
Origins of the U.S. Biological Warfare Program

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The wise assumption is that any method which appears to offer advantages to a nation at war will be vigorously employed by that nation. There is but one logical course to pursue—namely, to study the possibilities of biological warfare from every angle.

—National Academy of Sciences Committee Report, February 17, 1942

We had a crop destroyer, which we could use in September or October 1945 against Japan and destroy the food sources . . . nail them down until they sued for peace. A very logical enterprise . . . we recommended it.

—Assistant Secretary of War for Air Robert Lovett, 1960

The atomic bomb . . . is far worse than gas and biological warfare because it affects the civilian population and murders them wholesale.

—President Harry S. Truman, January 19, 1953

Until World War II, no modern state had employed or even developed a significant capacity for offensive biological warfare. Although legal barriers to the development and use of biological weaponry were weak—the United States had signed but never ratified the 1925 Geneva Protocol banning the use of biological as well as chemical weapons—the idea of deliberately spreading pestilence and creating disability then, as now, evoked widespread revulsion. Yet, in a manner that roughly parallels the development of the atomic bomb, the United States government's fear of Axis development of biological weapons encouraged American work on such weaponry and lowered barriers to its use.

America's World War II work on biological warfare, which like the A-bomb project was kept top secret, cost under \$60 million and involved about 4,000 workers, including scientists. Unlike the \$2 billion A-bomb project, little is generally known about America's wartime biological warfare activity. Publications on the subject are sparse, and even the archival sources are skimpy.¹

Nevertheless, some important questions can be usefully addressed, often by teasing out the answers from archival materials. How and why did the program arise? Why was it administered through a “cover” agency, the War Research Service (WRS)? Did Presidents Franklin D. Roosevelt and Harry S. Truman or their top advisers ever explicitly define policy for deterrence or combat use of biological weaponry, as Roosevelt did for gas? How great was presidential knowledge, and oversight, of the biological warfare program? What role did morality play for scientists and high-level officials in considering the program? Was there any wartime effort at establishing international control of biological warfare? How close did the United States come to using biological weaponry in the war?

Initiation of the U.S. Biological Warfare Program

The U.S. Army started conducting biological-warfare research in 1941 through its Chemical Warfare Service, but American efforts did not become substantial until 1942. In February of that year, a special committee appointed by the National Academy of Sciences submitted a report to Secretary of War Henry L. Stimson containing recommendations for the future of the biological-warfare program. Stimson had requested the report a few months before the bombing of Pearl Harbor.²

The committee, composed of eminent biologists such as Edwin B. Fred of the University of Wisconsin and Stanhope Bayne-Jones of Yale University, concluded that an enemy attacking with biological weapons could gravely harm human beings, crops, and livestock. Although the report stressed defense and called for work on vaccines and protection of the water supply, the committee also recommended that the U.S. develop bacterial weapons.³

Spurred by the scientists’ warnings, Stimson sought presidential approval for a formal biological warfare program that would include a small group of advisers to coordinate and direct all government research. “We must be prepared,” Stimson wrote to Roosevelt in an April 1942 memorandum. “And the matter must be handled with great secrecy as well as great vigor.”⁴

Stimson never mentioned that the Chemical Warfare Service had already begun research into biological weaponry; and the president

probably did not know of the program. Still, the chemical service later received millions of dollars in appropriations through the Army's budget and became more instrumental in the biological warfare program than the small advisory group that directed it. Why did Stimson press for the group?

Perhaps it was because, as he told Roosevelt, "biological warfare is dirty business." Stimson hoped to legitimize the research at the Chemical Warfare Service by naming civilians as monitors. Whereas some members of the National Academy of Sciences committee thought the program should be administered by the War Department, top Army officials preferred the establishment of a civilian agency with ties to the armed services. Stimson explained their reasoning to Roosevelt: "Entrusting the matter to a civilian agency would help in preventing the public from being unduly exercised over any ideas that the War Department might be contemplating the use of this weaponry offensively." He implied that the United States would not initiate biological warfare but added, significantly, that "reprisals by us are perhaps not beyond the bounds of possibility any more than they are in the field of gas attack, for which the Chemical Warfare Service . . . is prepared."⁵

Stimson suggested hiding the "germ warfare" advisory group in a New Deal welfare agency, called the Federal Security Agency, that oversaw the Public Health Service and Social Security.⁶ He wanted an academic luminary to direct the program, someone familiar with the university research system and skilled in administration. After a cabinet meeting on May 15, Roosevelt admitted he had not yet read the secretary's plan but told him to go ahead with it anyway.⁷ A week later, Stimson discussed his ideas with Secretary of Agriculture Claude R. Wickard, whose agency would later take part in the research coordinated by the advisory group, and with Paul V. McNutt, who directed the Federal Security Agency.⁸

By midsummer, three candidates had rejected an offer to head the new group: economist Walter W. Stewart, who chaired the Rockefeller Foundation, geographer Isaiah Bowman, president of Johns Hopkins University, and economist Edmund Ezra Day, president of Cornell University. Finally, in August, chemist George W. Merck, president of the pharmaceutical firm Merck & Co., Inc., accepted the position.⁹

Organizing Biology and Medicine for Biological Warfare

The innocuously named War Research Service (WRS) started out in mid-1942 with an initial allocation of \$200,000. Wide contacts with major biologists and physicians enabled the eight-member directorate to initiate secret work in about 28 American universities, including Harvard University, Columbia University, the University of Chicago, Northwestern University, Ohio State University, the University of Notre Dame, the University of Wisconsin, Stanford University, and the University of California. By January 1943, the WRS had contracted with William A. Hagan of Cornell to explore offensive uses of botulism and with J. Howard Mueller of the Harvard Medical School to study anthrax.¹⁰

Anthrax and botulism remained the foci of biological warfare research during the war. Both deadly diseases are of bacterial origin, and the bacteria are hardy and prolific. Both have very short incubation periods, lasting for only a few days or even hours. The tough but virulent anthrax spores can be inhaled or absorbed through breaks in the skin; botulism results from ingestion of the bacterial poison botulin.

At the same time, the WRS empowered the Army's Chemical Warfare Service to expand greatly its own work on biological warfare. In 1942 and 1943, the chemical service received millions of dollars to build research facilities. The most notable one was Camp Detrick in Frederick, Maryland (now Fort Detrick), which cost nearly \$13 million. The service also hired many scientists to work there and elsewhere in the newly enlarged system.¹¹

The scientists, drawn largely from university faculties, put aside their repugnance at developing agents of death because the work seemed necessary in the exceptional situation of World War II. Theodor Rosebury, a Columbia University microbiologist, argued in early 1942 that "the likelihood that bacterial warfare will be used against us will surely be increased if an enemy suspects that we are unprepared to meet it and return blow for blow."¹² Soon afterward Rosebury entered the Chemical Warfare Service's laboratory and became a leader at Camp Detrick. "We were fighting a fire [the Axis]," he later wrote, "and it seemed necessary to risk getting dirty as well as burnt."¹³

Stimson and McNutt might well have applauded these sentiments, but they would have been astonished at Rosebury's view of who held the reins. Rosebury believed the ethical concerns of the

scientists in his laboratory governed the use of the weapons they were creating. He wrote years later: "Civilians, in or out of uniform, made all the important decisions; the professional military kept out of the way. We resolved the ethical question just as other equally good men resolved the same question at Oak Ridge and Hanford and Chicago and Los Alamos."¹⁴

History tells a different story. Even though the president himself did not set the course of the War Research Service, it seems clear that the key decisions were made by civilian leaders and military chieftains in Washington. The scientists provided the necessary expertise to conceive and develop the weapons, and even to suggest how to deploy them, but they had no controlling authority, and even little influence, over when and under what political conditions the weapons would be used.

Expanding the Program

In spite of Paul McNutt's primary concern with welfare and social services, he kept an eye on the secret biological-warfare program hidden in his agency. In February 1943, McNutt informed President Roosevelt that the last of the WRS' \$200,000 was being spent. The president, McNutt said, would have to decide whether to "go more deeply into two or three. . . projects now under way."¹⁵ By April, with Stimson's approval, McNutt requested another \$25,000 for the WRS FY1943 budget and a total of \$350,000 for FY1944. Two days later, Roosevelt endorsed McNutt's request with a laconic notation: "O.K. F.D.R." The WRS 1944 budget grew again several months later, when Roosevelt expanded it to \$460,000.¹⁶

In keeping with the tight security of the program, McNutt did not commit particular projects or details to writing, even in his correspondence with the president. Roosevelt's own files contain fewer than a dozen letters and memoranda on biological warfare. Of the handful pertaining to 1942 and 1943, most deal with the small appropriations and administrative arrangements for the War Research Service. Perhaps in discussions with McNutt and Stimson or in meetings with General George C. Marshall, the trusted Army chief of staff, Roosevelt was kept informed of the additional millions of dollars in appropriations going to the biological warfare work of the Chemical Warfare Service. Not one of the available records, however, shows that Roosevelt was receiving such reports.¹⁷

Meanwhile the chemical service was enlarging its facilities for development, testing, and production. In addition to the 500-acre Camp Detrick site, a 2,000-acre installation for field trials was established on Horn Island in Pascagoula, Mississippi. A 250-square-mile site near the Dugway Proving Ground in Utah was designated for bombing tests, and 6,100 acres were secured for a manufacturing plant to be built near Terre Haute, Indiana.¹⁸

The technology of delivery and dissemination was also advancing. With British technical assistance, the chemical service made considerable progress in devising biological bombs and in late 1943 began work on 500-pound anthrax bombs. These bombs held 106 four-pound "bomblets" that would disperse and break on impact.¹⁹ The bombs were untested, but it was known that pulmonary anthrax, which causes lesions on the lungs, was almost invariably fatal.²⁰

The chemical service also succeeded in producing botulism toxin, one of the most potent of all gastrointestinal poisons. Merely tasting food infected with the toxin is usually sufficient to cause severe illness or death. In natural outbreaks the death rate ranges from 16 to 82 percent,²¹ but by varying the toxin and the delivery mechanism, the scientists at Camp Detrick aimed at producing a reliably lethal weapon.

Bolstered by these developments, in 1944 the Chemical Warfare Service pressed for and received an additional \$2.5 million to finance the manufacture of anthrax and botulism toxin bombs. The service could produce either 275,000 botulinum toxin bombs or one million anthrax bombs every month with that allocation. It was anticipated that by 1945, these weapons might be needed in the war with Japan.²² The most immediate threat, however, was that of possible German use of biological weapons.

Early in 1944, Allied intelligence experts were beginning to fear that Germany's powerful new V-1 "buzz bombs" might soon be directed against Britain or allied troops in Normandy, and that the missiles' warheads might be loaded with germ-warfare agents. The German high command, the experts warned, was facing a strategic crisis; it was assembling all its resources and might resort to biological warfare to gain a permanent advantage.²³ The analyses were based on so-called worst-case assumptions. They were not comforting.

By June 1944, the U.S. had probably prepared only a few anthrax bombs for testing, if any. Certainly no bombs were avail-

able for use against an enemy.²⁴ To deter Germany from launching a biological strike, military leaders arranged to inoculate about 100,000 soldiers against botulin, hoping to convince the Germans that Allied troops were preparing for biological retaliation.²⁵ If Germany have actually staged a biological attack, Anglo-American forces would probably have retaliated with gas.²⁶

Germany never called the bluff. Hitler used only conventional explosives in the V-1. As a matter of fact, for reasons that are still not known, he had barred all research on offensive biological warfare.²⁷ The American program—developed substantially to deal with a German threat that never existed—remained untried.

America's biological warfare effort moved at a brisk pace. In May 1944, Stimson and McNutt presented Roosevelt with a brief research summary that allotted only five lines to scientific developments.²⁸ Much more could have been said about developments. An anthrax plant soon received authorization through the Chemical Warfare Service to manufacture a million bombs, and the service was making headway with short-range dispersal techniques for botulin in paste form.

In November 1944, Merck sent a report to Stimson and Marshall—but not to Roosevelt—that cryptically referred to research on four additional “agents against men.”²⁹ Judging from other sources, these were probably brucellosis (undulant fever), psittacosis (parrot fever), tularemia (rabbit fever), and the respiratory disease glanders.³⁰

Merck said the Chemical Warfare Service was also developing “at least five agents for use against plants.” (These agents are actually chemicals, but at the time they were defined as part of the biological program because they could kill crops.) A sixth compound, ammonium thiocyanate, was recommended for the destruction of “Japanese gardens.”³¹

These developments constituted 12 lines in Merck's short November report on biological warfare. The document is tucked away in Stimson's declassified Secretary of War records in Washington. There is no evidence that the secretary or the president devoted any attention to the details of the program.

U.S. Biological Warfare Policy: Roosevelt's Legacy

In spite of the considerable progress at Camp Detrick and fears of a German biological offensive, Roosevelt seems to have given little

thought to the matter of biological warfare and the question of the policy that should guide development of biological weapons. In 1942 and again in 1943, Roosevelt had promised publicly not to initiate gas warfare, but he threatened retaliation in kind if the Axis used gas. Apparently he never considered issuing a similar statement on germ warfare. Nor did any adviser propose such a warning to deter action by Germany or Japan.³²

In May 1944, Roosevelt's ties to the biological-warfare program became even more tenuous when Stimson and McNutt urged him to abolish the War Research Service and make Merck a consultant to Stimson. The president readily acceded to this reorganization, which may have further distanced him from the secret enterprise.³³ Roosevelt himself never indicated whether he would launch a biological-warfare attack in retaliation for Axis first-use, or whether he might even countenance first-use against Japan. (During the war, there were some then-unsubstantiated claims that Japan had used biological warfare against China.³⁴) American use of biological warfare was never a central issue, and Roosevelt had a penchant for delaying decisions and keeping his options open.

The issue of America's first-use against Japan did come up, briefly, in July 1944, when Admiral William Leahy, military chief of staff to the president, and some other presidential advisers conducted in Roosevelt's presence what Leahy later called "a spirited discussion of bacteriological warfare," apparently focusing mostly on an effort to destroy Japan's rice crop.³⁵ Leahy, perhaps alone among the participants, "recoiled from the idea." A crusty old admiral who had gone on active duty in the 1890s, he was wedded to older moral principles about how America should conduct war even amid the horror of World War II. He recalled saying to Roosevelt, "Mr. President, this [using germs and poison] would violate every Christian ethic I have ever heard of and all of the known laws of war. It would be an attack on the noncombatant population of the enemy. The reaction can be foretold—if we use it, the enemy will use it." Leahy stated that the president "remained noncommittal through this discussion."³⁶

Thus, in stark contrast to President Roosevelt's public pledges that America would not initiate gas war, he bequeathed to Harry S. Truman an ambiguous legacy regarding biological warfare. It fell into a penumbra of new, unused, fearsome weapons where neither policies of deterrence nor of use had even been defined.

***Attempts to Achieve International Control of Biological Weapons:
The Proposals of Bush and Conant***

Somewhat like a monopoly in nuclear weaponry, a near-monopoly in biological weaponry could bestow great military and political power on a nation. Such superiority might also produce a feverish arms race in future years. Foreseeing such developments in October 1944, Vannevar Bush and James Conant, Roosevelt's two scientist-administrators who directed the Office of Scientific Research and Development and had recently warned against the president's policy of atomic-energy secrecy toward the Soviet Union, feared the international-political effects of the administration's similar secrecy policy toward the Soviets on biological warfare.³⁷

These two top advisers knew that the American biological-warfare program, like the top-secret A-bomb program, had established close links to the British program but had maintained a policy of secrecy toward the Soviets.³⁸ Bush and Conant probably even knew the details—unavailable from the skimpy records now available—of precisely who had devised this American policy of secrecy on biological warfare. The two scientist-administrators implied that the policy had been conceived to help assure that the United States, and presumably Britain, would have greater military power than the Soviets in the postwar period.

Bush and Conant hoped to avoid a postwar biological arms race. They believed that some international arrangement on biological warfare, possibly with a sharing of information under the future United Nations organization, might also serve as a rough model for handling the more disruptive problem of atomic energy in international relations. On October 27, 1944, they wrote to Stimson to plead their case on biological warfare and to request permission to take their proposal directly to President Roosevelt.³⁹

"If this war ends without the use of biological warfare by any country and without it being clear whether or not any country has solved the extremely difficult technical problems involved," they warned, "the United States will be confronted with a serious problem as to the future. Shall research and development along this line be pushed? . . . [F]ear and distrust of other countries might be intensified if the rumors spread [of work] on the perfection of this new weapon of destruction."⁴⁰

They argued that the United States, by gaining information of other nations' research and having the work placed under an inter-

national organization, would actually be safer. They admitted that their hope for international control and inspections, with a rollback of national secrecy, might pose problems for the Soviet Union. "Granted that evasion on the part of Russia might take place," they wrote, but "is not the scheme proposed less dangerous to [American] security . . . than to assume that Russia would proceed with this development without any reference to the activities of the other nations." If Russia were allowed to develop its work without any participation in such an international arrangement, Bush and Conant warned, the results would be corrosive fear, a souring of the postwar peace, and great difficulty in planning for America's defense establishment. Bush and Conant emphasized that their primary concern was American security and that their proposed international arrangements would enhance, not impair, their own nation's security.⁴¹

In mid-February 1945, Bush again pushed on the issue of international control of biological weapons. This time, in a draft letter to Roosevelt (which was never sent), Bush argued for a U.N. agency "recommend[ing] means for policing aggression. . . . It should provide for full interchange between peace-loving nations [so] that no nation shall be caused to fear the scientific activities of another. . . ." ⁴²

The proposals of Bush and Conant failed, as did their related efforts to move America toward international control on atomic energy. There is no evidence in the relevant archives—Stimson's papers, his Secretary of War records, Roosevelt's files, or in the Bush-Conant materials—that their bold October and February recommendations went any further than Stimson in late 1944 or early 1945. In May 1945, however, when their October proposal was circulated to the recently created Interim Committee on atomic energy, the paper was read primarily, as Bush and Conant intended, as a suggestion about atomic energy and not as a proposal to be dealt with on the seemingly less threatening matter of biological warfare. It failed then, too.⁴³

Contemplation of Biological Warfare Against Japan

Two weeks after Truman entered the White House in April of 1945, and a day after the president had received a lengthy briefing on the atomic bomb, Secretary Stimson got a memo from his special assistant Harvey H. Bundy. Bundy wrote that Merck and several other

members of the biological warfare program were proposing the use of chemicals against Japanese food crops. "It is a pretty serious step," the assistant cautioned, and you may want to speak to the President." Stimson sent a note to General Marshall asking to confer with him at his convenience.⁴⁴

From that point until the war's conclusion, emphasis on biological warfare shifted from bacteriological agents to crop defoliants.⁴⁵ American scientists certified that the chemicals were not poisonous to humans; the Judge Advocate's office concluded that their use would be legal because they were nontoxic to people and because the United States, as a warring nation, "is entitled to deprive the enemy of food and water, and to destroy the sources of supply in his fields."⁴⁶

Stimson, although deeply troubled by the mass killing of non-combatants that American bombing had already caused, seemed prepared to accept the poisoning of Japanese crops.⁴⁷ Given that General Marshall wanted to use gas against Japanese troops, he too was probably not unnerved by the tactic of crop poisoning.⁴⁸ In May and June an air force general drew up an elaborate plan for destroying Japan's rice crops by dropping ammonium thiocyanate on rice-producing areas near six major cities: Tokyo, Yokohama, Osaka, Nagoya, Kyoto, and Kobe.⁴⁹ General Henry H. Arnold, the commander of the air force, rejected the plan on tactical rather than moral grounds. Bombing Japan's industry and cities, he judged, would have "earlier and more certain impact."⁵⁰

At least one sector of the military did raise moral questions about biological warfare, including the poisoning of crops. "It is likely that this form of warfare will become more and more militarily practicable," the Chemical Warfare Service stated in July 1945. "This presents us with an important moral and political problem. These are all weapons of great hazard to the civilian population of an enemy, and the U.S. must . . . face the issue of determining whether in defeating an enemy we are willing to destroy not alone his property, as we have been doing from the air . . . but life on a large scale."⁵¹

Assistant Secretary of War For Air Robert Lovett approved a plan for destroying Japan's rice crop.⁵² But some questioned whether the supply of chemicals was sufficient; some thought the destruction of the 1945 rice crop would not have any effect until 1946. By then, they believed, the war would have been won and American occupation forces would have the added burden of feed-

ing a hungry civilian population.⁵³ On August 3, a few days before the bombing of Hiroshima, Arnold's deputy, Lieutenant General Ira C. Eaker, asked for a comprehensive report on crop destruction by air, including the capabilities of the air force, the best chemicals available, and the best techniques for their application.⁵⁴ He received the report on August 10, shortly after the Nagasaki bombing.⁵⁵ Four days after that report, the war in the Pacific ended.

The nation's secretly developed germ-warfare arsenal was not forgotten in the final months of the war. One high-ranking Army general had commented earlier in the program's history that the Administration might consider a policy of first use against Japan.⁵⁶ Later, strategists discussing retaliation concluded that if Japan broke the Geneva Protocol and resorted to gas agents, the U.S. should be prepared to respond with both gas and germ weapons. Admiral Donald B. Duncan, a staff member of the Joint Chiefs of Staff, pointed out that in some situations bacteriological attacks might be more effective than gas.⁵⁷

American beliefs about the morality of biological warfare, however, were never put to the test in World War II. The ultimate decision to use biological weapons would have fallen to Truman; he probably would have relied on the counsel of General Marshall, whom he greatly admired, and Secretary Stimson, whom he regarded as a moral man. Having sanctioned the use of atomic bombs on Japanese cities, these key advisers probably would not have taken exception to poisoning rice fields to compel Japan's surrender. They would have probably endorsed Assistant Secretary Lovett's plan to "nail down" the Japanese by killing their crops.

But germ warfare, with its specters of epidemic and invisible poison, would have been harder to endorse. Years later, however, Truman implied in a letter to an associate that if the war in the Pacific had dragged on past mid-August, he would have employed both bacteriological and chemical agents—that, in effect, the atomic bombing he had approved was so much worse.⁵⁸

The Legacy of World War II

In World War II, the governments of all the major nations except Germany worked to develop biological weapons. No major nation other than Japan used these weapons during the war. But the establishment of America's scientific-technological capacity for

biological warfare left a powerful legacy for the early postwar years: the continuation of general secrecy surrounding research and development, the creation of military institutions for biological warfare work, and a desire by some military and civilian advisers to pursue such work for possible deterrence and use in the emerging Cold War. In articulating the rationale for such efforts, George Merck advised President Truman soon after V-J Day, "Work in this field, born of the necessity of war, cannot be ignored in time of peace."⁵⁹ Others agreed.

Acknowledgments

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32. Roosevelt in Samuel Rosenman, ed., *The Public Papers and Addresses of Franklin D. Roosevelt* (New York: Harper, 1950), 1942, 258 (June 5, 1942 warning to Japan), and *ibid.*, 1943, 243 (June 8, 1943 general warning to Axis). For evidence that FDR’s 1943 statement was intended to refer *only* to gas warfare, see Cordell Hull to President, May 11, 1943, with “Statement by The President on Gas Warfare,” Speech File 1469, Roosevelt Library; and Roosevelt to Secretary of State, May 21, 1943, and Roosevelt to Leahy, June 5, 1943, PSF 93, Roosevelt Library. For a different but mistaken view (that FDR’s 1943 statement included BW), see Gen. Brehon Somervell to Chief of Staff (Marshall), on “Biological Warfare,” February 21, 1944, CCS 385.2 (12–27–43), Records of the Joint Chiefs of Staff.

33. Stimson and McNutt to President, May 12, 1944, and Roosevelt to Dr. (Ross) McIntire, June 1, 1944, PSF 104, Roosevelt Library; and Roosevelt to Stimson, June 8, 1944, Records of the Secretary of War. For background on the May 12 letter, see Harvey Bundy to Secretary (Stimson), February 13, 1944, Marshall Library.

34. H.L. Ismay to Churchill, July 9, 1942, Prem 3/85, PRO (on China’s claims); and John Powell, “Japan’s Germ Warfare: The U.S. Cover-up of a War Crime,” *Bulletin of Concerned Asian Scholars* 12 (October-December 1980), 2–17. Also see Sheldon Harris, “Japanese Biological Warfare Experiments and Other Atrocities in Manchuria, 1932–1945: A Preliminary Statement” (1988 ms.), courtesy of Harris, California State University, Northridge.

35. Leahy, *I Was There* (New York: Whittlesey, 1950), 439.
36. Leahy, *I Was There*, 440.
37. Bush and Conant to Stimson, October 27, 1944, with attached "Memorandum on the Future of Biological Warfare As An International Problem in the Postwar World," n.d., AEC Doc. 283, in Department of Energy Historical Office (Germantown, MD) Records and also in Bush-Conant Files, Office of Scientific Research and Development (OSRD) Records, RG 227, National Archives. For background, see Bush to Conant, October 24, 1944, AEC Doc. 188.
38. On American-British relations on the A-bomb project, see Bernstein, "The Uneasy Alliance," *Western Political Quarterly* (June 1976), 220-230.
39. Bush and Conant to Stimson, October 27, 1944, AEC Doc. 283; and John Anderson to Bush, April 19, 1944, and reply, May 15, 1944, Prem 3/89, PRO. On British secrecy and Russia, Chairman, BWIC, "The Capabilities of Our Defeated and Possible Future Enemies in the Field of B.W. During The Next Ten Years," January 18, 1946, BW (46) 3, Surgeon General (Army) Records. On U.S.-Soviet WW II relations on BW, see Joint Intelligence and Chemical Weapons," January 27, 1949, JIG 297/3, Records of the Joint Chiefs of Staff.
40. Bush and Conant to Stimson, October 27, 1944.
41. Bush and Conant to Stimson, October 27, 1944.
42. Bush, "Draft of Letter," February 15, 1945, Secretary of War Records.
43. James Conant to George Harrison, May 22, 1945, Harrison-Bundy files (H-B), Manhattan Engineer District Records, RG 77, N.A.
44. Bundy to the Secretary (Stimson), April 26, 1945, and handwritten Stimson note to Marchall, n.d. (April 1945), both in box 84, folder 27, George C. Marshall Papers, Marshall Library, called to my attention by Lt. Col. Charles F. Brower, IV.
45. For the official definition of BW as including chemical compounds against crops, see Brophy et al., *Chemical Warfare Service: From Laboratory*, 102.
46. Frank Jewett, President, National Academy of Sciences to Gen. William Porter, April 20, 1945, with attachments, and Maj. Gen. Myron Cramer, Judge Advocate General to Secretary of War, "Destruction of Crops by Chemicals," March 5, 1945, box 84, folder 27, Marchall Papers.
47. Bundy to Secretary (Stimson), April 26, 1945; and Gen. Barney Giles to Gen. Arnold (Stimson's concern about Dresden), March 7, 1945, box 223, Henry H. Arnold Papers, Library of Congress; and Stimson Diary, May 16, 1945.
48. John J. McCloy, "Memorandum of Conversation with General Marshall," May 29, 1945, Records of the Secretary of War.
49. Maj. Gen. V. E. Bertrandias to Gen. H. H. Arnold, May 29, 1945, box 115, Arnold Papers.
50. Brig. Gen. John Samford, Director, Joint Target Group, to Bertrandias, June 4, 1945, box 115, Arnold Papers.
51. "Conference General Policy Board Notes," July 19-21, 1945, File 337, Records of the Chemical Warfare Service, RG 175, N.A.
52. Robert Lovett oral history (1960), Columbia University.
53. Report by the Joint Staff Planners and the Joint Logistics Committee, "Policy on the Use of Chemical Agents For The Destruction of Japanese Food Crops." n.d. (June 1945), enclosure A to JCS 1371/1, ABC 475.92 (2-25-44), Records of

the Army Services Forces, RG 319, N.A. This report may have been considering a poison other than ammonium thiocyanate.

54. Lt. Gen. Ira Eaker, Deputy Commander, AAF, to Deputy Chief of Staff, August 3, 1945, "Experiment in Destruction of Crops By Air," box 115, Arnold Papers.

55. Lt. Gen. Hoyt Vandenberg, Assistant Chief of Air Staff, to Chief of Air Staff, "Experiment in Destruction of Crops By Air," August 10, 1945, which mentioned a June 1945 report (not found), "Developments of Tactics and Techniques for Dissemination of Chemicals from Aircraft for Crop Destruction," box 115, Arnold Papers.

56. Florence Newsome note, n.d. (about February 1944), attached to Maj. Gen. William Porter, Chief, Chemical Warfare Service, to Commanding General, (Somervell), Army Service Forces, "Plant, production, BW," February 2, 1944, CCS 385.2 (12-17-43), Records of the Joint Chiefs of Staff.

57. Minutes of the JPS 206th Meeting, June 13, 1945, CCS 441.5 (8-27-42), Records of the Joint Chiefs of Staff.

58. Harry S. Truman to AEC Commissioner Thomas Murray, January 19, 1953, PSF, Harry S. Truman Library.

59. George Merck, "Biological Warfare: Report to the Secretary of War by Mr. George Merck, Special Consultant For Biological Warfare," n.d. (about November 1945), PSF, Truman Library. This document is also in CCS 385.2 (12-17-43), Records of the Joint Chiefs of Staff.