
LLNL-CONF-464376

# Creating the Nuclear Weapons Laboratory at Livermore

*B. C. Hacker*

**1993**

**Release Date:**
**July 21, 2010**

108th Annual Meeting of the American Historical Association
San Francisco, CA, Unitied States
January 6, 1994 through January 9, 1994

## Disclaimer



This work was performed under the auspices of the U.S. Department of Energy by University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

This work was performed under the auspices of the Lawrence Livermore National Security, LLC, (LLNS) under Contract No. DE-AC52-07NA27344

# Creating the Nuclear Weapons Laboratory at Livermore
# SCIENCE, TECHNOLOGY, AND INSTITUTION-BUILDING
# 1949-1954

by

Barton C. Hacker, Historian

Lawrence Livermore National Laboratory

108th Annual Meeting of the American Historical Association

San Francisco, California

6-9 January 1994

Creating the Nuclear Weapons Laboratory at Livermore

# SCIENCE, TECHNOLOGY, AND INSTITUTION-BUILDING 1949-1954[1]

Formally established in 1952 as a branch of the University of California's Radiation Laboratory (hereafter UCRL, or the Rad Lab) in Berkeley, the institution now known as Lawrence Livermore National Laboratory has long since outgrown its origins, if not the controversy that surrounded them. However vital the issues, however great the impact of institutions like Livermore on Cold War America, they have only recently begun to attract serious historical attention. Until lately we have had to rely on participants and journalists, often unsatisfactory and sometimes misleading. The traditional account, like most such tales, is not so much wrong as partisan, highly colored, and incomplete. Confining the action to little more than a year, from early spring 1951 to late spring 1952, it pits Edward Teller and his Air Force allies as champions of the H-bomb and a new laboratory against Robert Oppenheimer and a complacent Atomic Energy Commission (AEC) more concerned with improving fission weapons than chasing H-bombs and anxious above all to protect its existing laboratory at Los Alamos, New Mexico.

As we have tried to show in this session, recent archival research and fresh thinking now permits telling a story more complex and more interesting. Actually, Livermore's creation was

---

[1]Thanks to Sybil Francis (Massachusetts Institute of Technology and Lawrence Livermore National Laboratory [LLNL]), Lori Hefner (Lawrence Berkeley Laboratory [LBL] Archivist), Bart Bernstein (Stanford University), and my colleagues in the LLNL Office of History and Historical Records (James E. Carothers, Stephen C. Wofford, and H. Babcock), all of whom shared with me ideas, documents, and comments.

a process spanning several years on either side of the formal opening, and it involved more than controversy over H-bomb development and a second lab. One consequence of new perspectives is an expanded roster of significant institutional and individual actors.[2] We have heard something about the previously underappreaciated or overlooked roles of two institutions, the University of California and the U.S. Navy, in creating Livermore. I want to focus on the projects of two key individuals: Ernest Lawrence, the Rad Lab's founder and leader who obtained the Livermore site and first put it to use, and Herbert York, Lawrence's former student and then colleague, who became the branch lab's first director.

Despite a major role in the World War II Manhattan Project, the Rad Lab largely vanished from postwar military R&D, though not for lack of interest. There simply seemed to be nothing suited to laboratory's special competence in particle accelerators for high-energy physics. Then, in August 1949, the Soviet Union tested its first nuclear weapon and everything started changing.[3] Three streams of events flowing from the Soviet test converged to create the laboratory at Livermore. One, Teller's redoubled efforts to speed H-bomb progress, already discussed in this session (and elsewhere), will figure only tangentially in my story.[4] Though

---

[2]Some of this work was presented at a workshop on "The Decade of Innovation: Los Alamos, Livermore and National Security Decision Making in the 1950's," Pleasanton, California, 19-21 February 1992. An "Executive Summary" by G. Allen Greb and Ken Adkins will soon be published.

[3]J. L. Heilbron et al., "Lawrence and His Laboratory: Nuclear Science at Berkeley," *LBL News Magazine* 6, no. 3 (Fall 1981): 1-106; Lillian Hoddeson et al., *Critical Assembly: A Technical History of Los Alamos during the Oppenheimer Years, 1943-1945* (Cambridge: Cambridge University Press, 1993); Richard G. Hewlett and Oscar E. Anderson, Jr., *The New World, 1939/1946*, and Hewlett and Francis Duncan, *Atomic Shield, 1947/1952*, volumes. 1 and 2 of *A History of the United States Atomic Energy Commission* (University Park: Pennsylvania State University Press, 1962, 1969); Ulrich Albrecht, "The Development of the First Atomic Bomb in the USSR," in *Science, Technology and the Military*, edited by Everett Mendelsohn et al. (2 vols.; Dordrecht: Kluwer Academic Publishers, 1988), 2:349-378; Charles Ziegler, "Waiting for Joe-1: Decisions Leading to the Detection of Russia's First Atomic Bomb Test," *Social Studies of Science* 18 (1988): 197-229.

[4]E.g., Stanley A. Blumberg and Louis G. Panos, *Edward Teller: Giant of the Golden Age of Physics* (New York: Charles Scribner's Sons, 1990). For an account granting Lawrence a larger role, though still focused on Teller, see Barton J. Bernstein, "The Struggle for the Second Lab--The Creation of Livermore," paper presented at the workshop cited in note 2.

also rising from an accelerated H-bomb program, the other two have received less notice; my account centers on these two closely intertwined but neglected streams of events: first, Lawrence's promotion of a giant linear accelerator called MTA; and second, York's work on a diagnostic experiment for Operation Greenhouse.

MTA started first; the letters stood for Materials Testing Accelerator, a meaningless code name intended to disguise the machine's real purpose. Like many others, Lawrence argued strongly for H-bomb development as the right response to the Soviet test.[5] So strongly, in fact, that then AEC Chairman David Lilienthal thought Lawrence and his allies "can only be described as drooling at the prospect."[6] To support H-bomb work with a ready supply of tritium, Lawrence proposed building a giant linear accelerator (or linac) to produce large numbers of free neutrons; such a machine could make other nuclear materials as well.[7] Though more costly than reactor production, the linac process offered the prospect of turning a waste product like depleted uranium into plutonium—particularly attractive at a time when major known sources of natural uranium were not only few but located outside United States borders. President Truman announced his decision in favor of H-bomb development on 31 January 1950. Little more than a week later the AEC approved building at the Rad Lab an MTA prototype called Mark I, essentially a full-size model of the front end of the production machine to be built near St. Louis.[8] But Mark I, a cylindrical vacuum chamber sixty feet long and sixty

---

[5]David Alan Rosenberg, "American Atomic Strategy and the Hydrogen Bomb Decision," *Journal of American History* 66 (1979): 62-87; McGeorge Bundy, *Danger and Survival: Choices about the Bomb in the First Fifty Years* (New York: Random House, 1988), chapter 5, "To Have Thermonuclear Weapons—And Other Truman Choices."

[6]David E. Lilienthal, *The Journals of David E. Lilienthal*, vol. 2, *The Atomic Energy Years, 1945-1950* (New York: Harper & Row, 1964), 582 (entry for October 30, 1949). This was not the first time that Lilienthal, who opposed the H-bomb as a mere technological fix ("gadget-making" [ibid.]), had described Lawrence in such terms (ibid., 577; entry for October 10).

[7]W. B. Reynolds (UCRL Business Manager) to Kenneth S. Pitzer (AEC Director of Research), 1 January 1950, submitting MTA proposal.

[8]Pitzer to Alfonso Tammaro (Manager, AEC Chicago Operations), "25 MEV High Cur-

across, to say nothing of a building to house it, was much too big for Berkeley.[9]

Washington offered several alternative sites, mostly abandoned military bases. The choice fell on the World War II naval air station at Livermore, forty miles southeast of Berkeley. Deactivated at the end of 1946, the former base stood empty in early 1950. It offered a reasonably convenient, low-cost location, plenty of room, several useful buildings, and other advantages; happily, the navy was willing to transfer title.[10] On 31 March the local *Livermore Herald* headlined the news: "$7,000,000 Atomic Research Project Coming Here." The AEC had contracted with California Research and Development (CR&D), newly formed subsidiary of Standard Oil's research arm, California Research Corporation, to build a particle accelerator for classified research at the former naval air station. Though omitted in the story, the accelerator was, in fact, Lawrence's MTA (or at least its front end, Mark I). Unable to win university support for what was, after all, essentially a production facility, Lawrence had persuaded Standard Oil to step in, which it did by promptly forming CR&D for the purpose. Construction began in June 1950 at what was soon labeled the Livermore Research Laboratory.[11]

---

rent Linear Accelerator at University of California Radiation Laboratory," 10 February 1950; Tammaro to H. A. Fidler (AEC Berkeley Area Manager), "25 MEV High Current Accelerator," 24 February 1950; Fidler to Reynolds, "25 MEV High Current Accelerator," 1 March 1950.

[9]Luis W. Alvarez, *Alvarez: Adventures of a Physicist* (New York: Basic Books, 1987), 172-175; Herbert F. York, *The Advisors: Oppenheimer, Teller, and the Superbomb* (San Francisco: W. H. Freeman, 1976; reprinted Stanford: Stanford University Press, 1989), 122-123; York, *Making Weapons, Talking Peace: A Physicist's Odyssey from Hiroshima to Geneva* (New York: Basic Books, 1987), 46-47; Richard Wayne Dyke, *Mr. Atomic Energy: Congressman Chet Holifield and Atomic Energy Affairs, 1945-1974* (New York: Greenwood Press, 1989), 66-67; Hewlett and Duncan, *Atomic Shield*, 425-426; Heilbron et al., "Lawrence and His Laboratory," 64-67.

[10]Site Selection Committee, MTA Project, to Fidler, "Site Recommendation," 15 March 1950, with attached exhibits 1A-1F, 2A-2G.

[11]"$7,000,000 Atomic Research Project Coming Here," *Livermore Herald*, 31 March 1950, p. 1; Heilbron et al., "Lawrence and His Laboratory," 68-69; Alvarez, *Alvarez*, 174; York, *The Advisors*, 124; Herbert Childs, *An American Genius: The Life of Ernest Orlando Lawrence* (New York: E.P. Dutton, 1968), 422-23. See also the illustrated history of Livermore Naval Air Station, an as yet unpublished and untitled pamphlet by Stephen C. Wofford, LLNL Office of History and Historical Records.

York's MTA role was small but vital. Working under Lawrence, he had received his physics doctorate in 1949, then continued at the Rad Lab on what was in fact, if not in name, a postdoctoral fellowship. When theoretical estimates of MTA neutron production differed slightly, York got the job of finding the efficiency of the process experimentally; he showed that a large enough machine would produce plenty of neutrons. But even before he finished that task, York won a more direct role in the weapons program when he learned that the H-bomb program at Los Alamos was short of hands. Accompanied by Hugh Bradner, a Los Alamos veteran who joined the Rad Lab in 1946, York flew to Los Alamos in late February 1950 to discuss how the Rad Lab might help.[12]

After a week and a half of talks with members of the test division and others at Los Alamos, they committed the Rad Lab to a diagnostic experiment in Operation Greenhouse, the four-shot nuclear weapon test series scheduled for spring 1951 at Enewetak in the Marshall Islands. One goal of the third test, code named George, was showing that a fission explosion could ignite thermonuclear fuel; the Rad Lab experiment would measure the reaction's temperature by observing thermal radiation in the form of soft x rays emitted by the burning gas. With Bradner and York as codirectors, work began even before the AEC formally approved the million-dollar effort called the Measurements Project, or more often MP.[13] Like MTA, MP soon outgrew Berkeley, Livermore once again coming to the rescue. Already busy there on MTA, CR&D readily provided the building alterations and housekeeping services MP required.[14]

---

[12]York, *The Advisors*, 126. See also Frank H. Shelton, *Reflections of a Nuclear Weaponeer* (Colorado Springs: Shelton Enterprises, 1988), chap. 4, p. 17.

[13]Alvin C. Graves (Head, Los Alamos J [Test]-Division) to Carroll L. Tyler (Manager, AEC Santa Fe Operations), "Proposed Contract with Berkeley Radiation Laboratory," 9 March 1950; Tyler to Alfonso Tammaro, "Proposed Contract with Berkeley Radiation Laboratory," 22 March 1950; Tammaro to Tyler, "Berkeley Test Project," 24 March 1950; Fidler to Reynolds, "Measurements Project," 28 March 1950. See also York, *Making Weapons, Talking Peace*, 46-47; York, *The Advisors*, 126-127.

[14]Morgan A. Gunst, Jr. (UCRL Director's Office) to file, "MP Project Livermore Facilities," 16 June 1950; E. C. Shute (Deputy Manager, Berkeley Area) to Reynolds, "Miscellaneous Minor Construction," 16 August 1950; Reynolds to Fred Powell (President, CR&D),

Work at Livermore, mainly setting up the electronics and a 200-foot length of vacuum pipe to be sure everything would work, went smoothly and ended by February 1951. Bradner had meanwhile led the first contingent to Enewetak. Of the fifty-four Rad Lab scientists and technologists who lent their talents to planning and executing the experiment, all but five included Pacific time as part of the job. Logistics, communications, transportation, and other problems plagued the Berkeley team in the islands, especially during the early weeks. By late March, however, the work seemed well in hand, with only minor glitches, weather, and the return schedule to worry about.[15]

Although the Teller-Ulam invention of radiation coupling in March 1951 had altered the basis of thermonuclear weapon design and rendered the theory behind the George device irrelevant, the test shot itself offered a spectacular display.[16] At half past nine on the morning of 9 May, "for the first time ever a tiny thermonuclear flame burned on the surface of the earth," York later wrote of his first look at a nuclear explosion. With a yield of 225 kilotons, George was "by far the most powerful to that date, . . . more than ten times larger than the bomb dropped on Hiroshima."[17] Detectors installed at the base of the tower vanished with everything

---

"Guard Requirements for Dispensary, Livermore Research Laboratory," 16 August 1950; Reynolds to Powell, "Further Dispensary Alterations and Housing for MP Vacuum Pipe," 6 Oct. 1950. See also York, *The Advisors*, 126-127.

[15]Bradner (from Enewetak) to York, 7 February 1951; York to Gunst, 5 March 1951; Bradner and York to Gunst, 18 March 1951; York to Gunst, 24 March 1951; Bradner and York to Alvarez, "Progress Report," 5 April 1951. On personnel figures, see Kaman Tempo, *Operation Greenhouse: 1951*, by L. H. Berkhouse et al., Report DNA 6034F (Santa Barbara, California, 15 June 1983), 148, 228.

[16]York, *The Advisors*, 75-81; Hans A. Bethe, "Comments on the History of the H-Bomb," *Los Alamos Science* 3 (Fall 1982): 42-53; Chuck Hansen, *U.S. Nuclear Weapons: The Secret History* (Arlington, Texas: Aerofax, 1988), 49-50. Cf. Edward Teller, "The Work of Many People," *Science* 121 (25 February 1955): 267-275; Stanley A. Blumberg and Gwinn Owens, *Energy and Conflict: The Life and Times of Edward Teller* (New York: G.P. Putnam's Sons, 1976), chap. 12, "Fusion and Confusion."

[17]York, *Making Weapons, Talking Peace*, 56 (quote); Department of Energy, "List of Declassified Yields of Tests Conducted in the Pacific Prior to 1958-1961 Moratorium," DOE Fact Sheet, 7 December 1993. Cf. DOE Nevada Field Office, *Announced United States Nuclear Tests: July 1945 through December 1991*, DOE/NV-209 (Rev. 12) (Las Vegas: May 1992),

else in a fraction of a second, but that was enough. Thousands of feet of buried coaxial cable carried the data to a remote recording station, and the experiment proved a complete success.[18]

Contrary to expectations, however, success did not lead to further test assignment, at least in the short term. The MP group, in fact, promptly disbanded. Most of its members returned to research though a few joined in posttest talks and planning sessions. But memories of those who had acquitted themselves so admirably in Greenhouse survived to play a crucial role in the AEC decision for a laboratory at Livermore.[19] Both Oppenheimer and Gordon Dean, Lilienthal's successor as AEC chairman, later testified to a change of mind about a second AEC weapons laboratory, at least in part, because a cadre of experienced young Berkeley physicists —"a whole raft of young imaginative fellows," in Dean's words—could staff an already existing facility at Livermore.[20]

That a Livermore facility existed, of course, owed less to Greenhouse than to MTA. Construction of the huge pressure vessel and its housing took longer than expected. Technologically, MTA required a huge jump over existing linear accelerators, typically a few feet in diameter, a few tens of feet long. The Mark I prototype measured sixty feet in both length and

---

2; Robert S. Norris and William M. Arkin, "Nuclear Notebook: Filling in the Blanks," *Bulletin of the Atomic Scientists* 48 (November 1992): 48; Hansen, *U.S. Nuclear Weapons*, 51-52.

[18]Operation Greenhouse, Scientific Director's Report, Annex 1.8, "Measurement of X-Rays, Part I, Summary," by H. Bradner, H. York, et al., Report WT-79, August 1950; "Part II, Design Considerations and Data Analysis," Report WT-80, August 1950; "Part III, Engineering Aspects," Report WT-51, September 1950. See also Kaman Tempo, *Operation Greenhouse*, 147-48, 254; York, *Making Weapons, Talking Peace*, 51-56.

[19]Reynolds to J. Q. Cope (Vice-president, CR&D), "Buildings 12 and 61 Facilities at Livermore Research Laboratory," 1 February 1951; Gunst to file, "Meeting to Discuss Disposition of MP Material," 11 July 1951; Gunst to distribution, "Demise of MP Group," 11 October 1951. See also Leona Marshall Libby, *The Uranium People* (New York: Crane, Russak; and Charles Scribner's Sons, 1979), 300.

[20]AEC, *In the Matter of J. Robert Oppenheimer: Transcript of Hearing before Personnel Security Board* (Washington, 12 April-6 May 1954), reprinted in AEC, *In the Matter of J. Robert Oppenheimer: Transcript of Hearing before Personnel Security Board and Texts of Principal Documents and Letters* (Cambridge: MIT Press, 1970), 85-86 (Oppenheimer), 314 (Dean). See also Philip M. Stern, *The Oppenheimer Case: Security on Trial* (New York: Harper & Row, 1969), 187.

diameter. Even larger was the planned Mark II production machine, which the AEC had tentatively authorized shortly after the outbreak of war in Korea. Although the same sixty feet in diameter as Mark I, Mark II would stretch a quarter of a mile in length; the blueprints alone took nearly two hours to page through. Despite delays and uncertain costs, Lawrence retained his enthusiasm.[21] Planning for Mark II continued apace, including the selection of a site at Weldon Spring, Missouri, just west of St. Louis. Lawrence also proposed an MTA Mark III, this a new cyclotron design that he now believed would outshine the linear accelerator.[22]

But the AEC had grown cautious. It postponed construction of Mark II until Mark I proved itself, rejected Mark III outright, and on 1 May 1951 formed a new San Francisco Area Office to oversee all phases of MTA work at Livermore, Weldon Spring, or any site that might be added.[23] This meant little for work in the field, as mounting problems forced UCRL to propose Mark I design modifications and CR&D to seek stricter controls over informal changes.[24]

---

[21]Lawrence to Robert G. Sproul (President, University of California), 18 August 1950; Powell to Fidler, 31 August 1950; C. S. Andressen, Jr., to Reynolds, "M.T.A.--Mark I Cost Budget," with attached "Comparison of Estimated Cost with Current Cost (August 31, 1950)," 6 October 1950 [this was the first of a series of such reports]; Powell to Fidler, "Mark I Cost Estimate," 9 October 1950; Powell to Fidler, "Prorate and Field Extra Items in Cost Estimates," 26 December 1950; Hewlett and Duncan, *Atomic Shield*, 544. See also York, *The Advisors*, 124-125; Heilbron et al., "Lawrence and His Laboratory," 68-69, 72; Alvarez, *Alvarez*, 172-175.

[22]Reynolds to Fidler, 16 June 1950; W. M. Brobeck (UCRL) to Reynolds, "Development Work Required for Mark II Accelerator," 18 August 1950; Brobeck to Reynolds, "Specifications and Costs of MTA Mark II Designs," 11 December 1950; Lawrence to Pitzer, 20 November 1950; Reynolds and Cope to Pitzer, "MTA--Mark III," 22 November 1950, with attached "Proposal for MTA Mark III," 11 November 1950.

[23]R. W. Cook (AEC Director of Production) to John A. Derry (Manager, San Francisco Area Office), "San Francisco Area Office," 1 May 1951; AEC Announcement No. 3, Cook to principal staff, Washington; and managers of operations, "Establishment of San Francisco Area Office," 21 May 1951; Fidler to Reynolds, "Establishment of San Francisco Area Office," 18 June 1951.

[24]Fidler to Derry, "Recently Proposed Modifications to Mark I," 22 August 1951, with attached "Background Information of Proposed Modifications to Mark I," 20 August 1951; Lawrence to Fidler, 22 August 1951; Josephine S. Hale (for Reynolds) to Cope, 24 August 1951; Cope to Reynolds, "Instructions to the Field," 27 October 1951; Brobeck to personnel concerned with work on Livermore accelerator, 30 October 1951; Cope to Reynolds, "Instruction to the Field," 23 November 1951.

By the time Mark I entered testing in early 1952, the MTA program was losing impetus. Prospectors inspired by AEC bounties and rising prices located vast new uranium deposits on the Colorado plateau. Plentiful domestic uranium undercut a major argument in MTA's favor, the need for a source of fissionable materials should overseas supplies fail, while the soon-to-be-completed reactors at Savanna River, South Carolina, would produce special nuclear materials much more cheaply than could MTA.[25]

Even though its performance steadily improved and testing went tolerably well, Mark I never ran troublefree. MTA simply involved too many large technical steps at one time. "For the first time Lawrence had, in effect, overreached himself in a big way," in York's judgment.[26] The AEC decided to end the MTA program in August 1952; all work on Mark II ceased, though Mark I survived briefly as a small independent program. California Research and Development's MTA contract lapsed in 1953, and the task of dismantling the machine began late in the year. On 30 June 1954 the CR&D site at Livermore formally closed; the fence came down and the former MTA building became part of UCRL's Livermore branch.[27]

Though failed in its primary purpose, MTA produced its share of benefits in accelerator technology and engineering experience. Perhaps its greatest significance, however, lay in a quite unexpected area. The branch laboratory at Livermore was very much MTA's legacy. At the very least, as Lawrence remarked some years later, "the MTA project made it possible for us to save at least a year or perhaps two years on the development of the Livermore Wea-

---

[25]Raye C. Ringholz, *Uranium Frenzy: Boom and Bust on the Colorado Plateau* (New York: W. W. Norton, 1989); Hewlett and Duncan, *Atomic Shield*, 583, 586; Heilbron et al., "Lawrence and His Laboratory," 74-75; York, *The Advisors*, 125.

[26]York, *Making Weapons, Talking Peace*, 47.

[27]Hewlett and Duncan, *Atomic Shield*, 583; Heilbron et al., "Lawrence and His Laboratory," 74-75; "In the Beginning . . . ," *Newsline* 3, no. 9 (September 1972): 6; "Livermore Time Line: A 20-year History of Lawrence Livermore Laboratory in Capsule Form," *Newsline* 3, no. 9 (September 1972): 14; Daniel Liberatore, "At the Thirty-Year Mark: The Directors Look Back at Lab History," in *Thirty Years of Technical Excellence* (Livermore: Lawrence Livermore Laboratory, 1982), 4.

pons Laboratory."[28] Support for MTA had given the AEC ownership of a spacious and convenient site at Livermore with links to one the country's acknowledged masters of big science, Lawrence himself. And apart from MTA, the Measurements Project had shown the site itself serving work directly relevant to the weapons program.[29] That MP had also displayed the talents and enthusiasm of young Berkeley physicists in a most favorable light was a bonus. When early in 1952 the AEC could no longer resist intense pressure by Teller and his Air Force allies for a second lab, Livermore offered a ready-made answer.

The first move came from Washington. In December 1951 Thomas Murray, one of the AEC's five commissioners, approached Lawrence about a second laboratory in the Berkeley area. Lawrence liked the idea of building on the Measurements Project's Greenhouse work to expand the Rad Lab. He enlisted York, back to teaching and research after his Greenhouse chores, for a grand tour to canvass the views of Teller (who was now at the University of Chicago) and other proponents of a second lab. In February 1952 Lawrence showed Teller around Livermore. Although still wedded to more ambitious schemes, Teller at least would not object to leaving Chicago for Livermore and thermonuclear research under Lawrence's aegis.[30]

Who else would work there, the exact nature of that work, what Teller would do, might all remain hard questions, but for the AEC the crucial point was that Teller did not oppose Lawrence's idea of using existing skills and facilities to expand the Rad Lab into weapons-related research. The Commission now had a specific and modest proposal for a second labor-

---

[28]Lawrence to Willard F. Libby, 8 March 1957, as quoted in Heilbron et al., "Lawrence and His Laboratory," 75. For other benefits, see York, *The Advisors*, 125; Heilbron et al., "Lawrence and His Laboratory," 69.

[29]Asked how UCRL entered weapons development, a San Francisco Field Office attorney omitted MTA and began with MP; see Leonard A. Jacobvitz (Attorney, Office of Assistant General Counsel) to Chester G. Brinck (Assistant General Counsel), "Participation of the University of California Radiation Laboratory in Weapons Development Program," 29 April 1954.

[30]Teller, with Allen Brown, *The Legacy of Hiroshima* (Garden City, New York: Doubleday, 1962), 60; Childs, *American Genius*, 444; Bernstein, "Struggle for the Second Lab," 26-28; Hewlett and Duncan, *Atomic Shield*, 582.

atory and that, as York later remarked,

> changed the nature of the argument. A proposal to establish a second laboratory in existing facilities at Livermore as a branch of the UCRL, as compared to a proposal to establish one "somewhere" under an unspecified aegis, clearly meant much less initial expense and an immediate, if small, cadre of people ready to go to work right away.[31]

Both Oppenheimer and Dean, the two leading opponents of a second laboratory, later testified to having found irresistible the combination of Lawrence, the Rad Lab, a cadre of young scientists, and an existing facility at Livermore.[32]

York's first thoughts about the new laboratory "reflected Lawrence's ideas about how to go about such things."[33] A cautious outline of organization, personnel, and prospective programs jotted down in January 1952 showed he had learned well. Like Lawrence, he preferred to start small and grow, an approach he acted upon as de facto director of the new branch laboratory. York projected a staff as small as eighty-one in his first formal planning document for Project Whitney, the code name initially assigned to work at Livermore; he assumed it would primarily support Los Alamos with diagnostic experiments, though it would also "contribute to longer range development of new ideas."[34] In Washington on 27 May 1952, the AEC took the first formal step toward creating the second lab when the commissioners, meeting in executive session, decided to ask the University of California to perform instrumentation and component testing for the thermonuclear program. The university accepted a month later.

---

[31]York, *Making Weapons, Talking Peace*, 66. See also Childs, *American Genius*, 442-443.

[32]AEC, *In the Matter of J. Robert Oppenheimer*, 85-86 (Oppenheimer), 311-315 (Dean).

[33]York, *The Advisors*, 131.

[34]York, untitled notes concerning a new laboratory, on Conrad Hilton Hotel stationery, n.d. (ca. 17 January 1952); York, untitled organizational notes, n.d. (ca. March 1952). The quote is from York to Norris E. Bradbury (Director, Los Alamos), 3 June 1952, with attached "Proposed Program for Project Whitney, UCRL."

When the newly formed Livermore branch officially opened in September 1952, it was indeed a modest operation. Project Whitney employed 123 people, about 50 of whom remained at Berkeley for the time being, and projected a budget of $600,000.[35]

The only certain fact was a contract with the AEC, or, more accurately, a promised supplement to the existing UCRL contract between the AEC and the University of California. Beyond that, the exact nature of the work at Livermore remained open; neither university nor commission concerned itself overmuch with formal mission statements. Still, the broad outlines seemed clear enough: Livermore would help Los Alamos design and test thermonuclear weapons, as well as conduct certain related basic research.[36] Initially, at least, the new laboratory filled a supporting role. Though often referred to as the nation's second nuclear weapons research laboratory, Livermore could as yet only aspire to a status that Los Alamos, its predecessor and prospective rival, had long since achieved.

Beside the absence of a precisely defined mission, Livermore lacked much experience. Novice designers tried to rework ideas Los Alamos had bypassed, to explore areas the older laboratory had for whatever reasons left untouched. Disappointment clouded their first efforts. Designs tested during 1953 in Nevada and 1954 at Bikini had yields so far below expectation as to prompt some jeering observers to call them "fizzles." Discouraged but willing and quick to learn, the young scientists and engineers broadened their design approaches and soon turned things around.[37] Even before that happened, the laboratory was firmly established: its staff

---

[35]Roger M. Anders, ed., *Forging the Atomic Shield: Excerpts from the Office Diary of Gordon E. Dean* (Chapel Hill: University of North Carolina Press, 1987), 215; Jacobvitz to Brinck, "Participation of the University of California Radiation Laboratory in the Weapons Development Program"; Bernstein, "Struggle for a Second Lab," 28-29; "Livermore Time Line," 14.

[36]See Ruth R. Harris and Richard G. Hewlett, "The Lawrence Livermore National Laboratory: The Evolution of Its Mission, 1952-1988" (Rockville, Maryland: History Associates Incorporated, 30 May 1990).

[37]Sybil Francis, "Race Horses vs. Work Horses: Competition between the Nuclear Weapons Labs in the 1950s," paper presented at the workshop cited in note 2. For an overview of Livermore's early trials, see Barton C. Hacker, "Polaris, Pluto, and Plowshare: How Three

had soared to well over a thousand, its budget doubled over the preceding year, to $14 million. Laboratory growth seemed largely unaffected by early failures. On 2 September 1954, two years to the day after Livermore's official opening, Lawrence notified the AEC that he had asked York to assume the title of Director of the Radiation Laboratory at Livermore, ratifying the position York had in fact held from the beginning.[38]

Although MTA was neither technically a Rad Lab project nor much of a success, the program was closely linked to Lawrence's lab, which provided CR&D considerable technical advice and assistance. That such a project existed proved vital when controversy arose about whether or not to establish a second laboratory. The fact of an ongoing operation at a proven site associated with a widely admired researcher like Lawrence disarmed much criticism. Equally important was the favorable impression Lawrence's students and colleagues in the MP group had made during Operation Greenhouse. "Lawrence firmly believed that if a group of bright young men are simply sent off in the right direction with a reasonable level of support, they will end up in the right place," York recalled. "He did not believe that the goals needed to be spelled out in great detail, nor that it was necessary that the leadership consist of persons who were already well known."[39] It was this insight, as much as anything else, that transformed the debate over a second laboratory and made Lawrence's modest proposal a welcome answer to the AEC's dilemma. It also helps explain how so large an enterprise sprouted from such small beginnings.

---

R&D Programs Transformed the Laboratory," *The Quarterly* [LLNL] 23 (September 1992): 21-30.

[38]Lawrence to Fidler, 2 September 1954. The figures on staff and budget are from LLNL, "Laboratory Manpower and Operating Cost History: FY 1953 through FY 1991," LO57, 14 February 1992.

[39]York, *The Advisors*, 131.