Nuclear Weapons Development Case Study

Attempts by scientists to influence decision-making around powerful technology

Samo Burja and Zachary Lerangis

Contents

Introduction

Well before nuclear weapons technology came to fruition during the Second World War, some people, predominantly scientists, foresaw the destructive potential of nuclear fission and the global problems that it would create. A few of these foresighted people, some of the most brilliant minds of their time, dedicated much of the rest of their lives to ensuring that the technology was developed in a way that minimized or eliminated the risk of catastrophic nuclear war.

They failed. Exactly the scenario they dreaded—one in which multiple opposing powers possess great numbers of nuclear weapons—has come to be. They believed that such a scenario would inevitably result in mass destruction. Luckily, that hasn't happened, but this has largely just been a matter of luck.

Their failure was not for lack of effort or ingenuity. These scientists penetrated the highest levels of government and to the center of the secret project to build the first atomic bombs. They gained the attention of the most powerful people of their time. They conceived of sophisticated schemes for international control. Still it did not work.

The scientists failed because their efforts relied on decision-makers following their recommendations. They hoped that if they could gain access to decision-makers and give them sound advice, then they would be listened to. Instead, they were generally ignored. This carries two main implications: one, at the surface level, the scientists failed because they did not effectively interface with existing elite hierarchies; two, more importantly, the scientists failed because they did not become political and military elites themselves.

The following analysis attempts to make sense of this failure, with the underlying notion that understanding it will help in trying to solve similar problems in our own time. After the analysis, some of the crucial events are described in more detail, so as to concretely illustrate the general ideas and to give the visceral understanding that is best acquired from particular episodic examples and primary source quotations. Four especially notable examples are described at length, after which a few others are briefly summarized with reference to further reading in case a closer look is desired.

Summary and Analysis

This document concerns the development of nuclear weapons in the mid-20th century, particularly the dynamics of control and decision-making surrounding their development.

A series of scientific breakthroughs from the late 19th century to the 1930s led to the discovery that, given the right configuration of raw materials and engineering, it would be possible to engineer a nuclear chain reaction which would unleash a vast amount of energy. As the great powers of the world mobilized for total war in the late 1930s and early 1940s, leaders in Britain, America, Germany, and the Soviet Union began working on secret weapons development projects to harness this newfound power for the creation of powerful new atomic bombs.

In America, these efforts culminated in the Manhattan Project, which in 1945 resulted in the first detonation of an atomic bomb (the Trinity Test) and later the U.S. nuclear bombings of Hiroshima and Nagasaki in Japan. These developments, coinciding with the end of World War II, radically altered the balance of power in the world and set the stage for a new geopolitical order centered on nuclear weapons that continues to dominate world politics.

It was within this emerging technological and political landscape that the scientists found themselves. Chief among these scientists were the eminent physicists Leo Szilard and Niels Bohr, both recent European emigres to the United States from Hungary and Denmark, respectively. Szilard would work on the world's first successful artificial nuclear reactor at the University of Chicago, and then on the Manhattan Project, which he would attempt to influence from within. He would also try to lobby Truman as the US was deliberating whether or not to use the atomic bomb on Japan. Bohr would gain access to Roosevelt and Churchill, and attempt to lobby them directly to establish international control of nuclear weapons.

The scientists had varying objectives depending on their understanding of the strategic landscape at a given time. These objectives can be summarized as follows, listed roughly in chronological order of pursuit:[1]

- Start and accelerate the Allied nuclear weapons program to ensure the Allies developed nuclear weapons before their enemies, primarily out of fear that the Germans would develop the weapons first and use them recklessly.[2]
- Shape the bomb project to be run more like a university and less like a military project, with scientists having more authority.
- Prevent the bomb from being used on Japan.

[1] Of course, not all scientists agreed on the desirability of these objectives. Many scientists for example were in favor of aggressive expansion of the US nuclear arsenal following World War II. The scientists who favored all of the above objectives could be called the internationalists, of whom Leo Szilard, the man who first conceived of the nuclear chain reaction, was the most active.

[2] Though there was no way for Allied-aligned scientists to know it at the time, this fear may have been misplaced, given the testimony of German scientists from the Farm Hall Tapes, collected in 1945 during Operation Epsilon (in which Allied forces captured German scientists who had worked on Germany's nuclear program and detained them in a bugged room in England).

- Bring about global coordination around the control of nuclear technology.
- Prevent the United States from dramatically expanding its nuclear arsenal.

They failed to achieve all but the first of these objectives, and as can be seen in Example 3 below, they were not very effective even in that.

The basic process they employed was to identify the key decision-makers, gain access to those decision-makers, and convey their analysis and recommendations to them. The decision-makers they identified were usually statesmen and their method for gaining access was usually to leverage their scientific prestige. In many cases, they succeeded in doing just this. However, in nearly every case, their counsel was not well-received. Decision-makers closely guarded their authority and were distrustful of advice. Indeed, they were often offended by the implication that the scientists knew what to do better than they did. The only area in which they reliably deferred to scientists was the technical aspect of the creation of nuclear weapons technology.

Even on technical matters, however, scientists' recommendations were sometimes ignored. For example, by 1945 there was a consensus among scientists that the knowledge and resources necessary to develop nuclear weapons were already available to technologists in the Soviet Union and elsewhere, and consequently the United States and Britain could not unilaterally prevent other countries from developing nuclear weapons. They communicated this to statesmen and military leaders on many occasions. Nonetheless, many elites, including Prime Minister Churchill and President Truman, maintained that a monopoly on the technology could be retained.

The scientists who were most able to influence decision-making were those who maneuvered to key administrative positions in the government research bureaucracy. These administrators had the ear of the statesmen, and they themselves had authority over many aspects of the development of the technology, such as resource allocation. Even so, they did not make decisions regarding the deployment of the technology, though they were sometimes consulted—but not deferred to—in that regard, and they also generally restricted their influence to the sphere that was granted to them by their superiors in the government. That they limited themselves in this way, concerning themselves mostly with technical matters within their circumscribed bureaucratic roles while not building owned power, is part of why they were given these positions in the first place. They were also often just as dismissive of the other scientists who tried to influence them as other decision-makers were, as can be seen in Example 3 below. In many respects, the culture of these institutionalized scientists was much closer to that of contemporary statesmen, rather than that of other scientists.

The implication of these historical outcomes is that in order to reliably affect decision-making, you must yourself be the decision-maker. Prestige, access to decision-makers, relevant expertise, and cogent reasoning are not sufficient; even with all these you are liable to be ignored. By understanding the complex workings of decision-making at the highest levels, you can substantially improve your chances of influencing things in the way you desire, but even if you understand how the game is played, you are ultimately subject to the judgment of those who wield power, and this judgment can be frustratingly capricious—as is any judgment that is not fundamentally aligned with your own. Without even such an understanding, you stand little or no chance whatsoever.

Lastly, it is important to keep in mind throughout the fact that the social scripts and institutions we in the West associate with "science" and "scientists" are not naturally necessary forms, but are rather historically contingent. The compartmentalization of institutional science from political authority, resulting in the failure to successfully integrate technical expertise into elite decision-making and therefore allow power to prudently direct technological development, has its direct roots in the wartime crystallization of America's dominant institutions. This bears heavily not only on the original failure to govern nuclear weapons development, but on all of the myriad shortcomings of our technical systems today. In the future, we should think about what social technologies we can use to remedy these failures and thereby better govern the development of weapons and other technology.

Culture clash as major obstacle

A large part of the failure of the scientists can be attributed to the mismatch between the culture of scientists and the culture of government elites. The difference between these two cultures was large. Scientific culture at the time was characterized by open discourse in which deference within a field was determined on the basis of directly-assessed technical ability, which then produced a reputation that was used for deference outside of the field. The culture was informal and hierarchy was not rigid. Scientific culture was also international—in few military circles of the time would you see Hungarians, Italians, and Americans working closely together, as in the case of Szilard, Fermi, and their collaborators on the Chicago Pile experiment. It was also politically diverse, as the example of the Oppenheimer Brothers' often exaggerated ties to the far left attests. Crucially, most of the scientists were recent emigres from continental Europe, and likely experienced significant culture shock upon their arrival in the United States. The picture that emerges here is one of European scientists, recently torn from their previous cultural and professional context, trying to operate within Anglo-American state and military hierarchies. This doubtlessly compounded the difficulty of the scientists' efforts.

Lastly, scientific culture contained an additional ethnic element in the extreme overrepresentation of Hungarians, especially Jewish Hungarians, who immigrated to the United States to work on the American bomb project, many of whom were educated at the same few schools in the same district of Budapest. These scientists were a subset of a group of Hungarian emigre scientists who would famously earn the moniker "The Martians."[3]

These scientists had prepared to be scientists, and were suddenly required to assimilate into the cultural protocol of the political and military elite. Elite culture, unlike scientific culture, was characterized by closed discourse through official channels in a relatively rigid hierarchy, with strict compartmentalization of information. Areas of authority were delineated in the formal hierarchy and generally used to determine patterns of deference (e.g. Administrator Smith is officially in charge of shock wave research and so people in the hierarchy defer to him about what to do about shock wave research and do not meddle).

Scientists who attempted to influence decision-making operated on the model of intellectual authority developed in scientific circles. They usually circumvented official channels to make recommendations, and for this fact alone their recommendations were often disregarded. Even if they attempted to operate within the official channels, they lacked the embodied knowledge of a civil service or military careerist necessary to

[3] This group, which emigrated to the US in the early 20th century, included luminaries such as polymath John von Nuemann, known among other things for his foundational contributions to the field of computing; eminent mathematician Paul Erdős; Edward Teller, the father of the hydrogen bomb; and of course Leo Szilard himself.

navigate elite coordination. The typical scientific personality also clashed with the personalities of government elites. All this is most evident in the case of Leo Szilard, who, to his great frustration and despite his extensive efforts to be involved, found himself totally shut out from high-level decision-making. As can be seen in the examples involving him below, he flagrantly disregarded established procedures and was socially and culturally distant from governmental elites.

What might the scientists have done instead? For one, they could have maneuvered to official positions of authority over the domains they wanted to influence. Secondly, they could have gained the trust of decision-makers so that their advice was more likely to be received. These things require understanding elite culture and the complex dynamics of elite decision-making and deference. In short, they require becoming a statesman oneself. Vannevar Bush, the head of US government wartime research, and Frederick Lindemann, a close friend of Churchill and his most trusted advisor on scientific matters, provide examples of this being done successfully, and some of their exploits are described in the examples below.

Relevant Players

Leo Szilard: Hungarian physicist and prewar emigre to the United States who first conceived of the nuclear chain reaction. Worked with Enrico Fermi at the University of Chicago to create the world's first artificial nuclear reactor and later on the Manhattan Project. Developed lofty ambitions to build a new ruling class that would govern nuclear weapons development and other emerging global problems.

Niels Bohr: Danish physicist and wartime emigre to Britain who pioneered much of modern atomic and quantum theory. Attempted to lobby British and American elites at the highest level of their respective states in order to establish international control of nuclear weapons.

Franklin Roosevelt: President of the United States from 1933 to 1945, only President ever to serve four terms. Gave the go-ahead to start nuclear weapons research. Initially in favor of reaching out to the Soviets regarding international control of nuclear weapons, but ultimately opposed.

Winston Churchill: Prime Minister of the United Kingdom from 1940 to 1945. Staunchly opposed to international nuclear arms control efforts during the war.

Frederick Lindemann: British aristocrat and scientist, close friend to Churchill and his main adviser on technical matters. Served as a conduit between nuclear scientists and Churchill. Important player on the British scientific scene, which was significantly ahead of American science in realizing the possibility of, and pushing for, nuclear weapons development.

Felix Frankfurter: Supreme Court Justice and confidant of President Roosevelt. Served as a conduit between nuclear scientists and Roosevelt.

Robert Oppenheimer: American theoretical physicist and wartime head of the Los Alamos Laboratory, the site of the Manhattan Project which created the first nuclear weapons. After the war, he became the chairman of the General Advisory Committee of the new United States Atomic Energy Commission, where he pushed for international control of nuclear weapons until his political career was scuttled in the 1950s thanks to his past communist sympathies.

Vannevar Bush: American scientist and political elite who held various powerful positions at MIT and headed the Office of Scientific Research and Development, the central institution responsible for American R&D during the Second World War. Instrumental in the creation of the Manhattan Project and in much of the early decision-making regarding nuclear weapons development.

James Conant: President of Harvard and chairman of the National Defense Research Committee during the war. Worked with Bush on the establishment of the Manhattan Project and the decision-making around early nuclear weapons.

Leslie Groves: Officer in the US Army Corps of Engineers who directed the Manhattan Project.

Harry Truman: President of the United States from 1945 to 1953; Roosevelt's successor in the final year of the war. Decided to drop the atomic bomb on Japan.

Case Study Methodology

Case studies are the best approach to both sociological research in general, and the situation of nuclear weapons development in particular. Theories of society—which by implication are also theories of history—must be deduced from reality as best as we can see it, in discrete cases. In other words, theory must be made to fit and explain reality, not the other way around. Case studies therefore provide the basis for constructing theory. In addition, case studies provide the background against which existing theories of society can be checked. If a theory fails to explain a certain set of events, it is likely incorrect, or at least incomplete.

Most importantly, case studies are useful because it is impossible to run a scientific experiment on a societal scale. Much as in the field of geology, in the analysis of society we must also rely on natural experiments to guide our pursuit of knowledge. Moreover, seeking to "control for" various pre-selected social phenomena reflects an implicit pre-existing theory of society on the part of the researcher, rather than an open-ended engagement with reality as it occurs.

To produce the analysis set forth in this document, we relied as much as we could on primary sources from the era. This allowed us to construct our analysis from a foundation as close as possible to the events as they were, rather than relying on previous analyses.

The most important primary sources regarding the events described in this document are the memoirs and papers (such as memos, correspondences, and meeting minutes) of the individuals involved. Among secondary sources, Richard Rhodes's books *The Making of the Atomic Bomb* and *Dark Sun: The Making of the Hydrogen Bomb* are by far the most comprehensive and authoritative. They are frequently referenced (as MAB and MHB respectively) and excerpted in this document because they collect together the various primary sources for a particular set of events in a way that is useful for the reader not interested in doing an in-depth study of the primary sources. There are however some filtered online collections of primary sources for the reader who does want to read further, including:

- The National Security Archive: https://nsarchive2.gwu.edu/nukevault/ebb525-The-Atomic-Bomb-and-the-End-of-World-War-II/
- The Atomic Heritage Foundation: https://www.atomicheritage.org/key-documents
- The Truman Library: https://www.trumanlibrary.org/whistlestop/study_collections/bomb/large/index.php
- A Leo Szilard enthusiast website: http://www.dannen.com/decision/index.html
- atomicarchive.com: http://www.atomicarchive.com/Docs/index.shtml
- A transcript of the reactions of captured scientists from the Nazi atomic bomb project and wider German physics community, as they were fed information by their British captors, as part of Operation Epsilon: http://germanhistorydocs.ghi-dc.org/pdf/eng/English101.pdf
- Mokusatsu: One Word, Two Lessons, an unclassified NSA document that sheds some light on issues of ambiguous communication that likely exacerbated poor decision-making around the use of nuclear weapons in 1945: https://www.nsa.gov/Portals/70/documents/news-features/declassified-documents/tech-journals/mokusatsu.pdf

Example 1: The genesis of the Manhattan Project

In early 1941 the American state's nuclear weapons research program was practically non-existent. At the time there was a small nuclear research committee called The Uranium Committee buried in the government wartime research bureaucracy, but it received little attention compared to projects that attempted to refine conventional weapons. It had been formed due to the efforts of Szilard represented by the Einstein-Szilard letter—a letter created by Leo Szilard and signed by Albert Einstein that warned President Roosevelt of the potential of nuclear weapons technology—but it was basically inactive. Most of the important work in the US was being done by independent scientists at universities. British scientists were carrying out a more centralized, more productive research program overseen by a committee of scientists called MAUD, but were also without much government involvement or support.

In March 1941, James Conant, the second-highest-ranking administrator of wartime government research in the US and President of Harvard, visited England to coordinate with their research program. Scientists at Oxford involved in the British program told him there that the bomb can be made and should be prioritized. Conant did nothing because, he said, nuclear research was not his official responsibility, and the information was not coming through official channels.

Around the same time, Ernest Lawrence, a leading nuclear physicist working at Berkeley, became convinced that the program towards the bomb must be accelerated and badgered the president of MIT, also a high-ranking government research administrator, who relayed his concerns to the head of government research, Vannevar Bush.[4] Bush was annoyed and met with Lawrence to convey that he is "running the show", and if Lawrence doesn't like it he'll find himself "utterly on the outside"; but Bush also did arrange a meeting between Lawrence and the head of the Uranium Committee. However, nothing seems to come of this.

Bush also, in May 1941, commissioned a committee of the National Academy of Sciences to submit a report on the potential of nuclear technology. Their report recommended greatly accelerating nuclear research and estimated that a bomb would not be ready until 1945. Skeptical of the report, Bush commissioned another NAS committee to report on the report.[5]

Meanwhile MAUD, the British committee, created a more comprehensive report and published it in July 1941. It concluded that a bomb could be made by the end of 1943, that it will be decisive in the war, that its development should be a top priority, and that the Americans and British should collaborate on its development. It also provided detailed estimates of the resources required. Bush received an unofficial summary, and was persuaded that nuclear research should be accelerated. He discussed the matter with the

[4] Vannevar Bush was also previously a student at MIT, and a member of the MIT faculty, both times in the electrical engineering department.

[5] This recursive reporting on reports, common in scientific bureaucracies, appears to indicate the use of reports as something other than the information contained within them. One use of them, perhaps the use by Bush in his case, is that the amount of information not covered by any given report can be narrativized as infinite, and so recursively rechecking claims inside one report can be used to stall for an indefinite amount of time. Secondly, recursive reporting on reports can be used to bolster the "truthiness" of claims in a given report by making their citation web more complex, or simply adding to the list of endorsing names.

Vice President, but did little further until the British officially transmitted the report, which wouldn't happen until several months later, on October 3, 1941.

In the meantime, a British physicist, Mark Oliphant, was also dismayed at the sluggishness of the American program and came to America to work with Lawrence on accelerating things. He met with the major American administrators, but again nothing seems to come of it—though in later years some of them would say that he persuaded them. Lawrence continued to badger administrators into late September. Still nothing happened. Conant and Bush commissioned a third report from the NAS around this time.

Finally the British report was officially transmitted. Six days afterward, Bush discussed it with FDR and the Vice President. Bush recommended initiating a serious research program. FDR agreed, promised to fund the program with a black-budget, and assigned control of nuclear weapons policy to a "Top Policy Group" under his authority consisting of the VP, the Secretary of War, the Chief of Staff of the Army, Bush, and Conant. This was the beginning of the Manhattan Project.

Example 2: Szilard fights in vain to shape the Manhattan Project

Throughout the war, Szilard was dissatisfied with how the Manhattan Project was being run. He thought that the corporations brought in (chiefly Du Pont) and the military had too much authority. He wanted scientists, particularly himself and his friends, to have more authority. The project leaders had instituted restrictions on information-sharing between different parts of the project. Szilard wanted there to be fewer restrictions, saying that the restrictions hamper the project because open discussion is necessary to facilitate invention. He initially voiced his concerns and was ignored. Then he tried to leverage his rights to relevant inventions he made before the government became involved, and his talent, threatening to leave the project unless his demands were met. The government research administrators, chiefly Vannevar Bush, the head of US government wartime research, refused to recognize his rights to the inventions and did not consider him indispensable enough to acquiesce to his demands in order to keep him, though they did offer him a substantial raise. No changes were made to how the project was run. General Groves, the military leader of the Manhattan Project, had Szilard put under surveillance and considered imprisoning him.

Example 3: Bohr's attempt to facilitate global coordination

In 1944, Niels Bohr, one of the great physicists of the 20th century and whose reputation was very well established at the time, was very concerned about the threat of nuclear war and a nuclear arms race after the inevitable end of the war. He wanted the Allies to cooperate with the Soviets on the control of nuclear technology to avoid a nuclear arms race or all out war. Towards this end, he wanted the Allies to tell the Soviets about the existence of the atomic bomb project in the hopes that this would build goodwill and foster future coordination.

Bohr then developed relationships with three top British statesmen, all allies of Prime Minister Churchill: 1) Lord Halifax, the British ambassador to the United States, 2) Sir John Anderson, a top-ranking member of Churchill's cabinet, and 3) Frederick Lindemann (Lord Cherwell), a respected scientist, British aristocrat and close friend of Churchill's, who Churchill called his main advisor on scientific issues. Bohr convinced them that the Allies ought to at least negotiate with the Soviets on the control of nuclear technology. The three attempted to convince Churchill without success.

It should be noted Lindemann was in many ways the success case of scientist influence, and likely the best person that Bohr could've possibly connected with in order to reach Churchill. He was enmeshed in European elite culture, which was instrumental in allowing him to develop a close relationship with Churchill. Churchill called him "my chief adviser on the scientific aspects of modern war." Despite this, as can be seen below, he was entirely unable to persuade Churchill to listen to Niels Bohr.[6]

Meanwhile, Bohr also gained access to FDR through his personal relationship with one of FDR's advisers, Supreme Court Justice Felix Frankfurter. Frankfurter discussed Bohr's concerns with FDR, and relayed to Bohr that FDR was very open to coordinating with Churchill on the relevant problems and wanted Bohr to meet with Churchill to discuss them and report back to FDR.

Bohr, along with Lindemann, met with Churchill in London. Off the bat Churchill was aggressively opposed to any cooperation with the Russians, or even telling them of the existence of the bomb project. The meeting went nowhere. Churchill seemed to intend for the US and Britain to keep the knowledge of how to create nuclear weapons secret, despite the fact that all of the relevant experts believed at the time that this would not be possible, and that the Soviets would develop their own bomb within a decade or so.

Dejected, Bohr through Frankfurter told FDR about the meeting. FDR said he wanted to meet with Bohr. Ahead of the meeting, Bohr sent FDR a memo expressing that a nuclear arms race and the associated dangers can only be avoided through a "universal agreement in true confidence." He was explicit in his deference to statesmen on the matter, and in his understanding that such an agreement may be extraordinarily difficult to achieve. At the meeting, FDR told Bohr that he read Bohr's memo, that he agrees that the Soviets ought to be approached, and that he is optimistic about the prospects of cooperation based on his assessment of Stalin. He also said that he is optimistic that Churchill will come around, and that they will discuss the topic at their upcoming conference at Roosevelt's estate in Hyde Park, New York, after which he would love to see Bohr again.

---

[6] For further reading, see MAB 222-223.

The next month, FDR and Churchill convened in Hyde Park. They had a short, secret agreement written up on the nuclear question that included the following resolutions: the nuclear program will continue to be kept absolutely secret; the US and Britain will continue to develop nuclear weapons after the end of the war; Professor Bohr should be put under surveillance.

The next day, Churchill wrote to Lindemann saying he is considering imprisoning Bohr (which does not happen). FDR and Bohr never meet again.

Example 4: Szilard's efforts to affect decision-making about the use of the bomb

Leo Szilard's efforts to personally control the development of the atomic bomb may stretch back to his own discovery of the nuclear chain reaction in 1933. Given that he applied for a patent that year for the neutron-assisted nuclear chain reaction, and that he assigned that patent to the British Admiralty in order to ensure the concept's secrecy, it seems very likely that Szilard intended to influence the use of nuclear science from an early date.

His actions most relevant to the Manhattan Project began in 1939. That year, after realizing that uranium might be the element capable of sustaining a nuclear chain reaction, he ghost wrote a letter for Albert Einstein to send to president Roosevelt, with additional consultation from Eugene Wigner and Edward Teller.[7] The "Einstein-Szilard letter" warned that the nuclear chain reaction might be used to create "extremely powerful bombs of a new type" and that the Germans might successfully create nuclear technology before the Americans, and explained that the physics community would continue research into the subject and required support—something that they were only really able to achieve after the Japanese attack on Pearl Harbor two years later in 1941. Szilard, Enrico Fermi, and others built the Chicago Pile, the first artificial nuclear reactor, in 1942, while they were employees of the Metallurgical Laboratory of the University of Chicago.

Notably, during the Chicago Pile phase of the atomic bomb project, Szilard is said to have offended Brigadier General Leslie R. Groves, the military director of the Manhattan Project, in a heated argument on the choice of coolants; Groves attempted to dismiss him (this was eventually blocked by Secretary of War Henry Stimson). Knowing only this example, one must infer that this was not the only case where Szilard, operating entirely within the mindset of the scientist, upset a member of the elite hierarchy. However, the status of Groves in the overall project was likely sufficient that this single incident might have been enough to marginalize Szilard politically, while allowing him to retain his status scientifically. Further details concerning the misadventures of Leo Szilard as he offends the American elite can be found in Example 4.

Szilard had been involved in nuclear weapons development from the beginning, coordinating the biggest names in the physics community, declaring the Manhattan Project and taking the technology from theory to practice. By 1945, Szilard's goals remained unchanged from his goals in 1939. Yet he had made almost no progress towards realizing them. Research had progressed, yet his social standing was nearly the same, with the exception of new friends (who were either not incumbent elites or, if they were, were sympathetic but not ultimately aligned), new enemies, and his status as a naturalized American citizen as of '43. Szilard still wanted scientists, particularly himself, to play a greater role in decision-making over the use and control of atomic bombs. He made multiple efforts towards this end, all of which were unsuccessful:

1) In early 1945, he drafted a memo recommending the creation of a small scientific panel to advise the US Presidential Cabinet on atomic matters, and tried to deliver it to President Truman. Gaining access to the

[7] Einstein was chosen as sender primarily for his brand value. He admitted to Szilard that he hadn't thought of the chain reaction himself.

President was difficult, but he managed it by going to Truman's original political base in Kansas City and getting an appointment with the President through contacts he made there. At the White House, before the appointment began, Truman, aware of what the meeting was about, had his secretary tell Szilard to go see James Byrnes instead, one of Truman's advisers and soon-to-be Secretary of State. Szilard and two scientist compatriots went to see Byrnes in May 1945 and delivered the memorandum. Byrnes found them and their proposal ridiculous and dismissed them.

2) He went to Washington in May 1945, while the Interim Committee—the committee commissioned to make recommendations about the use of the atomic bomb—is meeting. There he met with Oppenheimer, one of four scientists on the scientific advisory panel to the Interim Committee, and tried to convince him that the bomb shouldn't be used against Japanese cities. Oppenheimer disagreed. He may have contacted others involved in the committee, but we have not found a record of this. The scientific panel eventually recommended immediate use of the bomb against Japanese cities.

3) Soon afterwards, he drafted a petition to the President recommending that the bomb not be used against Japan unless Japan refuses a clear, detailed offer for surrender, and circulated it among Manhattan Project scientists, collecting about 70 signatures. Then, in mid July 1945, weeks before the bombings, he submitted the petition to his superiors in the project hierarchy. There is a good chance that the petition never reached Truman. [This is not described in *The Making of the Atomic Bomb*, but Szilard recounts the experience in a 1960 interview which we have excerpted below.]

4) Around the same time, he participated in (and given his track record was probably instrumental in the organization of) a small committee of scientists at the Chicago section of the Manhattan Project which in June 1945 submitted a report, called the Franck Report, to the Secretary of War Henry Stimson, who would play a major role in the decisions about the use of atomic weapons at this time. The report forecasted an arms race (and consequently the risk of catastrophic nuclear war) in the absence of credible international agreement to ban nuclear weapons and control nuclear technology, and recommended demonstrating the bomb non-violently rather than using it on an military target (e.g. Japanese cities, often euphemistically often referred to as such). We have not found any record that the report was read by Stimson, and according to Szilard none of the scientists from the Franck Report panel were able to get a meeting with him. It *was* read by at least one of the four members of the panel of scientists advising the Interim Committee, namely Arthur Compton, the head of the Chicago section.

Despite Szilard's prominence within the scientific hierarchy of the Manhattan Project from day one, he was never able to gain any meaningful standing in the state hierarchy, and thus depended entirely on action through intermediaries or creating unofficial channels to communicate with officials. Naturally, the same reasons that he was unable to gain status in the state hierarchy in the first place caused these strategies to fail altogether.

Additional Examples

The Einstein-Szilard letter

In 1939 Leo Szilard organized the creation and delivery of a letter from Einstein to President Roosevelt about the potentialities of fission. Crucially, the letter was delivered by a statesman and close ally of Roosevelt, who crafted the delivery so as to maximize its persuasiveness. It resulted in the first steps by the US government towards the bomb and provided some measure of security to the group of independent scientists coordinated around Szilard as they could not then be said to be working in secret from the government, but got bogged down by slow-moving government bureaucrats until Vannevar Bush decided to accelerate it in late 1941, as described in Example 3 above.

Further reading: the letter itself (https://www.atomicheritage.org/key-documents/einstein-szilard-letter); MAB 302-309, 312-317

Vannevar Bush takes control of wartime research

Vannevar Bush was an American scientist who climbed the hierarchy at MIT to be its vice president. In 1938 he left MIT to become the head of the Carnegie Institution, a prestigious research foundation in Washington DC with close ties to the government, so that he would be positioned to play a major role in wartime research. He made his move in the middle of 1940, when, after gaining buy-in from other major DC authorities, he persuaded one of President Roosevelt's lieutenants of his idea to head an overarching wartime research organization, the National Defense Research Committee. He and the lieutenant then persuade Roosevelt, and the thing is done. Bush said of the NDRC, "There were those who protested that the action of setting up NDRC was an end run, a grab by which a small company of scientists and engineers, acting outside established channels, got hold of the authority and money for the program of developing new weapons. That, in fact, is exactly what it was."

Further reading: MAB 336-338

Manhattan Project scientists protest corporate authority

In 1942, as the Manhattan Project was ramping up, the Army hired corporate engineers to oversee a large part of the project. The scientists found them unacceptably incompetent and protested en masse to their superiors. The engineers were replaced, but it is not clear if the scientists' protest was the cause.

Further reading: MAB 422-424

Manhattan Project scientists protest militarization

The original plan for Los Alamos was that scientists there be in the military and under military authority. As Oppenheimer tried to recruit for the lab, he encountered resistance to this plan on the basis of maintaining scientific autonomy. Oppenheimer negotiated with his civilian and military superiors to have the lab and its security measures officially under civilian authority, specifically his authority, though he was subordinate to the

military leader of the project. Ultimately the security measures used were military-like in their strictness, but the lifestyle of researchers within Los Alamos is far more akin to that of a university than a military base.

Further reading: MAB 454

Decision-making about what do with the bomb in 1945

Knowing the bomb will soon be ready, top statesmen, at the suggestion of top research administrators, convinced the President to create an eight-member committee for making recommendations about the wartime use of the bomb. This committee was composed of high-level non-military government officials, including top research administrators Bush, Conant, and Karl Compton. Some of its meetings also included military leaders, corporate leaders, and scientists Oppenheimer, Ernest Lawrence, Enrico Fermi, and Arthur Compton. The committee recommended to the President that the bomb be used immediately against Japan without warning. James Byrnes, soon-to-be Secretary of State and close adviser of the President, dominated the process. The decision was unanimous according to the record (though a few weeks later one of the committee members, the Under Secretary of the Navy, changed his mind). Byrnes relayed the recommendation to the President, who agreed.

Further reading: Collection of documents from the Truman Library including minutes of Interim Committee meetings (https://www.trumanlibrary.org/whistlestop/study_collections/bomb/large/index.php); MAB 620-635, 639-651

The Acheson-Lilienthal Report and the United Nations Atomic Energy Commission

The events surrounding the Acheson-Lilienthal Report might be the closest the world ever came to international control of nuclear technology, so the following summary is longer than others in this section.

In late 1945 the war was over and the US was the only country capable of producing nuclear weapons. The United Nations had just been established in San Francisco. There was much debate among US elites concerning what to do about controlling the spread of nuclear technology. Top State Department officials created a committee on atomic energy, which in turn commissioned a group to produce a report making recommendations about the matter. The group consisted of David Lilienthal, a high-level government utilities bureaucrat (who would eventually be the top US bureaucrat in charge of nuclear weapons); three executives from top technology companies; and Oppenheimer, who had just left Los Alamos to teach at Caltech. They spent seven weeks intensively working on the report.

The report recommended the creation of an international agency staffed by scientists and bureaucrats from around the world that controls all "dangerous" aspects of nuclear technology. It would own all of the crucial raw materials and operate all of the mining facilities and nuclear reactors thereto. Facilities of the agency would be scattered internationally. No new nuclear weapons would be manufactured; existing ones would at some point be destroyed. The idea was that, if a country were to take any steps towards the development of nuclear weapons, they would have to seize the international nuclear facilities in their territory, and so the rest of the world would know what they were doing, and would have years to act against the offender before any nuclear weapons would be operable. There would also be no real advantage to the first mover, since other countries would be able to seize the facilities in their country immediately afterwards. Thus nuclear weapons

development would be strongly disincentivized and a peaceful equilibrium maintained. It was very much the kind of proposal the scientists would make. Bohr read the report and loved it.

The organization that was expected to serve as the locus for the development of this plan was the United Nations Atomic Energy Commission. President Truman appointed financier Bernard Baruch as the U.S. representative to this commission. Baruch used the plan as the basis for his proposal to the commission, with the addition that offenders will be punished with sanctions, and that UN Security Council resolutions on these offences would not be not subject to veto.[8] US disarmament would happen once the international organization had control of all dangerous materials. The Soviets rejected the proposal and countered with the proposal that the US disarm before the international organization is established. The negotiations then stalled, no plan was approved, and the commission was disbanded.

The Acheson-Lilienthal Report: (http://fissilematerials.org/library/ach46.pdf); MHB 229-242

Oppenheimer resists working on bombs after the war

After the war, Oppenheimer was opposed to further nuclear weapons development, believing that efforts should be focused on bringing about international control of nuclear technology. He went to Washington and said so to high-level statesmen, including the Secretary of State and President Truman. Both were unreceptive. Afterwards, in reference to the meeting Truman called Oppenheimer a "cry baby scientist" and reportedly said, "I don't want to see that son of a bitch in this office ever again." Oppenheimer's resistance to further weapons development was eventually used against him in an attack that destroyed his political career in the 1950s.

Further reading: MHB 203-206; Documents from the political trial of Oppenheimer (http://www.atomicarchive.com/Docs/Oppenheimer/index.shtml)

[8] Naturally, this would allow the US and its allies to circumvent the Soviets and China.

Excerpts

The genesis of the Manhattan Project

British scientists lobby Conant and Bush to begin atomic weapons research

[From MAB 357-379:]

1941: James Bryant Conant [high-level NDRC administrator and President of Harvard] traveled to London in the winter of 1941 to open a liaison office between the British government and the National Defense Research Council. He met a "French scientist" at Oxford, probably Hans von Halban, who complained of inaction on uranium-heavy water research. "Since his complaints were clearly 'out of channels,' I quickly terminated the conversation and forgot the incident."…[Conant] also shied from Lindemann. They were lunching alone at a London club. "He introduced the subject of the study of the fission of uranium atoms. I reacted by repeating the doubts I had expressed and heard expressed at NDRC meetings." Lindemann brushed them aside and pounced:

> "'You have left out of consideration," said [Lindemann], "the possibility of the construction of a bomb of enormous power." "How would that be possible?" I asked. "By first separating uranium 235," he said, "and then arranging for the two portions of the element to be brought together suddenly so that the resulting mass would spontaneously undergo a self-sustaining reaction.'"

Remarkably, the chairman of the chemistry and explosives division of the NDRC adds that, as late as March 1941, "this was the first I had heard about even the remote possibility of a bomb." Nor did he pursue the matter. "I assumed, quite correctly, that if and when Bush wished to be in touch with the atomic energy work in England, he would do so through channels involving Briggs."

…

Warren Weaver, the director of the division of natural sciences at the Rockefeller Foundation, visited Berkeley in February to see how construction was progressing on the 4,900-ton, 184-inch cyclotron for which the foundation had awarded a $1,150,000 grant less than twelve months earlier. [Berkeley physicist Ernest] Lawrence took time to complain about the Uranium Committee's [the sub-committee of the NDRC that was in charge of nuclear research at this time] sloth – Weaver worked with another division of the NDRC – but then drove up behind the university to the cyclotron site on the hillside and first irritated and then enthralled the Rockefeller administrator with visions of a superior and much larger machine.

Lawrence rehearsed his complaint again in March when Conant, back from London, traveled out to deliver an address. "Light a fire under the Briggs committee," the energetic Californian badgered the president of Harvard. "What if German scientists succeed in making a nuclear bomb before we even investigate possibilities?" That prepared Lawrence for a full assault. He launched it on March 17 when he met with Karl Compton and Alfred Loomis at MIT…Both men understood the politics of organizations. Yet they were sufficiently seized with Lawrence's fervor that Compton telephoned Vannevar Bush almost as soon as Lawrence left the room and dictated a follow-up letter the same day. Briggs was "by nature slow, conservative,

methodical and accustomed to operate at peacetime government bureau tempo," Compton wrote, conveying Lawrence's blunt complaints, and had been "following a policy consistent with these qualities and still further inhibited by the requirement of secrecy." The British were ahead even though America had "the most in number and the best in quality of the nuclear physicists of the world." The Germans were "very active." Briggs had invited only a very few U.S. nuclear physicists into the work. There were other possibilities in fission research besides the pursuit of a slow-neutron chain reaction for power, possibilities "capable, if successful, of far more important military usage."…

[Bush] met Lawrence in New York two days after the MIT meeting and let fly:

> 'I told him flatly that I was running the show, that we had established a procedure for handling it, that he could either conform to that as a member of the NDRC and put in his kicks through the internal mechanism, or he could be utterly on the outside and act as an individual in any way that he saw fit. He got into line and I arranged for him to have with Briggs a series of excellent conferences. However, I made it very clear to Lawrence that I proposed to make available to Briggs the best advice and consultation possible, but that in the last analysis I proposed to back up Briggs and his committee in their decision unless there was some decidedly strong case for entering into it personally. I think this matter was thoroughly straightened out, therefore, but it left its trail behind.'

In 1940 Lawrence had recruited a Harvard experimentalist named Kenneth Bainbridge, by trade a nuclear physicist – Bainbridge built the Harvard cyclotron – to work on radar at MIT. When Conant went to London to open the new NDRC office there, Bainbridge and others had followed, to work with the British each in his own field of competence. But since Bainbridge knew nuclear physics as well as radar and had even looked into isotope separation, the British allowed him also to attend a full-dress meeting of the MAUD Committee [the British research committee on nuclear technology]. To Bainbridge's surprise, the committee had "a very good idea of the critical mass and [bomb] assembly [mechanism], and urged the exchange of personnel...Their estimate was that a minimum of three years would be required to solve all the problems involved in producing an atomic weapon." Bainbridge immediately contacted Briggs and suggested he send someone over to represent the United States in uranium matters.

Beneath Bush's organizational bristle lay genuine perplexity. "I am no atomic scientist," he writes candidly; "most of this was over my head." As he saw the situation that April, "it would be possible to spend a very large amount of money indeed, and yet there is certainly no clear-cut path to defense results of great importance lying open before us at the present time." But he felt the increasing pressure - Lawrence's prodding, Bainbridge's confirmation of British progress - and reached out now for help.

"It was Bush's strategy," writes the American experimental physicist Arthur Compton, Karl's younger brother, "as coordinator of the nation's war research, to use the National Academy [of Sciences] as the court of final appeal for important scientific problems." On a Tuesday in mid-April, after meeting with Briggs, Bush wrote Frank B. Jewett, the senior Bell Telephone engineer who was president of the National Academy. Briggs had heard from Bainbridge and alerted Bush; Bush and Briggs, "disturbed," had conferred. "The British are apparently doing fully as much as we are, if not more, and yet it seems as though, if the problem were of really great importance, we ought to be carrying most of the burden in this country." Bush wanted "an energetic but dispassionate review of the entire situation by a highly competent group of physicists." The men chosen ought to have "sufficient knowledge to understand and sufficient detachment to cold bloodedly evaluate."…

The review committee met immediately with some of Briggs' associates in Washington. A week later, May 5, 1941, it met again in Cambridge to hear from other Uranium Committee members and from Bainbridge. "There followed," writes [director of the committee Arthur] Compton, "two weeks spent in discussing the military possibilities of uranium with others who were actively interested." Compton worked quickly to complete a seven-page report and delivered it to Jewett on May 17.

The report began with the statement that the committee was concerned with "the matter of possible military aspects of atomic fission" and listed three of those possibilities: "production of violently radioactive materials ... carried by airplanes to be scattered as bombs over enemy territory," "a power source on submarines and other ships" and "violently explosive bombs." Radioactive dust would need a year's preparation after "the first successful production of a chain reaction," which meant "not earlier than 1943." A power source would need at least three years after a chain reaction. Bombs required concentrating U235 or possibly making plutonium in a chain reaction, so "atomic bombs can hardly be anticipated before 1945."

Bush was in the process of reorganizing government science when he received the NAS report. The NDRC, empowered equally with the military laboratories and the National Advisory Committee for Aeronautics, had served for research but lacked the authority to pursue engineering development. Bush proposed a new umbrella agency with wide authority over all government science in the service of war, the Office of Scientific Research and Development. Its director – Bush – would report personally to Roosevelt. Bush prepared to move up to the OSRD by calling in Conant to take over the NDRC. "And only after it was clear that I should shortly have a new position," writes Conant, "did Bush begin to take me into his confidence as he pondered on what to do with the Briggs Committee." Against the background of his British experience Conant told Bush his reaction to Compton's report was "almost completely negative."

Jewett had delivered the report to Bush with a cover letter calling it "authoritative and impressive," but privately he cautioned Bush that he had "a lurking fear" that the report "might be over-enthusiastic in parts and not so well balanced." Jewett also passed it to several senior colleagues for comment, including the 1923 Nobel laureate in physics, Robert A. Millikan of Caltech, and sent their comments along to Bush in early June. Bush responded with exasperation compounded with astonishing confusion about the developments in Britain:

> 'This uranium business is a headache! I have looked over Millikan's comments, and it is quite clear that he wrote them without realizing the present situation. The British have apparently definitely established the possibility of a chain reaction with 238 *[sic],* which entirely changes the complexion of the whole affair. Millikan bases his comments on the conviction that only 235 holds promise. This is natural, since he has not been brought in touch with recent developments which the British have told us about in great confidence.'

He agreed that the work "ought to be handled in a somewhat more vigorous form," but he was still profoundly skeptical of its promise:

> 'Even if the physicists get all that they expect, I believe that there is a very long period of engineering work of the most difficult nature before anything practical can come out of the matter, unless there is an explosive involved, which I very much doubt.'

The OSRD director was not yet convinced despite new word of plutonium's remarkable fissibility. Segre and Seaborg had continued working through the spring of 1941 to determine the man-made element's various cross sections. On Sunday, May 18, having finally prepared a sample thin enough for accurate measurement, they calculated plutonium's cross section for slow-neutron fission at 1.7 times that of U235. When Lawrence heard the news on Monday, says Seaborg, he swung into action:

> 'We told Lawrence about our definitive demonstration yesterday of the slow neutron fissionability of 94239 and he was quite excited. He immediately phoned the University of Chicago to give the news to Arthur H. Compton... Compton made an immediate attempt to phone (unsuccessfully) and then sent a telegram to Vannevar Bush... In his telegram Compton indicated that the demonstration... greatly increases the importance of the fission problem since the available material [i.e., U238 transmuted to plutonium] is thus increased by over 100 times... He said that Alfred Loomis and Ernest Lawrence accordingly have requested him to urge anew the vital importance of pushing the [uranium-graphite] work at Columbia.'

…

[Conant's reaction to Compton's report:]

> 'What worried me about Compton's first report, I told Bush, was the assumption that achieving a chain reaction was so important that a large expenditure of both money and manpower was justified. To me, the defense of the free world was in such a dangerous state that only efforts which were likely to yield results within a matter of months or, at most, a year or two were worthy of serious consideration. In that summer of 1941, with recollections of what I had seen and heard in England fresh in my mind, I was impatient with the arguments of some of the physicists associated with the Uranium Committee whom I met from time to time. They talked in excited tones about the discovery of a new world in which power from a uranium reactor would revolutionize our industrialized society. These fancies left me cold. I suggested that until Nazi Germany was defeated all our energies should be concentrated on one immediate objective.'

Bush, as Conant points out, "was faced with a momentous decision as to priorities." Both men wanted a hard, practical assessment. They decided Compton's report needed an injection of common sense in the form of engineering expertise. Compton discreetly retired from the line; W. D. Coolidge, the General Electric scientist, temporarily took his place. Conant added an engineer from Bell Laboratories and another from Westinghouse and early in July the enlarged committee reviewed the first review.

…

The American program was in danger for its life that summer, Compton thought: "The government's responsible representatives were ... very close to dropping fission studies from the war program." He believed the program was saved because of Lawrence's proposal to use plutonium to make a bomb. The fissibility of 94 may have convinced Compton. It was not decisive for the government's responsible representatives. They were hard men and needed hard facts. Those began to arrive. "More significant than the arguments of Compton and Lawrence," writes Conant, "was the news that a group of physicists in England had concluded that the construction of a bomb made out of uranium235 was entirely feasible."

The British had been trying all winter and spring to pass the word. In July they tried again. G. P. Thomson had assembled a draft final report for the MAUD Committee to consider on June 23, the day after Barbarossa exploded across the Balkans and eastern Poland. Charles C. Lauritsen of Caltech, a respected senior physicist, was beginning work for the NDRC developing rockets and happened to be in London conferring with the British at the time of the MAUD draft. The committee invited him to attend its July 2 meeting at Burlington House. Lauritsen listened carefully, took notes and afterward talked individually with eight of the twenty-four physicists now attached to the work. When he returned to the United States the following week he immediately reported the MAUD findings to Bush. "In essence," says Conant, "he summarized the 'draft report.'" The physicists Lauritsen had interviewed had all pushed for a U.S.-built gaseous-diffusion plant.

The British government would not officially transmit the final MAUD Report to the United States government until early October, but the committee approved it on July 15 (and thereupon promptly disbanded) and by then Bush had been passed a copy of the Thomson draft, which embodied the essential findings. The MAUD Report differed from the two National Academy studies as a blueprint differs from an architect's sketch. It announced at the outset:

> 'We have now reached the conclusion that it will be possible to make an effective uranium bomb which, containing some 25 lb of active material, would be equivalent as regards destructive effect to 1,800 tons of T.N.T. and would also release large quantities of radioactive substances... A plant to produce 2¼ lb (1 kg) per day [of U235] (or 3 bombs per month) is estimated to cost approximately £5,000,000.... In spite of this very large expenditure we consider that the destructive effect, both material and moral, is so great that every effort should be made to produce bombs of this kind... The material for the first bomb could be ready by the end of 1943... Even if the war should end before the bombs are ready the effort would not be wasted, except in the unlikely event of complete disarmament, since no nation would care to risk being caught without a weapon of such destructive capabilities.'

Of conclusions and recommendations the report offered, crisply, three:

> (i) The committee considers that the scheme for a uranium bomb is practicable and likely to lead to decisive results in the war.
>
> (ii) It recommends that this work continue on the highest priority and on the increasing scale necessary to obtain the weapon in the shortest possible time.
>
> (iii) That the present collaboration with America should be continued and extended especially in the region of experimental work.

"With the news from Great Britain unofficially in hand," Conant concludes in a secret history of the project he drafted in 1943, ". . . it became clear to the Director of OSRD and the Chairman of NDRC that a major push along the lines outlined was in order."

They still did not immediately organize that push. Nor was Conant, to his postwar recollection, yet convinced that a uranium bomb would work as described. British research and considered judgment had at least proposed a clear-cut program of *military* development. Bush took it to Vice President Henry Wallace, his

White House sounding board, who was the only scientist in the cabinet, a plant geneticist who had developed several varieties of hybrid corn. “During July,” writes Conant, “Bush had a discussion with Vice President Wallace about the question of spending a large amount of government money on the uranium program.” After which Bush apparently decided to wait for official transmittal of the final MAUD Report.

“If each necessary step requires ten months of deliberation,” Leo Szilard had complained to Alexander Sachs in 1940, “then obviously it will not be possible to carry out this development efficiently.” The American program was moving faster now than that, but not by much.

…

Mark Oliphant helped goad the American program over the top. "If Congress knew the true history of the atomic energy project," Leo Szilard said modestly after the war, "I have no doubt but that it would create a special medal to be given to meddling foreigners for distinguished services, and Dr. Oliphant would be the first to receive one." Conant in his 1943 secret history thought the "most important" reason the program changed direction in the autumn of 1941 was that "the all-out advocates of a head-on attack on the uranium problem had become more vocal and determined" and mentioned Oliphant's influence first of all.

Oliphant flew to the United States in late August to work with his NDRC counterparts on radar. But he was also charged with inquiring why the United States was ignoring the MAUD Committee's findings. "The minutes and reports ... had been sent to Lyman Briggs ... and we were puzzled to receive virtually no comment... I called on Briggs in Washington, only to find that this inarticulate and unimpressive man had put the reports in his safe and had not shown them to members of his Committee." Oliphant was "amazed and distressed."

He met then with the Uranium Committee. Samuel K. Allison was a new committee member, a talented experimentalist, a protégé of Arthur Compton at the University of Chicago. Oliphant "came to a meeting," Allison recalls, "... and said *'bomb'* in no uncertain terms. He told us we must concentrate every effort on the bomb and said we had no right to work on power plants or anything but the bomb. The bomb would cost twenty-five million dollars, he said, and Britain didn't have the money or the manpower, so it was up to us." Allison was surprised. Briggs had kept the committee in the dark. "I thought we were making a power source for submarines."

In desperation Oliphant reached out to the most effective champion he knew in the United States. He wired Ernest Lawrence: "I'll even fly from Washington to meet at a convenient time in Berkeley." At the beginning of September he did.

Lawrence drove Oliphant up the hill behind the Berkeley campus to the site of the 184-inch cyclotron where they could talk without being overheard. Oliphant rehearsed the MAUD Report, which Lawrence had not yet seen. Lawrence in turn proclaimed the possibility of electromagnetic separation of U235 in converted cyclotrons and the virtues of plutonium. "How much I still admire the way in which things are done in your laboratory," Oliphant would write him after their meeting. "I feel quite sure that in your hands the uranium question will receive proper and complete consideration." Back in his office Lawrence called Bush and Conant and arranged for Oliphant to see them. From Oliphant he collected a written summary of the secret British report.

In Washington Conant took Oliphant to dinner and listened with interest. Bush met him in New York and gave him a barely courteous twenty minutes. Neither administrator admitted to knowledge of the MAUD Report. "Gossip among nuclear physicists on forbidden subjects," Conant characterizes Oliphant's peregrinations in his secret history…

Before or after his meetings in Washington and New York Oliphant visited William D. Coolidge, the temporary chairman who produced the second NAS report, at General Electric in Schenectady. That visit at least stirred something like indignation. Coolidge immediately wrote Jewett of Oliphant's news, emphasizing for pure U235 "that the chain reaction in this case would take place thru the direct action *of fast* neutrons... This information, so far as I know, was not available in this country until after the National Academy Committee had sent in its second report. I think that Oliphant's story should be given serious consideration." Information had indeed been available in the United States - at least the MAUD minutes, including Peierls' April 9 statement - but Briggs had locked it away for safekeeping. Oliphant returned to Birmingham wondering if he had made any impression at all. Lawrence was already moving. He called Arthur Compton in Chicago after Oliphant left Berkeley. "Certain developments made him believe it would be possible to make an atomic bomb," Compton paraphrases the conversation. "Such a bomb, if developed in time, might determine the outcome of the war. The activity of the Germans in this field made it seem to him a matter of great urgency for us to press its development." It was no more than Szilard had argued two years earlier. Lawrence was scheduled to speak in Chicago on September 25. Conant would be in town to receive an honorary degree. Compton proposed to invite both men together to his home. Lawrence could then press the NDRC chairman directly…

"It was a cool September evening," Arthur Compton remembers. "My wife greeted Conant and Lawrence as they came into our home and gave each of us a cup of coffee as we gathered around the fireplace. Then she busied herself upstairs so the three of us might talkfreely."

Lawrence spoke with passion. He was "very vigorous in his expression of dissatisfaction with the U.S. program," writes Conant. "Dr. Oliphant had seen him during the summer and by recounting the British hopes had further fired Lawrence's zeal for more action in this whole field." Conant knew all about the British hopes, knew talk was cheap and chose to play the devil's advocate, easily gulling Compton, who thought his arguments turned the tide:

> 'Conant was reluctant. As a result of the reports so far received he had concluded that the time had come to drop the support of nuclear research as a subject for wartime study... We could not afford to spend either our scientific or our industrial effort on an atomic program of highly questionable military value when every ounce of our strength was needed for the nation's defense.
>
> 'I rallied to Lawrence's support...Conant began to be convinced.'

"I could not resist the temptation," says the Harvard president, "to cut behind [Lawrence's] rhetoric by asking if he was prepared to shelve his own research programs." Compton cranks Conant's challenge to high melodrama:

> '"If this task is as important as you men say," [Conant] remarked, "we must get going. I have argued with Vannevar Bush that the uranium project be put in wraps for the war period. Now you put

> before me plans for making a definite, highly effective weapon. If such a weapon is going to be made, we must do it first. We can't afford not to. But I'm here to tell you, nothing significant will happen on such a job as this unless we get into it with everything we've got."
>
> 'He turned to Lawrence. "Ernest, you say you are convinced of the importance of these fission bombs. Are you ready to devote the next several years of your life to getting them made?"
>
> 'The question brought Lawrence up with a start. I can still recall the expression in his eyes as he sat there with his mouth half open. Here was a serious personal decision.... He hesitated only a moment: "If you tell me this is my job, I'll do it."'

Conant and Bush finally initiate the Manhattan Project

Back in Washington Conant briefed Bush on what he calls "the results of the involuntary conference in Chicago to which [I] had been exposed." The two administrators decided to order up a third National Academy report, enlarging Compton's committee this time to include W. K. Lewis, a chemical engineer with an outstanding reputation for estimating the potential success at industrial scale of laboratory processes, and Conant's Harvard colleague George B. Kistiakowsky, the resident NDRC explosives expert…Conant had been among those who lured Kistiakowsky from Princeton to Harvard. He valued highly his friend and fellow chemist's opinion. "When I retailed to him the idea that a bomb could be made by the rapid assembly of two masses of fissionable material, his first remark was that of a doubting Thomas. 'It would seem to be a difficult undertaking on a battlefield,' he remarked." But it was Kistiakowsky's judgment that finally convinced Conant, as British hopes and physicists' entreaties had not:

> 'A few weeks later when we met, his doubts were gone. "It can be made to work," he said. "I am one hundred percent sold."
>
> 'My doubts about Briggs' project evaporated as soon as I heard George Kistiakowsky's considered verdict. I had known George for many years... I had asked him to be head of the NDRC division on explosives... I had complete faith in his judgment. If he was sold on Arthur Compton's program, who was I to have reservations?'

Oliphant convinced Lawrence, Lawrence convinced Compton, Kistiakowsky convinced Conant. Conant says Compton's and Lawrence's attitudes "counted heavily with Bush." But "more significant" was the MAUD Report, which G. P. Thomson, now British scientific liaison officer in Ottawa, officially transmitted to Conant on October 3. On October 9, without waiting for the third National Academy of Sciences review, Bush carried the report directly to the President.

Franklin Roosevelt, Henry Wallace and the director of the OSRD met that Thursday at the White House. In a memorandum Bush wrote to Conant the same day he makes it clear that the MAUD Report was the basis for the discussion: "I told the conference of the British conclusions." He told the President and the Vice President that the explosive core of an atomic bomb might weigh twenty-five pounds, that it might explode with a force equivalent to some eighteen hundred tons of TNT, that a vast industrial plant costing many times

as much as a major oil refinery would be necessary to separate the U235, that the raw material might come from Canada and the Belgian Congo, that the British estimated the first bombs might be ready by the end of 1943. Bush tried to explain that an atomic bomb plant would produce no more than two or three bombs a month but doubted if the President took in that "relatively low yield." He emphasized that he was basing his statements "primarily on calculation with some laboratory investigation, but not on a proved case" and therefore could not guarantee success.

Bush was presenting, essentially, British calculations and British conclusions. Such a presentation made it appear that Britain was further advanced in the field than America. The discussion therefore shifted to the question of how the United States was attached or might attach itself to the British program. "I told of complete interchange with Britain on technical matters, and this was endorsed." Bush explained that the "technical people" in Britain had also formulated policy - had proposed that the government develop the atomic bomb as a weapon of war - and had passed their formulations along directly to the War Cabinet. In the United States, Bush said, an NDRC section and an advisory committee considered technical matters and only he and Conant considered policy.

Policy was the President's prerogative. As soon as Bush exposed it to view Roosevelt seized it. Bush took that decision to be the most important outcome of the meeting and put it emphatically first in his memorandum to Conant. Roosevelt wanted policy consideration restricted to a small group (it came to be called the Top Policy Group). He named its members: Vice President Wallace, Secretary of War Henry L. Stimson, Army Chief of Staff George C. Marshall, Bush and Conant. Every man owed his authority to the President. Roosevelt had instinctively reserved nuclear weapons policy to himself.

Thus at the outset of the U.S. atomic energy program scientists were summarily denied a voice in deciding the political and military uses of the weapons they were proposing to build. Bush accepted the usurpation happily. To him it was simply a matter of who would run the show. It left him on top and inside and he put it to use immediately to shoulder the physics community into line. Within hours, as he wrote Frank Jewett in November, he had "emphasized to Arthur Compton and his people the fact that they are asked to report upon the techniques, and that consideration of general policy has not been turned over to them as a subject."

Significantly, Bush associated the reservation of policy with relief from criticism: "Much of the difficulty in the past has been due to the fact that Ernest Lawrence in particular had strong ideas in regard to policy, and talked about them generally... I cannot...bring him into the discussions, as I am not authorized by the President to do so." He applied just this test-silence on policy-to measure Lawrence's and Compton's loyalty: "I think [Lawrence] now understands this, and I am sure that Arthur Compton does, and I think our difficulties in this regard are over."

A scientist could choose to help or not to help build nuclear weapons. That was his only choice. The surrender of any further authority in the matter was the price of admission to what would grow to be a separate, secret state with separate sovereignty linked to the public state through the person and by the sole authority of the President…

There are indications in Bush's memorandum that Roosevelt was concerned less with a German challenge than with the long-term consequences of acquiring so decisive a new class of destructive instruments. "We discussed at some length after-war control," Bush wrote Conant, "together with sources of raw material"

(sources of raw material were then believed to be few and far between; whoever commanded them might well, it seemed, monopolize the bomb). Roosevelt was thinking beyond developing bombs for the war that the United States had not yet entered. He was thinking about a military development that would change the political organization of the world.

Bush, who was a successful administrator partly because he knew the limits of his charter, then suggested that a "broader program" - industrial production - ought to be handled when the time came by some larger organization than the OSRD. Roosevelt agreed. Summarizing his assignment, Bush told the President he understood he was to expedite in every possible way the necessary research but was "not [to] proceed with any definite steps on this expanded plan until further instructions from him... He indicated that this was correct." The money, the President told him, "would have to come from a special source available for such an unusual purpose and . . . he could arrange this."

The United States was not yet committed to building an atomic bomb. But it was committed to exploring thoroughly whether or not an atomic bomb could be built. One man, Franklin Roosevelt, decided that commitment – secretly, without consulting Congress or courts. It seemed to be a military decision and he was Commander in Chief.

Niels Bohr

Bohr makes inroads with Roosevelt

[From MAB 525-538:]

In December [1943], before he first went out to Los Alamos, at a small reception at the Danish Embassy in Washington where he and [his son] Aage lived when they visited that city, Bohr had renewed his acquaintance with Supreme Court Associate Justice Felix Frankfurter. The justice was short, crackling, bright, Vienna-born, an agnostic Zionist Jew, an ardent patriot, a close friend of Franklin Roosevelt and one of the President's longtime advisers. Bohr had met him in England in 1933 in connection with the rescue of the émigré academics; when Bohr visited Washington in 1939, the year Frankfurter was elevated to the Court, the two men developed what Frankfurter calls a "warm friendly relation."…

After Bohr returned to Washington from Los Alamos, in mid-February, the two men kept their appointment for lunch. Both left wartime memoranda describing the meeting. "We talked about the recent events in Denmark," Frankfurter writes, "the probable course of the war, the state of England…our certainty of German defeat and what lay ahead. Professor Bohr never remotely hinted the purpose of his visit to this country."

Fortunately Frankfurter had heard about the project he called X. He says he heard from "some distinguished American scientists," but he certainly heard from a distraught young Met Lab scientist [Szilard] who had penetrated all the way to Frankfurter and Eleanor Roosevelt in 1943 with complaints about Du Pont. "I had thus become aware of X - aware, that is, that there was such a thing as X and of its significance." Since Frankfurter knew Bohr's field he assumed X was the reason for Bohr's visit:

> 'And so…I made a very oblique reference to X so that if I was right in my assumption that Professor Bohr was sharing in it, he would know that I knew something about it…He likewise replied in an innocent remote way, but it soon became clear to both of us that two such persons, who had been so long and so deeply preoccupied with the menace of Hitlerism and who were so deeply engaged in the common cause, could talk about the implications of X without either of us making any disclosure to the other.'

"Professor Bohr then expressed to me," Frankfurter goes on, "his conviction that X might be one of the greatest boons to mankind or might become the greatest disaster ... and he made it clear to me that there was not a soul in this country with whom he could or did talk about these things except Lord Halifax [the British ambassador] and Sir Ronald Campbell [a British representative on the Anglo-American Combined Policy Committee]." Bohr picks up the narrative in third-person voice: "On hearing this F said that, knowing President Roosevelt, he was confident that the President would be very responsive to such ideas as B outlined."

Bohr had found his go-between. "B met F again one of the last days of March [1944]," Bohr records in his wartime memorandum, "and learned that in the meantime F had had occasion to speak with the President and that the President shared the hope that the project might bring about a turning point in history." Frankfurter describes his meeting with Roosevelt:

> ‘On this particular occasion I was with the President for about an hour and a half and practically all of it was consumed by this subject. He told me the whole thing "worried him to death" (I remember the phrase vividly), and he was very eager for all of the help he could have in dealing with the problem. He said he would like to see Professor Bohr and asked me whether I would arrange it. When I suggested to him that the solution of this problem might be more important than all the schemes for a world organization, he agreed and authorized me to tell Professor Bohr that he, Bohr, might tell our friends in London that the President was most eager to explore the proper safeguards in relation to X.’

Churchill stonewalls Bohr

Why did Roosevelt entrust so important a mission to Bohr? In fact, the commission worked the other way around: Bohr had come to the United States representing the British, representing at least Sir John Anderson, who had encouraged his visit as much to promote discussing the issues Bohr had raised as to bolster the British Los Alamos mission. If the commission was informal it was no more so than any number of other back-channel arrangements between the British and the Americans. Roosevelt simply responded to what he took to be a British approach. He seems to have assumed - correctly - that British statesmen around Churchill were using Bohr to communicate to the President ideas about wartime and post-war arrangements to which Churchill was not yet committed. He responded candidly with loyalty to his British counterpart, Bohr adds: "F also informed B that as soon as the question had been brought up, the President had said it was a matter for Prime Minister Churchill and himself to find the best ways of handling the project to the benefit of all mankind, and that he should heartily welcome any suggestion to this purpose from the Prime Minister." The President would be happy to discuss new ideas for postwar relations, but the British would first have to convince the P.M.; Roosevelt would not deal behind Churchill's back. Frankfurter implies this understanding: "I wrote out such a formula for Bohr to take to London - a communication to Sir John Anderson, who was apparently Bohr's connecting link with the British government."

Complicating Bohr's discussions, in March and later, was the question of what to do about the USSR. Bohr considered the question in the following perspective. Tell the Soviet Union soon, before the first bombs were nearly built, that a bomb project was under way, and the confidence might lead to negotiations on postwar arms control. Let the Soviet Union discover the information on its own, build the bombs and drop them, oppose the Soviets at the end of the war with an Anglo-American nuclear monopoly, and the likeliest outcome was a nuclear arms race…

[In fact by this time or very soon after the Soviets were already well aware of the Allied atomic bomb project. Indeed they had detailed information on the technical work from at least one mole working at high levels on the Manhattan Project, Karl Fuchs.]

The British in whom Bohr had been confiding were properly impressed. “[British ambassador to the US] Halifax considered this development to be so important," writes Aage Bohr, "that he thought my father should go to London immediately." Father and son crossed the Atlantic again, this time by military aircraft, in

early April. Anderson had been working to soften Churchill up. The tall, dark Chancellor of the Exchequer, whom Oppenheimer describes as a "conservative, dour, remarkably sweet man," sent the Prime Minister a long memorandum on March 21. He suggested opening Tube Alloys to wider discussion within the British government. Echoing Bohr, he saw the possibility of international proliferation of nuclear weapons after the war. He thought the only alternative to a vicious arms race was international agreement. He proposed "communicating to the Russians in the near future the bare fact that we expected, by a given date, to have this devastating weapon; and...inviting them to collaborate with us in preparing a scheme for international control."

Churchill circled "collaborate" and wrote in the margin: "on no account."

When Bohr arrived Anderson wrote the Prime Minister again, going over the same arguments but adding that he now believed Roosevelt was attending the subject and would welcome discussion. He even supplied a draft message Churchill might send to initiate an exchange. The response was equally waspish: "I do not think any such telegram is necessary nor do I wish to widen the circle who are informed."…

[While Bohr waits in London to meet with Churchill, he is contacted by a friend and Soviet scientist who is obviously fishing for information on weapons research. He reports the encounter to the British government.]

[Bohr] was called with Cherwell [i.e. Lindemann], finally, on May 16 [1944], to 10 Downing Street. The definitive account is from R. V. Jones, Cherwell's protégé, who had helped make arrangements and who was surprised to find Bohr wandering a few hours later in Old Queen Street outside the Tube Alloys office:

> 'When I asked him how the meeting had gone he said: "It was terrible. He scolded us like two schoolboys!" From what he told me at that time and afterwards, it appeared that the meeting misfired from the start. Churchill was in a bad mood, and he berated Cherwell for not having arranged the interview in a more regular manner. He then said he knew why Cherwell had done it - it was to reproach him about the Quebec Agreement. This, of course, was quite untrue, but it meant that Bohr's "set piece" talk was thrown right out of gear. Bohr, who used to say that accuracy and clarity were complementary (and so a short statement could never be precise), was not easy to hear, and all that Churchill seemed to gather was that he was worried about the likely state of the post-war world and that he wanted to tell the Russians about the progress towards the bomb. As regards the post-war world Churchill told him: "I cannot see what you are talking about. After all this new bomb is just going to be bigger than our present bombs. It involves no difference in the principles of war. And as for any post-war problems there are none that cannot be amicably settled between me and my friend, President Roosevelt."'

Bohr got only the bare thirty minutes of his scheduled appointment, most of which Churchill had monopolized. "As he was leaving," Aage Bohr concludes, "my father asked for permission to write Churchill, whereupon the latter answered, 'It will be an honour for me to receive a letter from you,' adding, 'but not about politics!'"

Bohr prepares for a second meeting with Roosevelt

For Bohr the way home was via Washington. He reported his dismal experience with Churchill to Felix Frankfurter on June 18. Frankfurter immediately carried the news to Roosevelt, who was amused to hear another tale of Churchillian pugnacity:

> 'About a week later F told B that this information had been heartily welcomed by the President who had said that he regarded the steps taken as a favourable development. During the talk the President had expressed the wish to see B, and as a preliminary step F advised B to give an account of his views in a brief memorandum.'

[Excerpt from Bohr's memo:]

It certainly surpasses the imagination of anyone to survey the consequences of the project in years to come, where, in the long run, the enormous energy sources which will be available may be expected to revolutionize industry and transport. The fact of immediate preponderance is, however, that a weapon of an unparalleled power is being created which will completely change all future conditions of warfare.

Quite apart from the question of how soon the weapon will be ready for use and what role it may play in the present war, this situation raises a number of problems which call for the most urgent attention. Unless, indeed, some agreement about the control of the use of the new active materials can be obtained in due time, any temporary advantage, however great, may be outweighed by a perpetual menace to human security.

Ever since the possibilities of releasing atomic energy on a vast scale came in sight, much thought has naturally been given to the question of control, but the further the exploration of the scientific problems concerned is proceeding, the clearer it becomes that no kind of customary measures will suffice for this purpose, and that the terrifying prospect of a future competition between nations about a weapon of such formidable character can only be avoided through a universal agreement in true confidence.

In this connection it is particularly significant that the enterprise, immense as it is, has still proved far smaller than might have been anticipated, and that the progress of the work has continually revealed new possibilities for facilitating the production of the active materials and of intensifying their efforts.

The prevention of a competition prepared in secrecy will therefore demand such concessions regarding exchange of information and openness about industrial efforts, including military preparations, as would hardly be conceivable unless all partners were assured of a compensating guarantee of common security against dangers of unprecedented acuteness.

The establishment of effective control measures will of course involve intricate technical and administrative problems, but the main point of the argument is that the accomplishment of the project would not only seem to necessitate but should also, due to the urgency of mutual confidence, facilitate a new approach to the problems of international relationship.

The present moment where almost all nations are entangled in a deadly struggle for freedom and humanity might, at first sight, seem most unsuited for any committing arrangement concerning the project. Not only

have the aggressive powers still great military strength, although their original plans of world domination have been frustrated and it seems certain that they must ultimately surrender, but even when this happens, the nations united against aggression may face grave causes of disagreement due to conflicting attitudes toward social and economic problems.

A closer consideration, however, would indicate that the potentialities of the project as a means of inspiring confidence under these very circumstances acquire real importance. Moreover, the present situation affords unique possibilities which might be forfeited by a postponement awaiting the further development of the war situation and the final completion of the new weapon.

In view of these eventualities the present situation appears to offer a most favorable opportunity for an early initiative from the side which by good fortune has achieved a lead in the efforts of mastering mighty forces of nature hitherto beyond human reach.

Without impeding the immediate military objectives, an initiative, aiming at forestalling a fateful competition, should serve to uproot any cause of distrust between the powers on whose harmonious collaboration the fate of coming generations will depend.

Indeed, it would appear that only when the question is raised among the united nations as to what concessions the various powers are prepared to make as their contribution to an adequate control arrangement, will it be possible for any one of the partners to assure himself of the sincerity of the intentions of the others.

Of course, the responsible statesmen alone can have insight as to the actual political possibilities. It would, however, seem most fortunate that the expectations for a future harmonious international co-operation, which have found unanimous expressions from all sides within the united nations, so remarkably correspond to the unique opportunities which, unknown to the public, have been created by the advancement of science.

Many reasons, indeed, would seem to justify the conviction that an approach with the object of establishing common security from ominous menaces, without excluding any nation from participating in the promising industrial development which the accomplishment of the project entails, will be welcomed, and be met with loyal co-operation in the enforcement of the necessary far-reaching control measures.

It is in such respects that helpful support may perhaps be afforded by the world-wide scientific collaboration which for years has embodied such bright promises for common human striving. Personal connections between scientists of different nations might even offer means of establishing preliminary and unofficial contact.

It need hardly be added that any such remark or suggestion implies no underrating of the difficulty and delicacy of the steps to be taken by the statesmen in order to obtain an arrangement satisfactory to all concerned, but aims only at pointing to some aspects of the situation which might facilitate endeavors to turn the project to the lasting benefit of the common cause.

Roosevelt meets Bohr again, then aligns with Churchill, snubbing Bohr

[Back to MAB:]

Bohr returned to the U.S. capital; "on August 26th at 5 p.m.," he writes, "B was received by the President in the White House in a completely private manner." Roosevelt "was very cordial and in excellent spirits," says Aage Bohr, as well he might have been after the rapid advances of the Allied armies across Europe. He had read Bohr's memorandum; he "most kindly gave B an opportunity to explain his views and spoke in a very frank and encouraging manner about the hopes he himself entertained." FDR liked to charm; he charmed Bohr with stories, Aage Bohr recounts:

> 'Roosevelt agreed that an approach to the Soviet Union of the kind suggested must be tried, and said that he had the best hopes that such a step would achieve a favourable result. In his opinion Stalin was enough of a realist to understand the revolutionary importance of this scientific and technical advance and the consequences it implied. Roosevelt described in this connection the impression he had received of Stalin at the meeting in Tehran, and also related humorous anecdotes of his discussion and debates with Churchill and Stalin. He mentioned that he had heard how the negotiations with Churchill in London had gone, but added that the latter had often reacted in this way at the first instance. However, Roosevelt said, he and Churchill always managed to reach agreement, and he thought that Churchill would eventually come around to sharing his point of view in this matter. He would discuss the problems with Churchill at their forthcoming meeting and hoped to see my father soon afterwards.'

The interview lasted an hour and a half. To Robert Oppenheimer in 1948 Bohr reported a more specific commitment from the President: he "left with Professor Bohr the impression," Oppenheimer writes, "that, after discussion with the Prime Minister, he might well ask [Bohr] to undertake an exploratory mission to the Soviet Union."

"It is hardly necessary to mention the encouragement and gratitude my father felt after his talk with Roosevelt," Aage Bohr goes on; "these were days filled with the greatest optimism and expectation." Bohr saw Frankfurter in Boston and told him about the meeting. Frankfurter suggested Bohr restate his case in a thank-you note, which Bohr managed to compress into one long page by September 7. Frankfurter passed it to Roosevelt's aide. Bohr settled in eagerly to wait.

The two heads of state saved their Tube Alloy discussions for the end of the conference, late September, when they retreated to Roosevelt's estate in the Hudson Valley at Hyde Park. "This was another piece of black comedy," writes C. P. Snow. "...Roosevelt surrendered without struggle to Churchill's view of Bohr." The result was a secret aide-memoire, obviously of Churchill's composition, that misrepresented Bohr's proposals, repudiated them and recorded for the first time the Anglo-American position on the new weapon's first use:

> The suggestion that the world should be informed regarding tube alloys, with a view to an international agreement regarding its control and use, is not accepted. The matter should continue to be regarded as of the utmost secrecy; but when a "bomb" is finally available, it might perhaps, after mature consideration, be used against the Japanese, who should be warned that this bombardment will be repeated until they surrender.

> 2. Full collaboration between the United States and the British Government in developing tube alloys for military and commercial purposes should continue after the defeat of Japan unless and until terminated by joint agreement.
>
> 3. Enquiries should be made regarding the activities of Professor Bohr and steps taken to ensure that he is responsible for no leakage of information particularly to the Russians.

The next day, September 20, Churchill wrote Cherwell in high dudgeon:

> 'The President and I are much worried about Professor Bohr. How did he come into this business? He is a great advocate of publicity. He made an unauthorized disclosure to Chief Justice *[sic]* Frankfurter who startled the President by telling him he knew all the details. He says he is in close correspondence with a Russian professor, an old friend of his in Russia to whom he has written about the matter and may be writing still. The Russian professor has urged him to go to Russia in order to discuss matters. What is all this about? It seems to me Bohr ought to be confined or at any rate made to see that he is very near the edge of mortal crimes. I had not visualized any of this before...I do not like it at all.'

Anderson, Halifax and Cherwell all defended Bohr to Churchill after the Hyde Park outburst, as did Bush and Conant to FDR. The Danish laureate was not confined. But neither was he invited to meet again with the President of the United States. There would be no exploratory mission to the USSR.

Leo Szilard

Szilard clashes with Groves over the Manhattan Project

[From MAB 502-510:]

Szilard's more staid scientific colleagues sometimes had trouble adjusting to his mercurial passage from one solution to another; his army associates were horrified, and to make matters worse, Szilard freely indulged in what he once identified as his favorite hobby - baiting brass hats. General Groves, in particular, had been outraged by Szilard's unabashed view that army compartmentalization rules, which forbade discussion of lines of research that did not immediately impinge on each other, should be ignored in the interests of completing the bomb.

The issue for Szilard was openness within the project to facilitate its work. "There is no way of telling beforehand," he wrote in a 1944 discussion of the problem, "what man is likely to discover and invent a new method which will make the old methods obsolete." The issue for Groves, to the contrary, was security.

At first Szilard bent the rules and Groves threatened him. In late October 1942, while Fermi moved toward building CP-1, Szilard apparently badgered the Du Pont engineers who arrived in Chicago to take over pile design. Arthur Compton saw this activity as obstructive but not necessarily subversive; on October 26 he wired Groves that he had given Szilard two days TO REMOVE BASE OF OPERATIONS TO NEW YORK. ACTION BASED ON EFFICIENT OPERATION OF ORGANIZATION NOT ON RELIABILITY. ANTICIPATE PROBABLE RESIGNATION…Compton proposed surveillance: SUGGEST ARMY FOLLOW HIS MOTIONS BUT NO DRASTIC ACTION NOW. Two days later Compton hurriedly wired Groves to desist: SZILARD SITUATION STABILIZED WITH HIM REMAINING CHICAGO OUT OF CONTACT WITH ENGINEERS. SUGGEST YOU NOT ACT WITHOUT FURTHER CONSULTATION CONANT AND MYSELF.

Groves had prepared drastic action indeed. On the stationery of the Office of the Chief of Engineers, over a signature block reserved for the Secretary of War, he had drafted a letter to the U.S. Attorney General calling Leo Szilard an "enemy alien" and proposing that he "be interned for the duration of the war." Compton's telegram forestalled an ugly arrest and the letter was never signed or sent…

Szilard responded forthrightly; he assembled a large collection of documents from the 1939-40 period demonstrating his part in carrying the news of fission to Franklin Roosevelt and, pointedly, his efforts to enforce voluntary secrecy among physicists in the United States, Britain and France. Compton sent the documents to Groves in mid-November…

Szilard embarked next on a careful campaign to negotiate changes by insisting meticulously on the enforcement of his legal rights…[Szilard sends memos to Compton claiming rights to patents for inventions he made before the project began; the project leaders' plan had been to have the government own the patents. He is trying to use his rights to his inventions as a bargaining chip. It is also a protest.]…

[Excerpt from one of Szilard's memos:] "I wish to take this opportunity to mention that the question of patents was discussed by those who were concerned in 1939 and 1940. At that time it was proposed by the

scientists that a government corporation should be formed which would look after the development of this field and...be the recipient of the patents. It was assumed that the scientists would have adequate representation within this government owned corporation…In the absence of such a government owned corporation in which the scientists can exert their influence on the use of funds, I do not now propose to assign to the government, without equitable compensation, patents covering the basic inventions."

…

[Compton] sent Szilard's two memoranda directly to Conant [the head of NDRC], whose office received them on January 11, 1943. "Szilard's case is perhaps unique," Compton wrote the NDRC chairman, "in that for a number of years the development of this project has continuously occupied his primary attention... There is no doubt that he is among the few to whom the United States Government can look for establishing basic claims for invention. The matter is thus one of real importance to our Government."…

Conant bumped Compton's letter up to Bush, who answered it personally. Inventions scientists made after joining the project belonged to the project, Bush told Compton; unless Szilard had disclosed his previous inventions to the University of Chicago at the time of his employment he had only a very short leg to stand on, if any at all. The OSRD director outlined the proper legal procedure for secret patent filings and then kicked at the leg Szilard had left: "It is my understanding that none of this procedure has been gone through with in the case of Dr. Szilard…I gather that Dr. Szilard is particularly anxious that the proceeds arising from his early activity in invention in this field, if such eventuate, should in some way become available for the furtherance of scientific research." He thought that was admirable, but he also thought it had nothing to do with the government…

Compton reported Bush's response to Szilard in late March. There matters stood until early May, when Szilard with restrained exasperation proposed to proceed with filing patent applications. He asked that Groves designate someone to act as his legal adviser. The Army general supplied a Navy captain, Robert A. Lavender, who was attached to the OSRD in Washington, and Szilard met frequently with Lavender in the spring and early summer to discuss his claims.

Somewhere along the way Groves put Szilard under surveillance. The surveillance was already months old in mid-June when the MED's security office suggested discontinuing it. Groves rejected the suggestion out of hand: "The investigation of Szilard should be continued despite the barrenness of the results. One letter or phone call once in three months would be sufficient for the passing of vital information and until we know for certain that he is 100% reliable we cannot entirely disregard this person."…

Since he worked for Vannevar Bush, Lavender [Szilard's assigned attorney] was hardly a disinterested consultant; when he met again with Szilard on July 14 he informed the physicist that his documents "failed to disclose an operable pile," meaning that in his opinion Szilard could not claim a patentable invention. Szilard realized then, if not before, that he needed private counsel and asked that an attorney who could act in his behalf be cleared…

[Szilard] negotiated now not only with Lavender but with Army Lieutenant Colonel John Landsdale, Jr., Groves' chief of security. In an October 9 letter to Szilard, Groves summed up the blunt exchange over which the three men bargained: "You were assured [by Lavender and Landsdale] that as soon as you were able to

convey full rights [to any inventions made prior to government employment], negotiations would be entered into with a view to acquisition by the Government of any rights you may have and your reemployment on Government contracts... I repeat this assurance."

Groves and Szilard arranged a temporary truce at a meeting in Chicago on December 3. The Army agreed to pay Szilard $15,416.60 to reimburse him for the twenty months when he worked unpaid and out-of-pocket at Columbia and for lawyers' fees.

The general had attempted several times to [get] Szilard to sign a document promising "not to give any information of any kind relating to the project to any unauthorized person." Szilard had consistently agreed verbally to that restriction and just as consistently refused as a matter of honor to sign. He meant to continue protesting and on January 14, 1944, he began again with a three-page letter to Vannevar Bush. He knew fifteen people, he told Bush, "who at one time or another felt so strongly about [compartmentalization] that they intended to reach the President…Decisions are often clearly recognized as mistakes at the time when they are made by those who are competent to judge, but…there is no mechanism by which their collective views would find expression or become a matter of record…If peace is organized before it has penetrated the public's mind that the potentialities of atomic bombs are a reality, it will be impossible to have a peace that is based on reality... [The atomic bomb] will be so powerful that there can be no peace if it is simultaneously in the possession of any two powers unless these two powers are bound by an indissoluble political union.... It will hardly be possible to get political action along that line unless high efficiency atomic bombs have actually been used in this war and the fact of their destructive power has deeply penetrated the mind of the public…This for me personally is perhaps the main reason for being distressed by what I see happening around me."

Bush insisted in return that all was well. "I feel that the record when this effort is over," he wrote Szilard, "will show clearly that there has never at any time been any bar to the proper expression of opinion by scientists and professional men within their appropriate sphere of activity in this whole project." But he was willing to meet with Szilard if that was what the physicist wanted. In February, preparing for that meeting, Szilard drafted forty-two pages of notes. [It seems nothing notable comes of the meeting.]

[Excerpts from Szilard's notes:]

"[Since invention is unpredictable] the only thing we can do in order to play safe is to encourage sufficiently large groups of scientists to think along those lines and to give them all the basic facts which they need to be encouraged to such activity. This was not done in the past [in the Manhattan Project] and it is not being done at present…

"The attitude taken toward foreign born scientists in the early stages of this work had far reaching consequences affecting the attitude of the American born scientists. Once the general principle that authority and responsibility should be given to those who had the best knowledge and judgment is abandoned by discriminating against the foreign born scientists, it is not possible to uphold this principle with respect to American born scientists either. If authority is not given to the best men in the field there does not seem to be any compelling reason to give it to the second-best men and one may give it to the third- or fourth- or fifth-best men, whichever of them appears to be the most agreeable on purely subjective grounds…

"The scientists are annoyed, feel unhappy and incapable of living up to their responsibility which this unexpected turn in the development of physics has thrown into their lap. As a consequence of this, the morale has suffered to the point where it almost amounts to a loss of faith. The scientists shrug their shoulders and go through the motions of performing their duty. They no longer consider the overall success of this work as their responsibility. In the Chicago project the morale of the scientists could almost be plotted in a graph by counting the number of lights burning after dinner in the offices in Eckhart Hall. At present the lights are out.

Truman evades Szilard

[From MAB 635-642:]

1945: As the man who had thought longer and harder than anyone else about the consequences of the chain reaction, Szilard had chafed at his continuing exile from the high councils of government. Another politically active Met Lab scientist, Eugene Rabinowitch, a younger man, confirms "the feeling which was certainly shared ... by others that we were surrounded by a kind of soundproof wall so that you could write to Washington or go to Washington and talk to somebody but you never got any reaction back." With the successful operation of the production reactors and separation plants at Hanford the work of the Met Lab had slowed; Compton's people, Szilard particularly, found time to think about the future. Szilard says he began to examine "the wisdom of testing bombs and using bombs." Rabinowitch remembers "many hours spent walking up and down the Midway [the wide World's Fair sward south of the University of Chicago main campus] with Leo Szilard and arguing about these questions and about what can be done. I remember sleepless nights."

There was no point in talking to Groves, Szilard reasoned in March 1945, nor to Bush or Conant for that matter. Secrecy barred discussion with middle-level authorities. "The only man with whom we were sure we would be entitled to communicate," Szilard recalls, "was the President." He prepared a memorandum for Franklin Roosevelt and traveled to Princeton to enlist once again the durable services of Albert Einstein.

Except for some minor theoretical calculations for the Navy, Einstein had been excluded from wartime nuclear development. Bush explained why to the director of the Institute for Advanced Study early in the war:

> 'I am not at all sure that if I place Einstein in entire contact with his subject he would not discuss it in a way that it should not be discussed…I wish very much that I could place the whole thing before him…but this is utterly impossible in view of the attitude of people here in Washington who have studied into his whole history.'

The great theoretician whose letter to Roosevelt helped alert the United States government to the possibility of an atomic bomb was thus spared by concern for security and by hostility to his earlier outspoken politics - his pacifism and probably also his Zionism - from contributing to that weapon's development. Szilard could not show Einstein his memorandum. He told his old friend simply that there was trouble ahead and asked for a letter of introduction to the President. Einstein complied.

From Chicago Szilard approached Roosevelt through his wife. Eleanor Roosevelt agreed to see him on May 8 to pursue the matter. Thus fortified, he wandered to Arthur Compton's office to confess his out-of- channel sins. Compton surprised him by cheering him on. "Elated by finding no resistance where I expected resistance," Szilard reports, "I went back to my office. I hadn't been in my office for five minutes when there was a knock on the door and Compton's assistant came in, telling me that he had just heard over the radio that President Roosevelt had died...

"So for a number of days I was at a complete loss for what to do," Szilard goes on. He needed a new avenue of approach. Eventually it occurred to him that a project as large as the Met Lab probably employed someone from Kansas City, Missouri, Harry Truman's original political base. He found a young mathematician named Albert Cahn who had worked for Kansas City boss Tom Pendergast's political machine to earn money for graduate school. Cahn and Szilard traveled to Kansas City later that month, dazzled Pendergast's hoodlum elite with who knows what Szilardian tale "and three days later we had an appointment at the White House."

Truman's appointments secretary, Matthew Connelly, barred the door. After he read the Einstein letter and the memorandum he relaxed. "I see now," Szilard remembers him saying, "this is a serious matter. At first I was a little suspicious, because the appointment came through Kansas City." Truman had guessed the subject of Szilard's concern. At the President's direction Connelly sent the wandering Hungarian to Spartansburg, South Carolina, to talk to a private citizen named Jimmy Byrnes [Truman adviser and soon-to-be Secretary of State].

A University of Chicago dean, a scientist named Walter Bartky, had accompanied Szilard to Washington. For added authority Szilard enlisted Nobel laureate Harold Urey and the three men boarded the overnight train south. Compartmentalization was working: "We did not quite understand why we were sent by the President to see James Byrnes...Was he to...be the man in charge of the uranium work after the war, or what? We did not know." Truman had alerted Byrnes that the delegation was on its way. The South Carolinian received it warily at his home. He read the letter from Einstein first - "I have much confidence in [Szilard's] judgment," the theoretician of relativity testified - then turned to the memorandum.

It was a prescient document. It argued that in preparing to test and then use atomic bombs the United States was "moving along a road leading to the destruction of the strong position [the nation] hitherto occupied in the world." Szilard was referring not to a moral advantage but to an industrial: as he wrote elsewhere that spring, U.S. military strength was "essentially due to the fact that the United States could outproduce every other country in heavy armaments." When other countries acquired nuclear weapons, as they would in "just a few years," that advantage would be lost: "Perhaps the greatest immediate danger which faces us is the probability that our 'demonstration' of atomic bombs will precipitate a race in the production of these devices between the United States and Russia."

Much of the rest of the memorandum asked the sort of questions the Interim Committee was also asking about international controls versus attempting to maintain an American monopoly. But Szilard echoed Bohr in pleading for what no one among the national leaders concerned with the problem seemed able to grasp, that "these decisions ought to be based not on the *present* evidence relating to atomic bombs, but rather on the situation which can be expected to confront us in this respect a few years from now." By present evidence the bombs were modest and the United States held them in monopoly; the difficulty was deciding what the future would bring. Szilard first offended Byrnes in his memorandum by concluding that "this situation can be

evaluated only by men who have first-hand knowledge of the facts involved, that is, by the small group of scientists who are actively engaged in this work." Having thus informed Byrnes that he thought him unqualified, Szilard then proceeded to tell him how his inadequacies might be corrected:

If there were in existence a small subcommittee of the Cabinet (having as its members the Secretary of War, either the Secretary of Commerce or the Secretary of the Interior, a representative of the State Department, and a representative of the President, acting as the secretary of the Committee), the scientists could then submit to such a committee their recommendations.

It was H. G. Wells' Open Conspiracy emerging again into the light; it amused Byrnes, a man who had climbed to the top across forty-five years of hard political service, not at all:

> 'Szilard complained that he and some of his associates did not know enough about the policy of the government with regard to the use of the bomb. He felt that scientists, including himself, should discuss the matter with the Cabinet, which I did not feel desirable. His general demeanor and his desire to participate in policy making made an unfavorable impression on me.'

Byrnes proceeded to demonstrate the dangers of a lack of firsthand knowledge, Szilard remembers:

"When I spoke of my concern that Russia might become an atomic power, and might become an atomic power soon, if we demonstrated the power of the bomb and if we used it against Japan, his reply was, 'General Groves tells me there is no uranium in Russia.'"

So Szilard explained to Byrnes what Groves, busy buying up the world supply of high-grade ore, apparently did not understand: that high-grade deposits are necessary for the extraction of so rare an element as radium but that low-grade ores, which undoubtedly existed in the Soviet Union, were entirely satisfactory where so abundant an element as uranium was concerned.

To Szilard's argument that using the atomic bomb, even testing the atomic bomb, would be unwise because it would disclose that the weapon existed, Byrnes took a turn at teaching the physicist a lesson in domestic politics:

"He said we had spent two billion dollars on developing the bomb, and Congress would want to know what we had got for the money spent. He said, 'How would you get Congress to appropriate money for atomic energy research if you do not show results for the money which has been spent already?'"

But Byrnes' most dangerous misunderstanding from Szilard's point of view was his reading of the Soviet Union:

> 'Byrnes thought that the war would be over in about six months... He was concerned about Russia's postwar behavior. Russian troops had moved into Hungary and Rumania, and Byrnes thought it would be very difficult to persuade Russia to withdraw her troops from these countries, that Russia might be more manageable if impressed by American military might, and that a demonstration of the bomb might impress Russia. I shared Byrnes' concern about Russia's throwing around her weight in the postwar period, but I was completely flabbergasted by the assumption that rattling the bomb

might make Russia more manageable.'

Shadowed by one of Groves' ubiquitous security agents, the three discouraged men caught the next train back to Washington.

Szilard reflects on his failure to prevent the use of atomic weapons on Japan

When Szilard returned to Washington from South Carolina he looked up Oppenheimer, just arrived in town for the Interim Committee meeting, to lobby him. So hard was the Los Alamos director working to complete the first atomic bombs that Groves had doubted two weeks earlier if he could break free for the May 31 meeting. Oppenheimer would not for the world have missed the chance to advise at so high a level. But his candid vision of the future of the weapon he was building was as unromantic as his understanding of its immediate necessity was, in Szilard's view, misinformed:

> 'I told Oppenheimer that I thought it would be a very serious mistake to use the bomb against the cities of Japan. Oppenheimer didn't share my view. He surprised me by starting the conversation by saying, "The atomic bomb is shit." "What do you mean by that?" I asked him. He said, "Well, this is a weapon which has no military significance. It will make a big bang - a very big bang - but it is not a weapon which is useful in war." He thought that it would be important, however, to inform the Russians that we had an atomic bomb and that we intended to use it against the cities of Japan, rather than taking them by surprise. This seemed reasonable to me... However, while this was necessary it was certainly not sufficient. "Well," Oppenheimer said, "don't you think that if we tell the Russians what we intend to do and then use the bomb in Japan, the Russians will understand it?" And I remember that I said, "They'll understand it only too well."'

[From an interview of Szilard in 1960:]

Q. *Dr. Szilard, what was your attitude in 1945 toward the question of dropping the atomic bomb on Japan?*

A. I opposed it with all my power, but I'm afraid not as effectively as I should have wished.

Q. *Did any other scientists feel the same way you did?*

A. Very many other scientists felt this way. This is particularly true of Oak Ridge and the Metallurgical Laboratory of the University of Chicago. I don't knowhow the scientists felt at Los Alamos.

Q. *At the Oak Ridge and Chicago branches of the A-bombproject, was there any division of opinion?*

A. I'll say this: Almost without exception, all the creative physicists had misgivings about the use of the bomb. I would not say the same about the chemists. The biologists felt very much as the physicists did.

Q. *When did your misgivings first arise?*

A. Well, I started to worry about the use of the bomb in the spring of '45. But misgivings about our way of conducting ourselves arose in Chicago when we first learned that we were using incendiary bombs on a large scale against the cities of Japan.

This, of course, was none of our responsibility. There was nothing we could do about it, but I do remember that my colleagues in the project were disturbed about it.

Q. *Do you feel that President Truman and those immediately below him gave full and conscientious study to all the alternatives to use of the atomic bomb?*

A. I do not think they did. They thought only in terms of our having to end the war by military means.

I don't think Japan would have surrendered unconditionally without the use of force. But there was no need to demand the unconditional surrender of Japan. If we had offered Japan the kind of peace treaty which we actually gave her, we could have had a negotiated peace.

Q. *In retrospect, do you think your views got a full hearing?*

A. Let me answer this by describing in detail just what kind of hearing my views got.

In March, 1945, I prepared a memorandum which was meant to be presented to President Roosevelt. This memorandum warned that the use of the bomb against the cities of Japan would start an atomic-arms race with Russia, and it raised the question whether avoiding such an arms race might not be more important than the short-term goal of knocking Japan out of the war. I was not certain that this memorandum would reach the President if I sent it "through channels." Therefore, I asked to see Mrs. Roosevelt, and I intended to transmit my memorandum through her - in a sealed envelope - to the President.

When Mrs. Roosevelt set the date for the interview which I had requested, I went to see Arthur H. Compton, who was in charge of the Chicago project. I rather expected him to object to the contents of my memorandum, and I was therefore much relieved when he told me that he hoped I would get the memorandum into the hands of the President and that it would receive the attention of the President. I then went back to my own office, and I hadn't been there for more than five minutes when there was a knock at the door and there stood Dr. Norman Hilberry. "We have just heard over the radio that President Roosevelt died," he said.

For a while I was at a loss to know how to bring my memorandum to President Truman's attention. I knew many people who knew Roosevelt, but President Truman didn't seem to move in the same circles. Then it occurred to me that we must have several men from Kansas City in the project and that some of these might know how to reach Truman.

When I was asked to go to the White House and see Matt Connelly, Truman's Appointments Secretary, I suggested to Walter Bartky, associate director of our project, that he accompany me. Mr. Connelly read my memorandum with attention. "I can see that this is serious business," he said. "Frankly, at first I was a little

suspicious because this appointment came through Kansas City." He told us that the President had an inkling of what our business might be and that he wanted us to go to Spartanburg and see James Byrnes. We didn't know why we were sent to see Byrnes, since at that point Byrnes held no Government position. We were quite willing to go, of course, and we asked for permission to take [atomic scientist] H. C. Urey along. On May 27 we took the night train to Spartanburg.

Q. *What happened then?*

A. Having read the memorandum, the first thing that Byrnes told us was that General Groves [head of the Manhattan District, which developed the A-bomb] had informed him that Russia had no uranium. Of course, if Russia did not have any uranium then she would not be able to participate in an atomic-arms race, but to me this seemed to be an exceedingly unlikely assumption. It was conceivable that Russia might have no high-grade uranium-ore deposits - deposits of pitchblende. The only known pitchblende deposit within the control of Russia was the deposit in Czechoslovakia, and this was not believed to be very extensive. But I found it difficult to believe that within the vast expanse of Russia there should be no low-grade uranium-ore deposits which could be used to obtain uranium for the production of bombs.

When I saw Mr. Byrnes I was very much concerned about the fact that no governmental policy had been developed on the issue of how to cope with the problem that the bomb would pose to the world. I raised the question of whether it might be wise to gain time for developing such a governmental policy by postponing the testing of the bomb. It seemed to me that once the bomb had been tested its existence could not be kept secret for long. Byrnes did not think that postponing the test was a good idea, and, in retrospect, I am inclined to agree with him. In retrospect, I don't think that postponing the test would have solved our problem.

Byrnes was concerned about Russia's having taken over Poland, Rumania and Hungary, and so was I. Byrnes thought that the possession of the bomb by America would render the Russians more manageable in Europe. I failed to see how sitting on a stockpile of bombs, which in the circumstances we could not possibly use, would have this effect, and I thought it even conceivable that it would have just the opposite effect.

When I returned to Chicago and learned that Byrnes had been appointed Secretary of State, I concluded that the arguments that I regarded as important would receive no consideration. I didn't realize at that time that Secretary Stimson would play a major role in the final decision and that he might be able to understand my point of view better than Mr. Byrnes had done.

In Chicago I collaborated in the writing of the so-called Franck Report. This report was addressed to Secretary Stimson, but none of those who participated in the writing of the report, including Prof. James Franck, had an opportunity to see Mr. Stimson.

In the meantime I drafted a petition to the President which did not go into any considerations of expediency but opposed, on purely moral grounds, the use of atomic bombs against the cities of Japan. This petition was signed by about 60 members of the Chicago project. Some of those who signed insisted that the petition be transmitted to the President through "official channels." To this I reluctantly agreed. I was, at this point, mainly concerned that the members of the project had an opportunity to go on record on this issue, and I didn't think that the petition would be likely to have an effect on the course of events. The petition was sent

to the President through official channels, and I should not be too surprised if it were discovered one of these days that it hadn't ever reached him.