The Making of the Atomic Bomb

Review Author[s]:
Zuoyue Wang

Technology and Culture, Vol. 30, No. 4 (Oct., 1989), 1078-1081.

Stable URL:
http://links.jstor.org/sici?sici=0040-165X%28198910%2930%3A4%3C1078%3ATMOTAB%3E2.0.CO%3B2-T

Technology and Culture is currently published by The Johns Hopkins University Press.

W. David Lewis and William F. Trimble have written a well-documented story of a great experiment, in good old-fashioned English, eschewing quasi-technical terms or conventional trendy clichés. They support the thoroughly readable text with the statutory "footnotes" demanded of the scholarly fraternity as a sine qua non. (But I join A. J. P. Taylor in his abhorrence of putting notes at the end of the book, necessitating much thumbing of pages and much losing of place.)

My main criticism of this book should probably be directed not at the authors but at the publisher. The photographs do not reproduce well on the slightly absorbent paper. They were not always captioned clearly: I read the explanation on page 112 several times before realizing that half the picture was missing. The text cries out for cartographic support in appropriate places, where the ever-changing route network is discussed. The map on page 137 comes as a surprise, as hitherto an atlas was needed for clarification. Worst of all is the absence of diagrams to explain the workings and subsequent modifications of the grappling system, ground installations, and tension-easing devices. I read the textual explanations several times and confess that I was little wiser than when I began.

These shortcomings apart, however, I thoroughly recommend this book as a fascinating account of one of the brave attempts, but at the same time one of the failures, in air transport history—an attempt that laid the foundations of one of the major trunk airlines today, USAir.

R. E. G. Davies

Mr. Davies is the curator of air transport at the National Air and Space Museum. He has written extensively on the subject of airline history and of air transport, in six books as well as innumerable periodical articles. The All American airmail pickup scheme is referred to in his book *Airlines of the United States since 1914*, which sets the operation in the broader perspective of the growth of the local service and regional airline industry.

The Making of the Atomic Bomb. By Richard Rhodes. New York: Simon & Schuster, 1986. Pp. 886; illustrations, notes, bibliography, index. $22.95 (cloth); $12.95 (paper).

This Pulitzer and National Book Prize–winning work (for 1987) by Richard Rhodes is an exceptionally well-written account of the building and use of the first nuclear weapons. Rhodes presents an extensive historical exploration of the scientific and political background to the bomb that focuses on people—the scientists, engineers, and administrators. He synthesizes a large amount of material, most of it published, and ably weaves various lines of development together to render a most up-to-date and surely most readable version of the exciting story.

Starting with Ernest Rutherford's 1911 discovery of the atomic nucleus, the first third of the book is mostly devoted to the history of nuclear physics before World War II. By narrating the milestone events in the field up to the discovery of nuclear fission in 1938, Rhodes does more than provide the necessary scientific framework within which the bomb was created. Scientists' faith in and practice of openness are well illustrated. Scientists are also shown interacting far beyond their national boundaries. Making full use of biographies, Rhodes introduces prominent scientists such as Niels Bohr, Leo Szilard, Albert Einstein, Werner Heisenberg, James Chadwick, Enrico Fermi, Otto Hahn, J. Robert Oppenheimer, Ernest Lawrence, Edward Teller, and many others, when he describes their discoveries. These men eventually became the central figures in the atomic bomb projects on the two sides of World War II.

The American efforts apparently originated in "the Hungarian Conspiracy" led by Szilard. Always concerned about the fate of the world, Szilard, in the days after fission's discovery, was alarmed by the possibility of an atomic bomb and particularly of its being in Nazi hands first. Together with Eugene Wigner and Teller, two fellow Hungarian refugee scientists, he went to see Einstein to encourage him to write what became the famous letter that brought the matter to President Roosevelt's attention. Although given some support in 1939, for bureaucratic and technical reasons the bomb project did not receive full impetus until 1941. Then, a more optimistic feasibility report on the bomb from Britain reached America, and Pearl Harbor brought the nation into war. Thereafter, under the general administration of Vannevar Bush, James Conant, and, more directly, General Leslie Groves, by 1945 the Manhattan Project succeeded, and Hiroshima and Nagasaki were devastated.

Though few engineers are named in the book, engineering was largely at the center of the project. Oppenheimer headed the Los Alamos Laboratory, where the bombs were designed and tested. The problems his people faced, highlighted well by the author, were at least as much technological as scientific. Ordnance experts, applied mathematicians, and engineers from numerous fields worked alongside physicists to understand and perfect the mechanism of implosion.

Industrialists were also an important part of the story. Production of bomb-quality uranium-235 and plutonium meant much more than merely an enlargement of laboratory-size apparatus. It figuratively demanded no less than "turning the whole country into a factory," as predicted by Bohr (p. 500). Du Pont, Kellex, Union Carbide, and many other industrial giants built plants in Oak Ridge, Tennessee, and Hanford, Washington, under the Army Corps of Engineers. In fact, the Hanford plutonium project was the largest plant Du Pont had ever constructed and operated.

Although this impressive achievement testified to the effectiveness of the collaboration between science and government, Rhodes hardly ignores any of the clashes between the two. Barbed wire at Los Alamos disgusted Edward Condon, a prominent physicist. For questioning the hierarchical structure and military control of the project, and Groves's "compartmentalization" policy, Szilard was almost interned by the general. He was, in any case, under continuous army surveillance. So was Oppenheimer, because of his prewar connection with left-wing organizations. Bohr came close to the same position. He tried to convince Roosevelt and Winston Churchill of both the great danger and the opportunity the new bomb would bring to the world and urged them to consider international control of nuclear weapons. Churchill, suspicious of Bohr's activities, warned his advisers that "Bohr ought to be confined" to avoid "leakage of information particularly to the Russians" (pp. 537–38). Rhodes highlights these instances to illustrate one of his themes, that "democratic" science conflicts with the "authoritarian" nation-state.

The military use of the atomic bomb also troubled a good many scientists working on the project. When the bombs were nearly ready, Truman's advisers, the Interim Committee, decided to drop them on Japanese cities. While the scientific consultants to this committee saw no other options, a group of Chicago scientists, including Szilard, disagreed. Led by James Franck, they produced the Franck Report, which surprisingly is not mentioned in the book, and suggested a nonmilitary demonstration of the bomb to better the chance for postwar international agreement on the control of nuclear weapons. But the bombs were dropped, and the nuclear arms race was under way.

There was never any serious questioning of the bomb's use on moral grounds. Atrocities in warfare since World War I, so keenly described by Rhodes, had "the long grave already dug." The use of chemical gases and bombing of civilians terrified people. But the Holocaust in the Nazi concentration camps, the Hamburg, Dresden, and Tokyo firebombings, and the December 1937 massacre of Nanjing where Japanese troops killed 300,000 Chinese, all emphatically proclaimed the darker nature of modern warfare. The apt adoption by all belligerents of new military technologies and the strategy of attrition war prepared the stage for the use of atomic weapons. It was merely a "bigger" bomb, as Churchill and many others saw it.

This failure to recognize the revolutionary nature of the new weapons, against which there is no protection except massive retaliation, Rhodes concludes, misled the politicians and brought us to today's confrontational world. The way out of the problem is to negotiate an open world with nuclear arms under international

control. This, Rhodes argues, is a direct consequence of science's challenge to the traditional power of nation-states.

ZUOYUE WANG

MR. WANG holds a Master's degree in history of science from Academia Sinica, Beijing, and is working on his Ph.D. in the History of Science and Technology Program at the University of California, Santa Barbara. His interests include history of modern physics and scientists and nuclear armaments.

RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology. By Merton E. Davies and William R. Harris. Santa Monica, Calif.: RAND Corporation (1700 Main Street, P.O. Box 2138 90406), 1988. Pp. xiii + 126; illustrations, bibliography. $10.00 (paper).

In 1946, the U.S. Army Air Force, under contract with Douglas Aircraft, initiated a procurement-related research program dubbed Project RAND (*R*esearch *AN*d *D*evelopment). The first investigation carried out under this program—a study of space satellites—soon expanded to include other vehicles such as balloons and rockets capable of being used for photoreconnaissance and remote sensing. With air force encouragement, Project RAND was institutionalized as the RAND Corporation in 1948, thus becoming the prototypical government-sponsored "think tank." In the 1950s, RAND carried out broad-based studies related to national security that pioneered most of the contemporary methods of strategic analysis, but space technology remained a primary focus of its research.

Unfortunately for historians, much of RAND's work has been, and remains, classified, and the open literature that deals with RAND's research on space-based systems in a substantive way is quite limited, consisting of a few articles, and chapters in specialized books on technical intelligence gathering (for example, R. C. Hall, "Early U.S. Satellite Proposals," *Technology and Culture* 4 [1963]: 410–34, and P. Klass, *Secret Sentries in Space* [New York, 1971], pp. 72–89; see also B. Smith, *The RAND Corporation* [Cambridge, Mass., 1966]). This book, written by two long-term employees to commemorate RAND's fortieth anniversary, therefore represents a highly significant addition to the sum total of public knowledge about RAND. It is intended as an overview that illustrates the scope and consequences (technical, social, and economic) of multidisciplinary research at RAND and how RAND scientists and their research findings influenced early (1946–60) U.S. space policy and operations.