

Edward Teller in the Public Arena

Having lived through upheavals in Hungary and Germany between the wars, Teller understood that political and military catastrophes are entirely possible. He was, perhaps, less aware that catastrophe can result from excess as well as inaction.

Harold Brown and Michael May

Early in his career, Edward Teller (1908–2003) showed the potential to be one of the century's leading figures of fundamental science. A student of Werner Heisenberg in Leipzig, Germany, in the late 1920s and then a member of Niels Bohr's Copenhagen institute in the 1930s, Teller made seminal contributions to applications of the new quantum mechanics, particularly to molecular physics. In that early part of his career, Teller worked, usually with collaborators, on a wide range of theoretical physics problems.

The traumatic aftermath of World War I in his native Hungary and, even more, the advent of the Nazi regime in Germany in 1933 changed Teller's world. Like many of the prominent Hungarian physicists of his generation, Teller was a Jew. Events following the report of uranium fission in January 1939, just eight months before the outbreak of war in Europe, brought Teller and other physicists into the center of events.

Caught up in World War II and the cold war, Teller became an active participant in, and even a symbol of, the interaction among technology (especially nuclear weapons), military capability, and international relations. Those are the principal concerns of this article.

The companion piece, by Stephen Libby and Morton Weiss on page 45, deals with Teller's many contributions to pure science. He never lost his interest in science, or in music, literature, education, and good conversation. He often repeated, with approval, a friend's characterization of him as "the only monomaniac with several manias."

A controversial figure

Both of us knew Edward Teller for more than 50 years, worked with him, and were involved in some of the controversies that swirled around him, often on the opposite side from Teller.

With Teller's death last year, a larger-than-life, highly controversial figure passed from the stage, and a link to the major disputes of the nuclear age was severed. Many regarded him as an unthinking advocate of nuclear weapons in particular, and weapons systems in general, as the answer to all questions of national security. To others, he was a creative architect of US military strength, a perceptive analyst of the international scene, and an accurate anticipator of future threats.

By any standard, he had a significant influence on

public opinion, congressional attitudes, and, occasionally, on government policy. With regard to policy, however, he was as often an instrument as an influence. And he was a highly polarizing influence on the technical community.

Academics largely opposed him. At the 1954 Oppenheimer security hearing, initiated by Robert Oppenheimer's opponents in the Eisenhower

administration, Teller famously said that "I would prefer to see the vital interests of this country in hands that I understand better and therefore trust more." Most university physicists never forgave Teller for that testimony. Scientists in industry and government were more evenly divided.

Oppenheimer had been the wartime director of the Los Alamos laboratory that created the atomic bomb. At the time of the hearing, he was the country's most highly placed adviser on nuclear matters. Teller's testimony probably did not affect the hearing's outcome, which was the revocation of Oppenheimer's security clearance. But it left wounds unhealed for decades.

Teller was associated with nuclear weapons from the very start. During World War II, he was a member of the Manhattan Project. His principal technical contribution to nuclear weaponry was the final insight, reached in 1951 at Los Alamos, that made thermonuclear weapons possible. Although Teller alone was not responsible for that insight, his persistent pursuit of a solution since 1944 and his successful approach, following many false starts, justify his identification as "father of the H-bomb," a title with which he was neither altogether happy nor unhappy.

Livermore

Following a successful demonstration in 1951 of a key bomb principle, in a test explosion on Eniwetok Atoll organized by the Los Alamos lab, Teller became dissatisfied with the pace of research and development on thermonuclear and advanced fission weapons at Los Alamos. So he, together with Ernest Lawrence, Herbert York, and others, including senior US Air Force figures, urged the establishment of a second nuclear weapons laboratory. Their effort led to the creation of the Livermore laboratory in 1952, with York as its first director.

For decades thereafter, Teller was a major driving force at Livermore. He served two years (1958–60) as director. In many ways the lab, now called Lawrence Livermore National Laboratory, continues to reflect his personality and attitude. Teller and York encouraged the development of thermonuclear warheads light enough to be carried on solid-propellant intercontinental and submarine-launched missiles, which became the backbone of the US nuclear arsenal.

Teller went on to seek what he called third-generation nuclear weapons—that is, designs that would amplify specific effects such as neutron flux or electromagnetic effects. In the 1980s, he promoted the concept of multiple x-ray lasers driven by a single nuclear explosion as a key to ballistic-missile defense. Most of those later ideas turned out to be technically unworkable. And none of them, after the success of lightweight nuclear weapons, had much effect on the military balance.

Harold Brown, US secretary of defense in the Carter administration, is now a counselor with the Center for Strategic and International Studies in Washington, DC. **Michael May** is director emeritus of Stanford University's Center for International Security and Cooperation. Both are physicists and former directors of Lawrence Livermore National Laboratory.



Edward Teller (right) congratulates Robert Oppenheimer, who has just been awarded the US government's 1963 Enrico Fermi Award. Teller won it the previous year. Looking on (center) is 1959 winner Glenn Seaborg.

Though himself a theoretical physicist with significant achievements in pure science, Teller understood that American security and prosperity depended on applied science and technology. To obtain societal support, he realized, science needed to demonstrate useful applications. He strongly supported basic research both for its own sake and for its value in leading to the development of new technologies. And he sought to expand the education of scientists at all levels. To serve education and make the Livermore lab more attractive, Teller established at Livermore an applied science department associated with the University of California, Davis. For Teller, that was a labor of love. Throughout his life, he delighted in the company of young people. He befriended and fostered the careers of many aspiring young scientists.

Beyond the laboratory, Teller's impact from the 1960s on was predominantly political. He judged the Soviet Union to be ahead of the US, or soon to be ahead, in military technology. He argued that any agreed limitations would only widen the gap—because the Soviets would cheat and the US would not. Thus he saw arms control of any kind as a trap rather than an element of national security strategy. He opposed test bans, strategic arms limitations, and the antiballistic-missile treaty of 1972.

Star Wars

Teller was encouraged by the Strategic Defense Initiative. Indeed, he played a part in its adoption by the Reagan administration. Quite generally, he was pleased with President Reagan. In 1976, one of us (May) had asked him whom he would prefer as president. "Ronald Reagan," Teller answered, "but he will never make it!" Both the political preference and the underlying pessimism were characteristic of Teller. Along with others from prewar Europe, he never lost sight of the fact that political and military catastrophes were entirely possible. He was less aware that catastrophe can result from excess as well as inaction.

His unwavering advocacy of ballistic-missile defense further widened the divide between Teller and the mainstream of physicists. Most scientists, including us, regarded missile defense as not ready for prime time. When asked why he supported a system with such obvious faults, Teller answered that if the US didn't work on it, it wouldn't get any better and, without a deployment goal, no one would work on it seriously.

To Teller, whose central priority was defending the US in a difficult and unpredictable future, that was the right position. But to many others, it was intellectual dishonesty. Scientists were supposed to tell the truth as they understood it, not to subordinate the truth to other agendas.

Also close to Teller's heart were two causes that might surprise those who knew him only in caricature. One was his dislike of secrecy, especially in technical matters. Teller saw secrecy as harmful to the US in a fundamental way. It lessened the key American advantage of broad, free discussion and criticism while it assisted closed societies, which were better at maintaining secrecy. One of his examples



Teller with Livermore colleagues who made up the faculty of the off-campus applied science department of the University of California, Davis, newly formed at Livermore in 1963. Left to right are Michael May, Harold Furth, Montgomery Johnson, Bernard Alder, John Killeen, Roy Brainer, Teller, Wilson Talley, Richard Borg, Albert Kirschbaum, and Richard Post.



Teller with Vitaly Ginzburg (right) in 1992 in Washington, DC. Ginzburg had played a major role in the development of Soviet nuclear weapons. (Photo courtesy of Fred Rothwarf.)

was the nuclear weapons program itself. He maintained that the Soviet program was ahead of ours precisely because of US secrecy. At the same time, he argued, the US was forging ahead of the Soviets on other defense initiatives that were not so highly classified.

Teller's other somewhat surprising cause was that of nuclear power and nuclear safety. In his view, the two issues were synergistic. He was ahead of his time, and perhaps ours, in seeing that nuclear power, which he thought essential, would go nowhere if its safety and security were in question. But the nuclear industry and the government, under pressure of competition and budgets, did not give safety and security the continuing priority Teller would have liked—at least not until very recently.

Edward Teller, for better and worse, left his mark on his time. He unquestionably helped strengthen the country's nuclear capability and, through it, nuclear deterrence. He was one of the very last of the legendary generation of physicists born early in the 20th century. He was personally open, generous, and willing to raise fundamental issues that went against prevailing wisdom. But perhaps he was also too willing to make enemies and not quite willing enough to acknowledge that, in the end, he and his domestic enemies were ultimately on the same side.

Teller was a cultured and often witty man, a pleasant companion when optimistic. But when preoccupied with adversaries foreign and domestic, he was given to black moods. When he was engaged with such matters, nuance and even major flaws in his positions were sometimes suppressed in the service of leading his audience to what he considered the right conclusion.

One anecdote from Edward's old age may help characterize him. In late 2000, he and one of us (May) were attending a memorial service for a longtime colleague. Waiting for things to begin, he asked me what I thought were the three most important achievements of the 20th century. His candidates were the ability to rapidly go anywhere in the world, to communicate with nearly everyone at the speed of light, and to efficiently destroy all of us. He then told me what would be the most important thing to accomplish in the new century. That was, he said, to learn to get along with one another—a task whose difficulty he did not underestimate. ■

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