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In Memoriam

Robert Serber (1909–1997)*

Abraham Pais**

Serber is one of the unsung heroes of twentieth-century physics, in which he played an important role, in peace as well as war. It is a reflection of his personality that this is not as widely known as it should be: He always spoke softly, both literally and figuratively, never sought the limelight, and often did not much care for publishing his scientific results.

Robert was born in 1909, in Philadelphia, the oldest of the three children of David Serber, a lawyer, and Rose, née Frankel. His paternal grandfather had been a Russian immigrant. He received his early education in his native city, and did his undergraduate work at Lehigh University in Bethlehem, Pennsylvania. In those years he held various picturesque summer jobs, such as oilman on a tanker. In 1930 he went to the University of Wisconsin in Madison for graduate studies. In 1933 he married Charlotte Leof (b. 1911), whom he had known since his Philadelphia years.

Robert had published six papers before he got his Ph.D. A typical Serber story: at his final exam he could not remember which one of these papers he had submitted for his Doctor's degree. Thereafter he and his wife took off for Princeton, where he intended to spend the National Research Council Fellowship he had been awarded, one of five given out nationwide that year in theoretical physics. It carried a stipend of $1200, not a royal but still a princely sum for that time. (Robert and Charlotte paid $25 a month for their room in Madison.) On the way they stopped off in Ann Arbor, to attend one of the famous summer schools. There they met Robert Oppnheimer for the first time – which changed the course of their life. Deeply impressed, Serber decided to change the venue of his NRC Fellowship to Berkeley, where he arrived in the autumn of 1934.

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After Oppenheimer had returned in 1929 to the U.S. from Europe, he had started schools of theoretical physics at Berkeley and Caltech which became the centers where quantum field theory in America was founded. Serber at once contributed to this subject with two papers,[1] in the first of which he introduced a concept which is now part of the physics language: to *renormalize* the polarization of the vacuum. He also participated in other lively work at the physics frontiers, notably in nuclear physics, an area that became one of his life-long interests. Thus he and Oppenheimer were the first, I believe, to note (1938) that isospin is conserved in nuclear reactions.[2] In 1947 he introduced the "Serber forces" which act between nucleon pairs with even orbital angular momentum only.[3] His last research paper (1976) deals with a simple nuclear model.[4] Back to the Berkeley days, a paper of 1937, together with Oppenheimer,[5] appears to be the first in which Yukawa's meson theory is mentioned in a Western publication. He also published on theories of cosmic rays and of stellar constitution. Of Oppenheimer's contributions in those years, Serber has recalled: "His physics was good, but his arithmetic awful."[6] On his personal relations with him he has said that there was "from the beginning a very special rapport between us."[7]

Much as he liked Berkeley, Serber nevertheless accepted in the spring of 1938 an offer for an assistant professor position at the University of Illinois in Urbana. Jobs were scarce at that time, especially for young Jews. He kept in steady touch with Oppenheimer, however, who "would write to me every Sunday."[8] Both Serbers also continued their earlier summer visits to Oppenheimer's ranch in New Mexico. Serber's most memorable work in Urbana was his paper with Donald Kerst (1911–1993) on theoretical aspects of the betatron, a new type of accelerator, "the most useful thing I did for particle physics."[9]

Around Christmas 1941, just after Pearl Harbor, Serber received a call from Oppenheimer, who wanted to come to Urbana to discuss a delicate matter. On a walk in the corn fields he told him that he would be appointed head of the atomic bomb project and asked Serber to be his assistant. So it came about that Robert and Charlotte were the first after Oppenheimer to arrive in Los Alamos.

One of Serber's early tasks was to give a series of lectures on what physics was known about the project. This resulted in *Los Alamos Report Number 1: The Los Alamos Primer*.[10] He became the group leader assigned to overseeing the design of the Uranium-235 bomb and the gun assembly (its detonation device) – the Hiroshima bomb. He was present at the Trinity test of that gadget on July 16, 1945. On that same day a cruiser left San Francisco harbor with Little Boy, the Hiroshima bomb, on board, bound for Tinian in the Mariana Islands in the Pacific, where also Fat Man, the plutonium bomb destined for Nagasaki, was delivered.

Serber was flown out to Tinian, with the field rank of colonel, to participate in the gun assembly. While there he was asked by Colonel Tibbets, commander of the Enola Gay, the plane that was to make the Hiroshima drop, to calculate whether his flight plan would make his plane survive the blast. Serber did so and could assure the Colonel that he would be perfectly safe.

Two stories about the Nagasaki drop. First, Serber, Luis Alvarez (1911–1988), and Phil Morrison (b. 1915) had written a letter to Ryokichi Sagane (1905–1969), a Japanese physicist whom they knew from the time he had worked with Ernest

Lawrence in Berkeley, in which they implored him to urge his government to stop the war in order to avoid further destruction. This letter, which was dropped on August 9, together with the Nagasaki bomb, reached Sagane, who eventually returned it to Alvarez.

Second story. Serber was supposed to run the camera that would take pictures of the Nagasaki drop, but was thrown off from the accompanying plane because he had no parachute.

When it was all over, Serber was made head of mission to inspect on site the results of the two atom bombings and so, in September 1945, was among the first Americans to enter Japan. He returned to Los Alamos on October 15.

In January 1946 Serber was back in Berkeley, now as full professor (see Fig. 1). His first task was to give a series of lectures on high energy processes, which were later published under the title *Serber says*.[11] His research in the late 1940s includes papers on the workings of new Berkeley accelerators.[12]

I first met Bob (as everyone called Serber) at the "Shelter Island" conference in 1947, where he reported on first results obtained with the 184-inch Berkeley cyclotron – the first high energy experiments. I met him again during the sequels to this meeting, the "Pocono" conference in 1948, and the "Old Stone" conference in 1949, where he described the first experiments with aritificially produced π-mesons. Of these early encounters I recall that he spoke softly, and with a slight stutter, but that *what* he said showed him to be a true professional. I also saw Bob in Princeton,

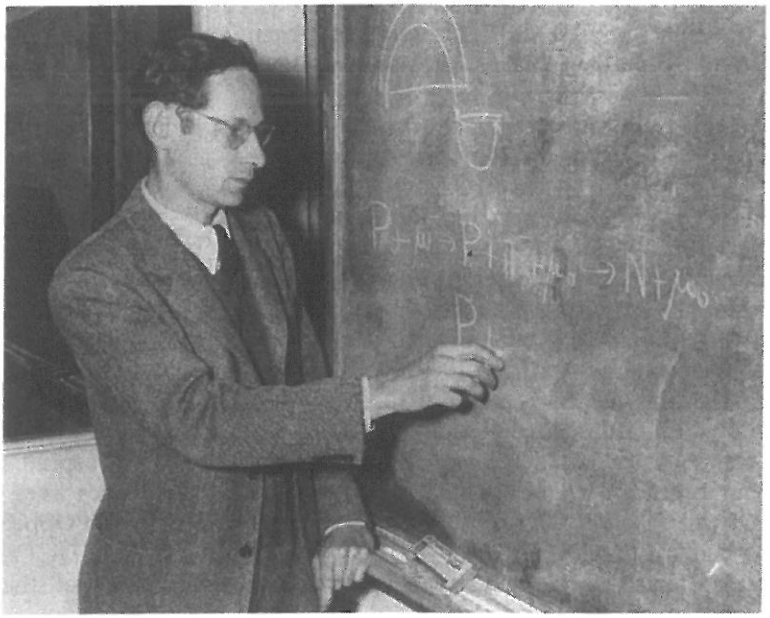

Fig. 1. Serber working on pions at Berkeley. From *Peace and War*, by Robert Serber with Robert Crease © 1998 Columbia University Press. Reprinted with the permission of the publisher.

in October 1949. I did not know at that time that he was there to attend a meeting on the fate of the hydrogen bomb project.[13]

Meanwhile Bob had run into some political problems. In 1948 he had been the subject of investigations into his "character, associations, and loyalty," not pleasant but causing him no harm in the event. In 1950 the Regents of the University of California demanded that all faculty members take an oath of loyalty to the United States. "I was unhappy but I didn't take it so seriously that I wouldn't sign."[14] He was much offended, however, when colleagues were fired for refusing to sign. Even more unpleasant for him was to be caught in the middle of political controversies between Lawrence, the conservative, and Oppenheimer, the liberal, a situation so uncomfortable that Bob felt he had better leave Berkeley. In 1951 he did so, starting his professorship at Columbia University.

I, too, was at Columbia, in academic year 1954–55, on a sabbatical from the Institute for Advanced Study in Princeton. It was in that year that I got to know Bob really well and that our friendship began. We collaborated on several papers, one on the interaction of K-mesons with atomic nuclei,[15] and two on strong coupling theory.[16] I got to like his dry sense of humor. Two examples. A story Bob liked to tell. He dreamt that he had died and gone to heaven. Saint Peter leads him in the presence of God, who says to him: "You won't remember me but I took your quantum mechanics course in Berkeley in 1946." Another story about a discussion we once had. I told him how much I liked the beautiful designs on wings of butterflies. Bob's reply: He much liked the design on the back of a turtle on which was written: Greetings from Atlantic City.

That year began our joint trips by car to Brookhaven National Laboratory, where both of us were consultants. (At some time or other Bob was also consultant for Fermi Laboratory, SLAC, and Los Alamos.) That was before the Sunrise Highway and the Long Island Expressway had been constructed, so the ride was still fairly lengthy but nevertheless enjoyable, not least because at that time Bob had a Jaguar XKE, the sexiest car I have ever driven in.

We have also frequently been in touch with each other in later years but never as closely as during my time at Columbia University.

I conclude with brief remarks on Bob's later years.

In the late 1960s, Charlotte was diagnosed to suffer from Parkinson's Disease. In 1967 she committed suicide by taking an overdose of sleeping pills. I have been told that Bob stopped stuttering after her death.

In 1970 Bob served as president of the American Physical Society.

After Oppenheimer's death in 1967, Bob had become intimate with Kitty, his widow. In 1972 he and Kitty planned to cross the Pacific by sailboat, which also had a motor on board, helped by a crew of four. They did not get further than the Panama Canal, when Kitty had to be put into a Panama City hospital, suffering from an embolism, of which she died. Bob saw to it that her ashes were scattered in the sea, near Carvel Rock on St. John, Virgin Islands, where also Oppenheimer's ashes had been dispersed.

From 1975 until his retirement in 1978 Bob was Chairman of the Physics Department, Columbia Univeristy.

In 1976 Bob met Fiona St. Clair, daughter of old-time residents of St. John. They married in 1979. Fiona brought along Zacharias (then aged 4), her son by an earlier marriage. In 1980 Bob and Fiona's son William was born.

In 1983, Bob was one of three physicists who presented to the Secretary General of the United Nations a petition signed by about 10,000 physicists, asking for an end to the testing and production of nuclear weapons.

In 1993 Bob gave the keynote address at the 50th Anniversary celebration of Los Alamos. The meeting was classified, armed guards standing at the door.

In 1997 Bob underwent surgery to remove a brain tumor. He never fully recovered from that operation, and died on June 1, 1997, at age 88.

Honored be his memory.

Added Note. On the day I gave this address, Robert Crease was so kind to present me with a copy of the memoir on Serber, the result of interviews with him, which had just come out.[7] I have used this very readable book to add here some biographical details about Bob's life and work.

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