

Thoughts on Edward Teller's memoirs
(Edward Teller, *Memoirs: A Twentieth-Century Journey in Science and Politics*,
Perseus Publishing, Cambridge, MA (2001), 628 pp.)

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Edward Teller's *Memoirs* (published in his 93rd year) discuss science, politics, and his personal life, especially his devotion to family and his exiles-- from Hungary in the 1920's because of the *numerus clausus* in Hungarian universities, from Germany in the 1930's because of Hitler's rise to power, and from the American physics community because of his testimony against Oppenheimer. These memoirs are a distinctive, important record of the twentieth century, but they do not provide an accurate history. This is a book to react to, as well as to read.

In his long life, Edward Teller has participated in most of the major physics events of the twentieth century. As a student and young graduate, he contributed to the glorious days after WW I in Germany and Denmark. He helped arrange Einstein's letter of August 1939 to Roosevelt that initiated the US atomic bomb project and he worked at Los Alamos during the war. The latter sixty percent of his memoirs is devoted primarily to political themes, including the development of the H-bomb, establishment of a second nuclear weapons laboratory, and the Oppenheimer hearing, as well as work against nuclear test bans and arms control and for ballistic missile defense and peaceful uses of nuclear explosives.

As a physicist born shortly after WW II, I have heard of Edward Teller all my life. In my own work, I have come across some of his scientific collaborations, including the BET theory, Inglis-Teller effect, and Jahn-Teller effect. In politics, his contributions have been individual and forceful. Having read several of his books, I already "know" him, but his memoirs are the longest and most readable of the lot.

Teller devotes an astonishing amount of space to J. Robert Oppenheimer, about whom almost everything is "suspect," from the time of their first meeting in 1942 until Oppenheimer's death. Teller was already a focus of controversy before his negative testimony at the hearing (April-May 1954) which led to the removal of Oppenheimer's security clearance. Teller's extended discussion confirms that the Oppenheimer hearing is the central point in his own life and that he is still much vexed over his rejection by many American physicists following his testimony.

The famous Teller-Oppenheimer dichotomy is not, in fact, well defined in terms of history or morality. Teller and Oppenheimer are not the "opposites" of myth. Teller is a brilliant man of considerable integrity with some unpleasant, dangerous opinions regarding armaments. He is also a nasty manipulator. Oppenheimer shares some of these characteristics in the guise of a very different personality. Oppenheimer did a magnificent job for our country in the Manhattan Project and it is sad to contemplate how the government treated him afterward. Teller argues in his memoirs that the reason he spoke against granting a security clearance to Oppenheimer was the latter's treatment of Haakon Chevalier. This claim is inconsistent with Teller's story as it evolves in these memoirs. Oppenheimer was dropped because of insufficient enthusiasm for the H-bomb [395]. (References to pages in *Memoirs* are given in brackets.) That was the government's policy interest, and Teller was a handy tool for the occasion.

Teller has a point about Oppenheimer's treatment of Chevalier. I read about the Oppenheimer affair when I was in high school, and felt that Oppenheimer mistreated Chevalier and was not a nice guy. Indeed, Oppenheimer left a number of his graduate students and colleagues to blow in the winds of the anticommunist hysteria of the 1950's. David Bohm, one of Oppenheimer's students and among the brightest US-born physicists of the century, had to develop his career overseas. When my wife read Robert Jungk's *Brighter than a Thousand Suns*, a history of the atomic bomb published in the 1950's, she also got a bad sense of Oppenheimer, despite Jungk's sympathy for him. As she said, that is a sign of a well told story. So, Oppie was not a good friend. And he told some fibs to the security people in the Manhattan Project, all of which they knew about.¹ But that was not the issue for the Personnel Security Board. Teller's "distaste for ambiguity in friendship" is firmly stated [394], but in the Oppenheimer affair he was being used.

Teller's comments [395+] on Oppenheimer's hazy moral reasons against further work on the H-bomb are obliquely appropriate. Oppenheimer's occasional arguments for preventive war and further weapons development were not far from actual US policies or, as it appears today, from the consequences of Teller's positions. Preventive war is only a step away from the later policy of mutually assured destruction. If war happens, the distinction lies in the time of attack.

In the early postwar years, the nation's leadership was conceding the country's future to increasing militarization. Eisenhower commented on this trend in his farewell address in 1961, to Teller's scorn [459+]. Massive nuclear armament was advocated by, among others, Forrestal (the first Secretary of Defense, whose paranoia was well known), Baruch (who subverted the Acheson-Lilienthal proposals for international control of nuclear energy), Byrnes (secretary of state), Generals LeMay, Arnold, and others (who threatened to bomb Soviet cities in "massive retaliation," long before they could have attacked), and Dulles. The record presented by Teller shows that he was speaking for (but, I emphasize, not working for) E.O. Lawrence, Willard Libby, and Lewis Strauss, all of whom were strongly opposed to Oppenheimer. Teller was always a true believer, quite willing to "be alone." We can infer from his long list of politically agreeable friends that he was not really alone from 1945 onward. His efforts to vindicate himself vis-a-vis Oppenheimer, Rabi, and Bethe and to gain sympathy for himself in his isolation of half a century ago are unconvincing. I suspect that Teller could (have) ease(d) his pain over Oppenheimer by looking "outside" himself occasionally.

Teller has often spoken and written about the problem of secrecy, and he sometimes makes sense about it. But his own use of secrecy to cover his tracks or avoid the appearance of incompetence or failure is evident in his memoirs. This is analogous to the government's use of secrecy.

The successes of the plowshare program (nuclear explosives for excavation and enhanced gas production) were more limited² than Teller claims [448+, 466, 492+]. His praise of Soviet successes in this area compared to American failures is quaint nonsense. Both the Soviet and American programs were flops-- unnecessary and without economic benefit. Nobody uses "peaceful nuclear explosives" today or would even think of it; the demand did not come from the consumer.

Teller can be a lucid writer, but he does not explain the "secret" of the Hbomb clearly. His discussion of thermal disequilibrium and radiation opacity [178+, 312+] hints at, but skirts,

the mechanism by which radiation from a fission explosion initiates a fusion explosion in the H-bomb, even though much of the idea has been exposed publicly since 1970 (laser fusion!).

Fallout from nuclear tests was the major reason for the atmospheric test ban of 1963. Teller's figurehead opposition to a test ban delayed this treaty for years. He still defends nuclear testing and opposes agreements limiting nuclear armaments. He writes [440] that "the annual amount of radiation received from atmospheric nuclear testing at its highest level (in 1963) was 13 mrem." This is presumably to be compared to the roughly 100 mrem annual dose at sea level from natural sources. Fallout, however, is not distributed uniformly over the earth's surface. Thus, cumulative doses exceeding 3.0 roentgens (for gamma rays, equal to 3000 mrem or more than 200 times Teller's value) were reported³ for inhabited areas more than 80 miles from the center of the Nevada test site from about 1 MT cumulative fission explosion energy release through 1958.

Andrei Sakharov, the leading Soviet developer of the Hbomb, had a very different career and very different sensibilities from Teller's. Teller writes [320], "I formed the impression that the Russian physicist's strong negative feelings about nuclear explosives may have been related in part to the use of political prisoners as laborers at test sites, and the lack of even rudimentary safety measures to protect them. The situation in the United States was very different." Teller refers smugly [463] to Sakharov's "impression (based on well-publicized speculations) about the hazards of low-level radiation." On the contrary, Sakharov's views were strong and well founded:⁴ "My view of nuclear tests in the atmosphere as a direct crime against humanity no different, say, from secretly pouring pathogenic microbes into a city aqueduct, a viewpoint which I came to hold even the 1950's, received no support among the people around me. I saw how easily people fit their opinions to conceptions that are convenient to them." Given his contributions to the Soviet civil rights movement from 1965 onward, Sakharov was undoubtedly aware of prisoners working in the weapons complex, a phenomenon widespread throughout Soviet society. Was the safety situation really different for the Indian uranium miners of northwestern New Mexico in the 1940-60's? Many of them died of radiation-induced lung disease long after the danger was identified.

Teller's "impressions" are a grotesque trivialization and distortion of Sakharov's own views on nuclear testing and armaments from 1959 to his death. Sakharov wrote,⁵ "Three technical aspects of thermonuclear arms have made thermonuclear war a threat to the very existence of civilization. These are the enormous destructive power of thermonuclear explosions, the relative cheapness of rocket-borne thermonuclear weapons, and the practical impossibility of effective defense against a massive nuclear missile attack." Teller's faith in defense against nuclear weapons and missiles appears early, with reports he wrote for a naval officer in 1945 [218+] and for a member of Congress in 1946 [224+], continues through the Star Wars episodes of the 1980's [525+, 541+], and on to the present day. The impossibility of effective defense was pointed out in the Acheson-Lilienthal report⁶ and has never been refuted by any of the missile defense notions upon which our country has spent billions of dollars. The Acheson-Lilienthal report treated nuclear weapons as a political problem with no long-term solution except the limits of (1) agreement to stop their production and deployment by all or (2) annihilation.

Teller cites E. U. Condon's "discomfort" with Oppenheimer as the reason for his resignation from the Manhattan Project in 1943 [180], but Condon, himself, wrote¹ that the main issue was "compartmentalization" (i.e., General Groves). Herbert York was the first director of the Livermore laboratory. After leaving that position (succeeded by Teller), York became an

effective government advisor and negotiator for the test ban and later treaties. He provided the world with much information to counter the claims of the nuclear armorers.⁷ Teller makes no mention of York's opinions and later activities, except to note that "the current [*in 1958*] director of the laboratory, Herb York, leaned considerably toward approval of such a treaty" (atmospheric test ban) [434].

Teller delights [531+] in his contribution to Reagan's "Star Wars" speech of 23 March 1983 (actually a brief appendage to a longer speech mainly about Cuba). A more representative incident that Teller fails to mention is the role of his "x-ray" laser missile defence scheme in the failure of the Reykjavik summit of October 1986, where Reagan met the Soviet leader Gorbachev to discuss disarmament. At that time there was a battle at Livermore regarding data from x-ray laser experiments, whose success had been trumpeted by Teller and the laboratory administration, while the immediate supervisors were concerned about the validity of that data. Briefed on the "successes," Reagan believed the system was nearly ready for deployment and pressed the Russians on the matter, thereby wrecking the Reykjavik talks. After long political battles and (as in the 1950's) damage to the careers of some opponents of the x-ray laser scheme at Teller's instigation, the results were shown to be negative, bordering on fraud.⁸

In sum, Teller's memoirs are an extensive record of physics in the twentieth century. His stories of his student and post graduate life are lively and engaging, as are his stories of his devotion to his wife and family. The book begins with several typographical errors in Hungarian and ends with a dubious interpretation of Aristarchos' name as "best beginning." ("Noble leader" is a better translation.) In between, there are so many distortions of history, science, and politics that the reader is well advised to check other sources. Teller has his "glasnost" in these memoirs, but the rest of us need more data.

Over the years Teller seems never to have grasped the relationships among the interests and activities of those who do research (this pays well), those who build weapons (this pays even better), those who use weapons (mass murder presents problems to many military leaders), and peace (even bigger problems). He writes that "in a democracy, using nuclear weapons is an issue entirely different from that of working on their development" [396]. To the extent that this ambiguous notion is true here, it was true in the Soviet Union. (Khrushchev pointed it out to Sakharov^{4,5} [464].) Leo Szilárd, who was central in starting the bomb project but left at war's end, had a clearer understanding: "brass hats are brass hats."

Teller laments that, "For more than four decades, well-qualified scientists whose contributions would have been of great value have tended to avoid weapons work. I suspect that at least part of that unwillingness arose because of their misunderstanding of the Oppenheimer hearing and of security regulations." [396] Actually, some of us have understood these things well. As the US sets out on a course of independent warmaking all over the globe in the early twenty first century, with the rejection of at least ten international agreements on armaments and the conduct of war in the first eighteen months of the George W. Bush administration, it is important to remember that for our country, the tragedy is that, through the influence of Teller and people like him, the US has pursued unlimited armament as the answer to our and the world's problems, while ignoring far less expensive and more durable diplomatic and cooperative initiatives. Teller has, from time to time, been aware of the limits of armaments [562+], but simplified technical solutions have more charm for him than for most other people. It looks like it's been a while (50 years?) since any of his proposals actually worked.

1. L. Groves, *Now it Can be Told: The Story of the Manhattan Project*, Harper, NY (1962).
2. B. Bolt, *Nuclear Explosions and Earthquakes: The Parted Veil*, W. H. Freeman, San Francisco (1976).
3. G. Dunning, "Fallout from nuclear tests at the Nevada test site," in: *Hearings before the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, Congress of the United States, 5-8 May 1959, Vol. 3*, pp. 2021-2113.
4. A. Sakharov, *Vospominaniya* [Memoirs], Chekhov Publishing Corp, NY (1990). Sakharov's encounter with Teller is discussed in his companion memoir *Gor'kii, Moskva, dalee vezde* [Gorky, Moscow, and everywhere else], (1990).
5. A. Sakharov, *Thoughts on Progress, Peaceful Coexistence, and Intellectual Freedom*, June 1968 (in *O Strane i Mire* [About my Country and the World], Khronika Press, NY (1976), pp.139-179).
6. *A Report on the International Control of Atomic Energy*, US Dept. of State, 16 March 1946.
7. H. York, *Making Weapons, Talking Peace: A Physicist's Odyssey from Hiroshima to Geneva*, Basic Books, NY (1987).
8. W. Broad, *Teller's War: The Top-secret Story behind the Star Wars Deception*, Simon and Schuster, NY (1992).

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