motivations and roles of the numerous individuals involved in the program.

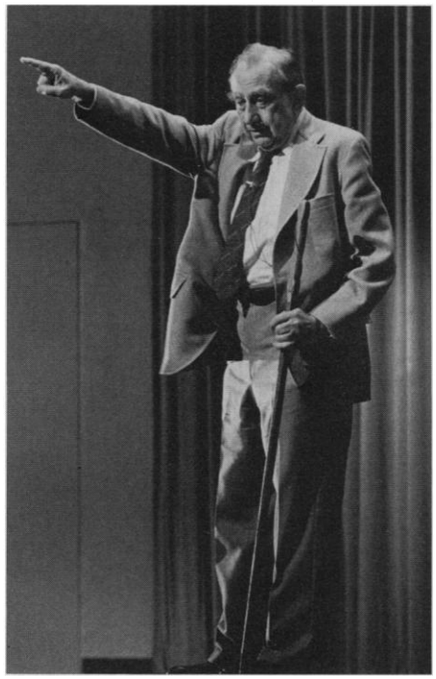
This is a fascinating human as well as technical story. Broad tells it well, yet his intensive focus on Teller himself sometimes distorts more than it illuminates. There is no question that Teller had a special relationship with and influence over SDI's god-

father, Ronald Reagan. Moreover, as Broad emphasizes, Teller has had a major, perhaps inordinate, impact on national security decision-making at least since the days of Dwight Eisenhower. But to say that Teller is "more icon than flesh and blood" (p. 247), that he is "the most influential scientist of the nuclear era—and perhaps the century" (p. 20), overstates the case, in some instances (such as the beginnings of SDI) directly contradicting Broad's own evidence. In a sense Broad seems to have been captured by Teller, seduced by the man he so strongly criticizes.

On the plus side, *Teller's War* does a good job of recounting the very complex set of circumstances surrounding the origins of SDI. It sets the idea introduced in Reagan's 23 March 1983 speech in excellent context. The "selling" of Star Wars, as Broad colorfully puts it, involved numerous individuals with widely different motivations and perspectives, ranging from Admiral James D. Watkins's moral and ethical concerns about nuclear weapons to national security adviser Robert McFarlane's use of antimissile rhetoric as an arms control "bargaining chip" strategy. Broad details particularly well Reagan's own thinking on the issue, with SDI being the culmination of a search for a technological solution to the dual problems of nuclear weapons and the evil empire. Feeding into this picture was the "intellectual turmoil" and public debate of the early 1980s over the "proper role" of nuclear arms in national strategy, manifesting itself most visibly in the now nearly forgotten nuclear freeze movement.

Another positive contribution of the book, especially for the general readership it is likely to attract, is the dispelling of whatever might be left of the myth of monolithic thinking at the national nuclear weapons design laboratories. Although the final word is yet to be written on the subject, Broad's elaboration on the rift between Teller and Roy Woodruff shows that SDI generated as much controversy and criticism within the Lawrence Livermore Laboratory as it did from external public sources. The long tradition of friendly competition and outright rivalry between Livermore and Los Alamos scientists also jumps from these pages.

Still, after all of this, Broad again inexorably, inevitably comes back to Teller. Without Teller and his active promotion of the x-ray laser, Broad maintains, the Star Wars program would not have "materialized" (p. 136). Teller perhaps was the most zealous advocate, but, as Broad himself shows, a large cast of characters and forces were involved. Moreover, because everything begins and ends with Teller in Broad's account, we lose a sense of what was going on in antimissile research *before* March 1983. In actuality, Washington consistently spent a great deal on missile defense prior to Reagan's public pronouncement by way of allocations to the individual military services. Broad thus misses the initial, largely consolidating role of SDI and the SDI organization. Comparative budget figures for the x-ray laser and other aspects of the program as it subsequently developed would have been helpful as well.



Edward Teller. [From *Teller's War*; Los Alamos National Laboratory]

Broad's overemphasis on Teller's influence extends to such secondary subjects of the book as arms control and the creation of the Livermore Laboratory. According to the author, Teller "begat" the laboratory and defeated single-handed the drive for a comprehensive nuclear test ban in the late 1950s: "He felt the nation needed another lab for the design of nuclear weapons—and it materialized. He opposed the ending of nuclear tests—and the blasts continued" (pp. 19, 270). This characterization seriously underestimates the role of other scientists and policy-makers in these episodes, most directly the role of Berkeley scientists E. O. Lawrence and Herbert York in the founding of Livermore and that of the Atomic Energy Commission, the Joint Chiefs of Staff, and the President's Science Advisory Committee in the test ban debate.

Certainly, this is a good book to learn more about the secret and largely closed world of the national laboratories and their relation to Washington, D.C. But Broad's ultimate fascination with Teller—a key figure to be sure—really prevents us from getting a clear picture about the true dynamics of the arms race, arms development, and arms control.

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Lives of a Chemist

Steroids Made It Possible. CARL DJERASSI. American Chemical Society, Washington, DC, 1990. xxiv, 205 pp., illus. $24.95. Profiles, Pathways, and Dreams: Autobiographies of Eminent Chemists.

The Pill, Pygmy Chimps, and Degas' Horse. The Autobiography of CARL DJERASSI. Basic Books, New York, 1992. viii, 319 pp. + plates. $25.

Within less than two years, Carl Djerassi, "father" of the birth control pill, has given us two autobiographies. The earlier of the two, *Steroids Made It Possible*, is part of a 22-volume series of autobiographies whose stated goal is "to document the development of modern organic chemistry by having individual chemists discuss their roles in this development." With four and a half decades of scientific accomplishment described in more than 1100 research publications, Djerassi's was no mean task. Fortunately, there are a few *leitmotivs* that unify large groups of these papers, and Djerassi is successful in showing how his research on subjects as disparate as magnetic circular dichroism, artificial intelligence, and marine phospholipids all grew out of his early and abiding passion for steroids. Readers will appreciate the author's overview, along with his selection of his own "greatest hits," since it is unlikely that many will ever read a significant fraction of this massive output. Organic chemists will be pleased to acquire some incidental trivia, such as the fact that the "dienone-phenol" rearrangement and the "Birch reduction" were christened by Djerassi.

Though the chief purpose of the 1990 volume is to summarize scientific accomplishments, the opening and closing chapters that frame the science provide tantalizing glimpses into some non-scientific aspects of a remarkable life. Djerassi's boyhood as the son of two physicians in Vienna and Sofia prepared him for a career in medicine. However, his whirlwind undergraduate education at Newark Junior College, Tarkio College (Wallace H.