

Legacy of a Bomb

The Manhattan Project's Impact on the Scientific Community

by Jany Huan Gao

Above the pillared entrance of the University of California Berkeley's Doe library, the fair face of Athena, goddess of wisdom and war, smiles down on its visitors. Dual-natured Athena's presence seems both fitting, yet odd on the Berkeley campus. While Berkeley may be the home of many reputable anti-war protests, the university's research department plays a large role in weapon development. However, Berkeley is not alone in this dichotomy since many universities across the United States also contribute to the development of war-related technology. Some may protest that this research not only has negative effects on society, but also is antithetical to the progressive education that students receive at such schools.

These critics, nevertheless, underemphasize that such research has a beneficial impact, especially on the scientific community. There is one specific military research project that demonstrates well the complex relationship between war and science: the Manhattan Project. This operation ended the Second World War but also contributed to the making of the Cold War. It ushered in a new age and raised many misgivings and fear as well. As will be demonstrated, however, the Manhattan Project's legacy does not entirely have to do with the military for the operation also made an indelible mark on research and education as well.

In 1941, while World War II was still raging, the Manhattan Project was commissioned to develop the first nuclear weapon. The majority of the project was completed by the United States, although two other Allied nations, Britain and Canada, both contributed to the undertaking as well. In the United States, the bulk of the Manhattan Project was handled by three facilities that were constructed specifically for the project: Hanford Site, Oak Ridge, and Los Alamos. Oak Ridge lab conducted research and development of successful and controlled chain reaction and designed facilities necessary to produce plutonium. Hanford Facility produced plutonium and separated plutonium from uranium and fission byproducts (Brown & MacDonald 1977). The later stages of the production of the first nuclear bomb were completed in Los Alamos. In 1945, as a result of this collaboration, the first atomic bombs were constructed and

dropped over Hiroshima and Nagasaki, killing hundreds of thousands of civilians and forcing Japan to finally surrender.

After World War II, two of these three facilities remained important contributors to scientific discovery and technological innovations. Hanford Site remained a nuclear facility; it ran multiple reactors and produced tritium for production of hydrogen bombs during the Cold War (D'Antonio 1993). In 1968, a major reactor was deactivated in Hanford and most of the structures were encased and buried. By 1987, all of the reactors were shut down. Today, Hanford Site is no more than a museum and remains an area that demands extensive clean-up due to the early, leakage-prone reactors.

In contrast, the Los Alamos facility, now named the Los Alamos National Laboratory (LANL), is still running. The LANL has continued to participate in military research and development. Even today it manages America's nuclear arsenal as part of the Nuclear Weapons Stockpile

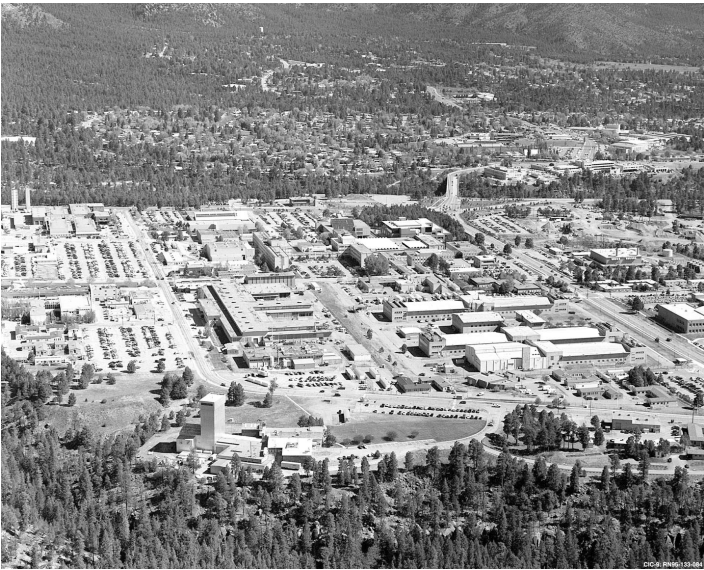
Stewardship program. The LANL runs threat detection and reduction programs and develops new technology for defense and intelligence purposes. This lab also researches in the areas of energy, material science, computing, nanotechnology, and the life sciences. The LANL has contributed significantly to the development of biotechnology as well. In 1983, it began its partnership with Lawrence Livermore National Laboratory and together the two labs developed the National Laboratory Gene Library project. The project concluded in 1995 after generating many libraries of the human genome. The LANL has also made major advances in immunology. It published the first genetic sequence of the HIV virus. Furthermore, the lab has built an impressive database of genetic and immunological codes of various pathogens. This database is available for all researchers to use. While the LANL remains a military research center, its contributions to research and general science are also undeniable.

The Oak Ridge laboratory, now called Oak Ridge National Laboratory (ORNL), was less military-oriented after the war, but like the LANL, its research has also



Bust of Athena, Doe Library at the University of California, Berkeley

http://www.atlanet.berkeley.edu/images/Alumni/California_Xenith/2002_Feb/bustofAthena_150x100.jpg



Los Alamos National Laboratory

greatly benefited the scientific community. The Graphite Reactor of the ORNL, constructed to produce plutonium for atomic bombs, now produces over sixty different isotopes for research facilities and hospitals. By 1950, the ORNL was delivering 20,000 shipments of nuclear isotopes (Oak Ridge National Laboratory 2006). During this same year, the ORNL also experimented with a plethora of nuclear reactors, developing different concepts for nuclear power generators. Thus, the ORNL was especially prominent in developing fuel reclaiming technology. Today, the ORNL conducts research in many areas including supercomputing, energy, neural science, etc. Still, national defense does remain a part of the laboratory's responsibilities. The government funded the buildings of both the LANL and the ORNL as part of emergency wartime measures; however, the labs' missions have expanded well beyond weaponry research and development.

Not only do these labs contribute to scientific research, but they also play a vital role in education. Both the LANL and the ORNL have strong ties with universities. While the LANL was founded for defense needs and operated in secrecy during its early years, it has been managed by the University of California (UC) system since its inception. This close cooperation greatly enriches the UC campuses by offering its faculty and students unique research opportunities. Indeed, UC considers bridging laboratories and classrooms as one of its most important missions in its management of the LANL and of two other national laboratories (University of California 2005). The LANL offers many internship opportunities to undergraduate and graduate students. Together with the university, the

LANL has also established new academic institutions. A fine example would be the Los Alamos-UC San Diego Engineering Institute. This institute recruits young talent and offers specialized training and hands-on experience specifically catered towards laboratory research. The Engineering Institute was such a success that the LANL began three other programs: two for material sciences in partnership with UC Davis and UC Santa Barbara and another for Scientific Data Management in conjecture with UC Santa Cruz. The University of California and the LANL are also planning to build more of such institutions in New Mexico (University of California 2005). Not only is the LANL a leader in scientific research and development, but it is also a leading cultivator of the next generation of young scientists.

The ORNL is similarly an important educator. As early as the 1950s the laboratory began programs and taught the design, construction, and operation of nuclear reactors to thousands of personnel from universities, industry, and the military. Reactor training was perhaps the ORNL's most important contribution towards nuclear science in the fifties. Since 2000, the ORNL has participated in a partnership between the University of Tennessee and Battelle, an international science and technology enterprise. This collaboration also includes nine other universities and the coalition aims for collaborative research and development that allows university faculty and students access to the resources available in the ORNL (Oak Ridge National Laboratory 2006). Both the LANL and the ORNL may have been initiated by war efforts, but their wartime beginnings certainly did not stop them from becoming important educators.

Of course, there are also problems when the general scientific community works alongside military research and development. Security measures can place scientists in difficult situations and limit the extent of their research.

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It can also hinder international cooperation on projects deemed "sensitive" by the government. A report from the National Research Council claims that security mechanisms are often inefficiently implemented and can create unnecessary

work for scientists (Committee for Science and Security 2007). The report also emphasizes that foreign scientists often work in these American research institutions and this can be an issue especially for institutions that serve the military, like the LANL and the ORNL. While many researchers in these laboratories demand international collaboration, the laboratories' involvement in national

defense demands security and secrecy. There are indeed drawbacks when war research is conducted within the American scientific community.

War and education seem like two opposing concepts. Weapons research and development is often decried as misuse of knowledge. There is no denying the immense, complex moral implications of coupling learning and creating tools of destruction. However, one can also see that war is a major push factor towards new scientific discovery and technological innovation. The World War II Manhattan Project established facilities that have been the home of revolutionary scientific discoveries, but also helped to usher in the nuclear age. Even today, these facilities remain crucial members of the scientific community. While both laboratories depended heavily on government funding during their early years and continued developing weaponry and military technology, they both also expanded into many other areas of research and made vital contributions towards the growth of science and technology in the twentieth century. Both laboratories have also become close partners with universities. Their existence as both military facilities and as centers of discovery and learning does raise some issues, but one must not forget the benefits that military funding has brought to science even in areas extending beyond weapons research.

Perhaps the ancient Greek concept was not so strange after all: war and wisdom do share a tangible relationship. This relationship, while not uncontested, remains a part of UC Berkeley, as represented by the smiling face of Athena above the door of the grand Doe Library.

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