Building Bombs, Talking Peace:
The Political Activity of Manhattan Project Physicists
Before Hiroshima

A Thesis

Presented to

The Division of History and Social Sciences

Reed College

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Arts

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May 1998

Acknowledgments

I'd like to thank the following people for helping me on this project, at Reed, and in life:

John Simpson, Lee Grodzins, and Patrick Catt for providing unpublished materials, electronic interviews, and permission to cite.

Norman Ramsey, Gerald Holton, and Philip and Phyllis Morrison for agreeing to lengthy personal interviews that (with any luck) helped me to adopt an historical perspective.

Ed Segel for providing guidance and a healthy dose of realism when needed.

Daniel Freund, Margarita Seldera, and the boys of 4225 SE 15th for demanding personal and academic integrity, sharing friendship, and not getting evicted until the end of the 1997-1998 school year.

John Lin, Sarah Saalfield, Brad Samuels, Andrew Thompson, and Adam Maloof for composing the generalized other.

And, finally, my mom (Carol Grodzins) and dad (Paul Horowitz) for providing me with support, advice, encouragement, and freedom. I love you.

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Abstract

This thesis is a history of the political activity of Manhattan Project physicists before the bombing of Hiroshima. It is a case-study of how physicists function in political worlds, a pre-history of the scientists' postwar movement, and an examination of a critical period when physicists redefined their relation to society and their responsibilities as scientist-citizens.

By building the nuclear bomb, physicists brought scientific discovery into contact with technological invention and thereby transgressed the bounds of scientific purity. Attempting to shape the postwar implications of their invention, the physicists themselves entered the political realm to advocate the need for international unification, atomic control, and a ban on war. The physicists acknowledged that science would play a more central role in the structure of society, and many decided that the culture of science had to make accommodating changes by taking responsibility for the practical results of laboratory exploration. The physicists' political arguments, however, were rooted in the ethos of science and therefore inapplicable to national governance and international diplomacy. Furthermore, the physicists' attempt to "scientize" politics invited the reciprocal action wherein science was "politicized": military-political administrators regimented, funded, and directed "free" scientific exploration. Manhattan Project physicists were made suspects of indiscretion because the scientific tenets of internationalism and free exchange of information seemed disloyal in the 1940s.

The unprecedented case of the Manhattan Project physicists' political activity before Hiroshima highlights both the capacity of scientists to assume social responsibility for science and the limitations of their profession in the political realm. In doing so, it explains how the notion of scientific purity was transformed, how the practice of physicists has changed over time, and where these two elements may go in the future.

Introduction

> We now know that in atoms of matter there exists a store of energy incomparably more abundant and powerful than any over which we have thus far obtained control. With a pound weight of this radioactive substance we will get as much energy as we now obtain from 150 tons of coal. Or another pound weight can be made to do the work of 150 tons of dynamite.
>
> One hundred and fifty tons of dynamite - enough to blow a modern city into oblivion - compressed to a pound weight which might be held in the hand! No wonder that a sober-thinking scientist like Professor Frederick Soddy of Oxford University should write: 'I trust this discovery will not be made until it is clearly understood what is involved.' 'And yet,' he goes on to say, 'it is a discovery that is sooner or later bound to come. Conceivably it might be made to-morrow.'
>
> -Raymond Fosdick, 1929[1]

Here Raymond Fosdick posed the paradox where an unstoppable science challenged the capacity for restraint of a static society. He and Professor Soddy were both worried about what kind of world would receive this atomic weapon that was bound to appear. Because nuclear weapons were first created in the midst of World War II, it was impossible for most contemporaries to consider the issues at stake. Manhattan Project security demanded that the bomb be kept secret from the American public, and consequently very few people could deter or influence the invention. Those political and military leaders who could have spoken out were never inclined to do so because it was their job to win the war. Therefore, the only people who remained to question the social, moral, and political implications of the atomic bomb were the scientists who invented it. The World War II manifestation of Fosdick's dilemma calls for an examination of the political activity of Manhattan Project physicists before Hiroshima.

The problem was, however, more complicated. When physicists met with politics, their conception of scientific purity was challenged. Pure science had traditionally been defined in terms of detachment from the rest of societal affairs. In order to protect their

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[1]Raymond B. Fosdick, *The Old Savage in the New Civilization* (New York: Doubleday, Duran & Company, 1929), 23-24

autonomous right to free investigation, scientists found it prudent to "insist that scientific knowledge is strictly objective and neutral, and that the professional work of scientists... is of no particular political significance."[2] Therefore, simply practicing explicitly political or military work was inconceivable to physicists in the late 1930s. For example, Joseph Rotblat writes that in 1939

> The thought that I myself would [build an atom bomb] did not cross my mind, because it was completely alien to me. At that time my life was centered on doing 'pure' research work.... The notion of utilizing my knowledge to produce an awesome weapon of destruction was abhorrent to me.

Certain forces could, however, lead scientists into political realms: when Germany invaded Poland, asserts Rotblat, it seemed "the whole of our civilization was in mortal peril. My scruples were finally overcome."[3] When scientists finally enlisted in political-military projects, they were faced with the choice of whether or not to help define the project itself. That is, should scientists serve as tools of the state, or should they also help to direct its political objectives? Once again, the traditional role of the physicist prescribed a compartmentalized, detached position: many argued that "By mixing the two [politics and profession] you will dilute your effectiveness as an objective scientific observer. It is also claimed that this mixing-in of politics will dilute or destroy the 'holiness' of science."[4]

With the Manhattan Project, however, many physicists would redefine purity and thereby their relation to society. J.H. Rush reflected in 1947, "Science had become politically interesting, and scientists had become interested in politics."[5] On the one hand, the physicists were dedicated to their project and to helping the United States win the war. On the other hand, they had grave doubts about the effects their work would have on the

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[2]John Ziman, "Basic Principles," in Joseph Rotblat, *Scientists, the Arms Race and Disarmament: A UNESCO/Pugwash Symposium* (London: Taylor & Francis Press, 1982), 172

[3]Joseph Rotblat, "Leaving the Bomb Project," *The Bulletin of Atomic Scientists*, 41 (August, 1985): 17

[4]Charles Schwartz, "Professional Organization," in Martin Brown, *The Social Responsibility of the Scientist* (New York: Free Press, 1971), 33

[5]In Alice Kimball Smith, *A Peril and A Hope: The Scientists' Movement in America, 1945-47* (Cambridge: The MIT Press, 1970), title page

postwar world. This conflict forced the scientists to take opposing positions as professionals and citizens:

> When its eager inventors confront the bomb's incredible destructiveness, they recoil. Albert Einstein gropes for the right English words to urge the President to make a Uranium bomb, then, years afterward, disowns the creation in disgust. Danish physicist Niels Bohr travels across the Atlantic to enlist the aid of scientists, only later to repeat the journey with dark prophecies of an arms race. J. Robert Oppenheimer drives himself to exhaustion to solve the puzzle of how to sustain an explosive nuclear reaction. Yet as he watches the first atomic fireball rise from the New Mexican desert, he thinks only of death and destruction.[6]

This internal conflict led the physicists to build bombs while talking peace. Having committed themselves to building a nuclear weapon, the scientists advocated using it to establish an international organization to control the atom and prevent future wars.

Science collided with politics because of World War II. The Manhattan Project physicists then assumed political roles because their perceived duties and legitimacies overcame the inertia of scientific detachment. Purity was redefined as involvement in, not separation from, the worldly implications of scientific discoveries. Their involvement was, however, ineffective because scientific and political obligations were irreconcilable when it came to wartime demands. That is, the physicists' political arguments and assumptions were largely the result of their scientific baggage. In the early 1940s scientific tenets of international cooperation and free exchange of information aroused suspicions of disloyalty. Consequently, the physicists' romp in the political realm took a toll on the principles and practices of science. As the physicists fought to "scientize" politics, government and military officials gradually appropriated what was considered to be the once-pure profession of physics and subjected it to political concerns. When science and politics collided in the Manhattan Project, both had their destinies changed, and neither

[6]Jonathon Fanton et al., *The Manhattan Project: A Documentary Introduction to the Atomic Age* (Philadelphia: Temple University Press, 1991), xix

was particularly pleased. The unprecedented political efforts of Manhattan Project physicists could not stop Soddy's nightmare from coming true.

Why is this worth studying? First, it fills a gap in the momentous history of the Manhattan Project. Physically, the project "cost over $2 billion, required the construction and use of thirty-seven installations in nineteen states and Canada, employed approximately 120,000 persons, and absorbed a large proportion of the nation's scientific and engineering talent."[7] It promised in the revolutionary tradition of alchemy that "1kg of 25 [fissionable material] 20000 tons of TNT." [8] Finally, the physicists were faced with a new task: exploration was no longer the end but rather the means to an end. The first line of The Los Alamos Primer (an "indoctrination course" for new recruits) read, "The object of the project is to produce a practical military weapon in the form of a bomb...."[9]

Second, the Manhattan Project represented a watershed in the relationship between physics and politics. During World War I, Thomas Edison suggested "to the Navy that it should bring into the war effort at least *one* physicist in case it became necessary to 'calculate something.'"[10] With World War II, however, physics was acknowledged to have worldly implications. Wrote John Simpson, "Scientists saw the successful application of basic principles result in violent success during the war. The effects of science on our society could no longer be ignored."[11] Science could consequently be made to serve political ends. "Never again would or could a government relegate the scientist to a secondary position," asserts Robert Gilpin, "[because] science research had become a

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[7]Martin Sherwin, *A World Destroyed: The Atomic Bomb and the Grand Alliance* (New York: Alfred A. Knopf, 1975), 42

[8]E.U. Condon, "The Los Alamos Primer," TMs (photocopy), 1943, 1

[9]Ibid.

[10]Robert Gilpin, *American Scientists and Nuclear Weapons Policy* (Princeton: Princeton University Press, 1987), 10

[11]John Simpson, "The Scientists as Public Educators: A Two Year Summary," *The Bulletin of Atomic Scientists*, (September, 1947): 243

major element in national power."[12] Scientific contributions to international warfare redefined both worlds and bound them together for the future. The relationship between science and state, asserts Martin Sherwin, "became tied to the political and national defense issues generated by the cold war. As a result, the boundary between science and politics blurred...."[13] Finally, the physicists became experts. Richard Feynman commented,

> After the war, physicists were often asked to go to Washington and give advice to various sections of the government, especially the military. What happened, I suppose, is that since the scientists had made these bombs that were so important, the military felt we were useful for something.[14]

Third, the Manhattan Project represented a watershed in the relationship between *scientists* and politics. By explaining how the legacy of the socially-responsible scientist was born during the years 1939-1945 this thesis distinguishes itself from the larger body of historiography. Many historians have attempted to minimize the wartime development of the physicists' new mentality in order to accentuate the novelty of their postwar activism. For example, Paul Boyer writes, "The most striking feature of the postwar scientists' movement was its sudden and spontaneous emergence."[15] There is, however, much evidence that the postwar movement was neither spontaneous nor sudden. During the war, Phyllis Morisson commented, "You had a lot of political laying out of ideas... and I would say they spoke with a lot of forthrightness and a sense of confidence that they had something to say. Now, I don't think that ever went away."[16] Those historians who

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[12]In Joseph Rotblat, "Movements of Scientists Against the Arms Race," in Rotblat, 83

[13]Sherwin, *A World Destroyed*, xxv

[14]Richard Feynman, *Surely You're Joking, Mr. Feynman!* (New York: WW Norton, 1985), 288. Nuclear bombs no doubt played a crucial role in the physicists' elevated status after World War II. The bombs, however, only ended the war. As Gerald Holton commented, "What really won the war was radar. It was radar and the proximity fuse and above all, because it is so forgotten, synthetic rubber, without which the war could not be pursued. As a result of these successes in essentially technology the scientists and engineers had a completely different status." Gerald Holton, interview with author, 31 December 1997, Cambridge, MA

[15]Paul Boyer, *By the Bomb's Early Light: American Thought and Culture at the Dawn of the Atomic Age* (Chapel Hill: The University of North Carolina Press, 1985), 50

[16]Phyllis Morisson, interview with author, 6 January 1998, Cambridge, MA

acknowledge that the culture of science was revolutionized rarely examine how it did so. This thesis *investigates* the period before Hiroshima: "The nascence of that moral and political consciousness during which the major issues were defined in the terms which would dominate scientists' political activity during the immediate postwar years."[17] This thesis goes beyond the *assertion* that "virtually all of the basic ideas associated with nuclear weapons today... derive from attitudes, assumptions, and expectations formulated during the war..."[18] to *explain* the development of a new mentality with its own language to discuss these revolutionary weapons. The past clearly informs the present and an understanding of the birth of the scientist-citizen promises to help interpret the behavior of scientists today. As Donald Strickland has argued, "It behooves us... to think about scientists as social and political creatures."[19]

Finally, the past needs to be told historically: that is, prospectively and not retrospectively. According to Bernard Bailyn, good history "does not violate the texture of the past, [it] does not telescope past and present. The task is to look at these issues in their own context."[20] For recent history, in this case two generations past, this is especially important, because most "common knowledge" takes the form of memory derived from tales. There is always a need to unveil myths and to reinterpret the past. For example, Herbert York discovered when talking to younger audiences,

> A very wide gap separates us. The first thing most of my listeners learned about World War II is that we won it. That is, so to speak, the last thing I learned about it. The first thing they learned about the atomic bomb is that we dropped one on Hiroshima and another on Nagasaki. That is the last

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[17]Martha Kessler, "The Development of Moral and Political Consciousness in the Physical Scientists' Community as Reflected in *The Bulletin of Atomic Scientists*" (MA thesis, University of Oklahoma, 1970), 8

[18]Sherwin, *A World Destroyed*, xv. Historian Alice Smith agreed, "many concepts and ideas, germinated there, have since appeared as potent forces in the world scene." Alice Kimball Smith, "Behind the Decision to Use the Atomic Bomb: Chicago 1944-45," *The Bulletin of Atomic Scientists*, 14 (1958): 288

[19]Donald Strickland, *Scientists in Politics: The Atomic Scientists' Movement, 1945-46* (Lafayette: Purdue University Studies, 1968), 137

[20]Bernard Bailyn, *On the Teaching and Writing of History* (Hanover: University Press of New England, 1994), 42

> thing I learned about the project. For most people born after 1940, those events marked the beginning of the nuclear arms race with the Soviets. For those of us in the project, they heralded the end of history's bloodiest war.[21]

To avoid these pitfalls, this paper consults primary documents whenever possible and in some cases goes directly to the Manhattan Project physicists themselves.

While history is a narrative of how past became present, it is never definitive for the simple reason that new generations must constantly re-form where they came from. Contemporary circumstances inform the historians' questions and therefore develop knowledge of past and self. History, like science and politics, is constantly changing.

[21]Herbert York, *Making Weapons, Talking Peace: A Physicists' Odyssey from Hiroshima to Geneva* (New York: Basic Books, 1987), 22

Chapter One: Science Meets Politics

This first chapter recounts the meeting of physicists and politics in the early 1940s. Essentially, it is a tale of innocence lost. The coming of age of a "pure" science coincided with the escalation of tremendous international hostilities, and the two developments were bound to collide. Beginning with an examination of scientific purity, this narrative describes the foundation of the Manhattan Project, the physicists' debate over personal involvement, and the unprecedented activism of scientists in political issues of their own creation. Between August 2, 1939 and August 6, 1945, the physicists of the Manhattan Project redefined their relationship with society.

Physicist John Ziman asserts,

> The basic principle of [science] is that the pursuit of knowledge is the most worthy of all human activities. Simply to acquire knowledge is an end in itself. This doctrine is usually expressed in the form: research should be undertaken for its own sake. That is to say, science is disconnected from all other human activities or concerns and has significance only in and for itself.[22]

However, throughout history science has been plagued with religious and political pressure and even persecution. The intrusion of such "irrelevant" social institutions, the scientists believed, threatened the right to free inquiry and was wholly inconsistent with the methods of science. If those institutions did not set an agenda for science or abuse the scientists' discoveries through application, they introduced an unwanted bias into an objective exploration. Consequently, scientists have agreed to maintain a wall separating the laboratory from worldly affairs in order to protect the purity of their profession against outside forces. As a side effect, this wall that has kept worldly pressures out of the scientific realm has also served to keep scientists out of the worldly realm. Though it was intended to protect science, it has effectively silenced the political opinions of its

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[22]John Ziman, "Basic Principles," in Joseph Rotblat, *Scientists, the Arms Race and Disarmament* (London: Taylor & Francis, 1982), 163

practitioners. As historian of science Patrick Catt has argued, an attitude has been fostered that "the best way to ruin the effectiveness or integrity of [the scientific profession] is to have it get involved in public questions where it has no special expertise."[23] Scientists, who are free to develop political consciousness and opinions, are perceived as impure if they connect their profession with national affairs. This sense of scientific purity can, however, lead to elitist beliefs:

> The peculiarity of science is that the principles which are used to excuse social irresponsibility have been elevated into a more or less coherent ideology. This ideology...[,] by setting science itself above all other human values[,] has a powerful influence within the psyche of every scientist and in society as a whole.[24]

This wall, based on ethos and historical experience, acts to ensure scientific purity; it purges both professional knowledge and the physicists themselves of subjective elements by restricting interaction between the scientific and the worldly. Political scientist Donald Strickland asserts,

> The prevalent attitude of scientists as a group has been that they should not *as scientists* become politically engaged. The purists tend to think that *good* scientists *are not* political activists and that those who do become active are temporarily indulging an idiosyncratic personal need.[25]

This attitude is evident in the life of J. Robert Oppenheimer, wartime director in Los Alamos, New Mexico. In the first half of the twentieth century, Oppenheimer "never read a newspaper or a current magazine...; I had no radio, no television; I learned of the stock market crack in the fall of 1929 only long after the event; the first time I ever voted was in the presidential election of 1936."[26] Shortly after World War II, he wrote, "I was deeply interested in my science, but I had no understanding of the relations of man to his

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[23]Patrick Catt, "Putting the Social into the American Physical Society: The Creation of the Forum on Physics and Society, 1967-1972," TMs (photocopy), 1996, 3

[24]Ziman, 162

[25]Donald Strickland, *Scientists in Politics: The Atomic Scientists' Movement, 1945-46* (Lafayette: Purdue University Studies, 1968), 78

[26]In R.W. Reid, *Tongues of Conscience: War and the Scientists' Dilemma* (London: Readers Union Constable, 1970), 170

society."[27] This wall that isolated Oppenheimer would be challenged by the events surrounding and flowing throughout the Manhattan Project. Here science became so unambiguously political that the physicists themselves became liaisons between the two realms. Here many physicists perceived such unprecedented duties and legitimacy to act that they overcame the inertia of scientific purity.

Manhattan Project Origins

The great nuclear physicists of the early twentieth century formed a tight community. While making unprecedented progress in revealing the secrets of the atom, they remained part of a relatively small field of science. This community reflected science as it existed ninety years ago. As Richard Rhodes has asserted, "Science grew out of the craft tradition... retain[ing] an informal system of mastery and apprenticeship. This informal collegiality partly explains the feeling among scientists of Szilard's generation [born 1898] of membership in an exclusive group...."[28] In the 1920s the epicenter of this community was Germany and the universities at Berlin and Göttingen. Here the apprenticeship system created a dynasty of great physicists: J. Robert Oppenheimer, Edward Teller, Eugene Rabinowitch, Leo Szilard, along with Nobel Laureates Max Born, James Franck, Werner Heisenberg, Max von Laue, Enrico Fermi, Albert Einstein, Niels Bohr, Hans Bethe, and Eugene Wigner. Connected by locale, friendship, and profession, these men formed a web of connections that would sustain their community when it was threatened in the 1930s and 1940s. (For example, Oppenheimer, who would later instruct Philip Morrison, worked with Bohr, who was teaching Teller, whose fellow Hungarian Szilard met Wigner in 1921 while studying under Einstein, von Laue, and Planck in Berlin.)

When Hitler assumed control of Germany, the scientists could no longer maintain their wall. Those physicists who were Jewish were thrown out of the universities, and those

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[27]In Jonathan Fanton et. al., *The Manhattan Project: A Documentary Introduction to the Atomic Age* (Philadelphia: Temple University Press, 1991), 3

[28]Richard Rhodes, *The Making of the Atomic Bomb* (NY: Simon and Schuster, 1986), 16

who could remain were forced to submit to state control.[29] No longer steering "their" science, the physicists fled Germany for other parts of Europe and, when Europe became embroiled in the World War, the United States.

Meanwhile the scientists were unlocking the secrets of the atom's nucleus. In September 1933 Szilard had a vision of a nuclear chain reaction. The scientific investigation of this possible natural phenomenon, developing within the context of a world at war and a Hitler in Germany, soon assumed political implications. When in January 1939 at a conference on low temperature physics, Niels Bohr delivered a lecture on splitting the nucleus of uranium, he aroused the concern of numerous conscientious scientists. Leo Szilard, "obviously concerned, took [Edward Teller] aside," and said, "Let's be careful. Let's not talk about this too much." Teller agreed and "concentrated on returning the conference to the subject of low temperatures."[30] Szilard, Teller and others were aware that, given the capabilities of German physics and the inclinations of Hitler, the world might be endangered by scientific discovery. Consequently, a number of scientists informally agreed to a ban on all publishing related to nuclear investigation.[31]

Armed with a knowledge of nuclear capabilities and urged by a fear of Hitler's Germany, the scientists decided it was not enough to keep a lid on their secret; they had to provide the advantage to the United States. Political reality had forced the scientists into an uncomfortable position where they had to break through their own wall of isolation. Yet the choice was clear:

> The certainty that German scientists were working on this weapon and that their government would certainly have no scruples against using it when available was the main motivation of the initiative which American

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[29]In the 1930s, Jews constituted only one percent of the German population but occupied twelve percent of the professorships. The Nazi "Cleansing of the Civil Service" decree dismissed almost forty percent of all university professors and sixteen Nobel Laureates. Writes Lawrence Badash, "the list read like a 'who's who' of learning. Never in history has a country tried so hard to export its brains." Lawrence Badash, *Scientists and the Development of Nuclear Weapons: From Fission to the Limited Test Ban Treaty, 1939-1963* (New Jersey: Humanities Press, 1995), 12

[30]In Edward Teller's *The Legacy of Hiroshima* (NY: Doubleday and Co. Inc., 1962), 9

[31]This ban met with only partial success. It will be discussed in chapter 3.

> scientists took in urging the development of nuclear power for military purposes on a large scale in this country.[32]

Scientists like Leo Szilard recognized that the wall was wearing thin:

> On March 3, 1939, Dr. Walter Zinn and I performed a simple experiment at Columbia University. When we saw the neutrons which came off in the fission process of uranium, there was little doubt in my mind that the world was headed for trouble.[33]

As the wall broke down, the scientists realized that when they entered the realm of political weaponry, they would have to check their ethos of non-involvement at the door. Finally, on August 2, 1939, science collided with politics. Leo Szilard approached Albert Einstein to ask if he would use his considerable clout to introduce Szilard to President Roosevelt. The ensuing memoranda and conferences eventually resulted in the formation of the Manhattan Project. In a sense, the scientists were so afraid of the implications of their investigations that they decided, in an unprecedented move, to take political responsibility for them.

Science Approaches Politics

Although the approach to politics and weaponry was easy for Szilard, it was a tougher choice for others. While working at Berkeley, a bastion of isolationism in the late 1930s, physicist Robert Wilson vowed to keep *his* science pure. However, upon moving to Princeton and hearing the refugee scientists talk of their experiences with Nazism and watching the British physicists leave for active duty in Europe, Wilson changed his mind. In the early 1940s he worked at MIT on the development of radar, and soon he was convinced to join the A-Bomb project.[34] It is critical to note, however, that the scientists who joined the Project used peculiarly unscientific reasoning to justify their decisions.

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[32]James Franck et al., "A Report to the Secretary of War," in Morton Grodzins and Eugene Rabinowitch, *The Atomic Age: Scientists in National and World Affairs* (New York: Basic Books, 1963), 20

[33]Leo Szilard, "The Physicist Invades Politics," *The Saturday Review of Literature*, (May 3, 1947): 7-8

[34]Robert Wilson, "The Conscience of a Scientist," in Richard Lewis et al., *Alamogordo Plus Twenty-Five Years* (New York: The Viking Press, 1970), 67-69

Edward Teller, a physicist who initially harbored deep resentment against applying science to weaponry, was convinced by Roosevelt's speech delivered on May 11, 1940, the day after Germany invaded the Netherlands. In the speech, Teller reports, Roosevelt said, "The duty of scientists was to see that the most effective weapons would be available for use if necessary, that we would stand morally guilty before the free world if we refused to lend our talents to the cause of the free world." Despite the fact that Teller "considered any political speech a waste of time,"

> President Roosevelt's talk answered my last doubts. I left the meeting feeling I was committed to do whatever I could regardless of the ultimate consequences to help provide the instruments of strength for the defense of freedom. So it was that I felt no qualms of personal conscience about my work on the atomic bomb. My moral decision had been made in 1941. That was the year I joined the effort to produce an atomic bomb.[35]

Political exhortations and appeals to patriotism, elements that the wall of science should have held at bay, were convincing the nuclear physicists that they had a duty to act as citizens (though many were not) of a nation at war. The consensus among the scientists was that Hitler was an unprecedented threat to civilization. One physicist wrote, "With Hitler on the rise, we scientists no longer can be frivolous. We cannot play around with ideas and theories. We must go to work."[36] This fear was the impetus that spurred scientists into politically-motivated weapons research.

While the nuclear physicists were certainly lending their scientific expertise to a political cause, they were by no means becoming politically active themselves. They had a talent that could help end a war, and they vowed to support the United States. It is critical to acknowledge, as has Manhattan Project physicist Philip Morrison, that the militarization of science "was part of the whole country's change: you couldn't have managed without high priorities... without some military purpose."[37] More than scientists

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[35]Teller, *Legacy*, 13

[36]Anonymous Russian scientist quoted in ibid., 8

[37]Philip Morrison, interview with the author, 6 January 1998, Cambridge, MA.

or politicians, the physicists were acting as citizens, something they had been hesitant to do in the past. Indeed, during these years many of the émigré scientists became U.S. citizens: Eugene Wigner in 1937, Albert Einstein in 1940, Hans Bethe and Edward Teller in 1941, and Enrico Fermi in 1944. This understanding of physicists acting as citizens (with democratic duties) as well as scientists will help to explain much of what happened between 1942 and 1945.

Still, the question of science in the Manhattan Project remains. That is, did the physicists maintain some semblance of scientific "purity," or were they corrupted inventors interested only in the technical application of scientific discoveries? Donald Strickland has argued that "the Manhattan Project was essentially engineering rather than science."[38] As evidence he cites the teleological nature of the Project and the considerable technical difficulties that occupied much of the scientists' time. However, this is an inadequate answer. Before the Project began, the physicists were unsure if a nuclear chain reaction could even be sustained, and much investigation remained. A more satisfying explanation is that the Project represented a collapse of the distinction between science and technological application. If application of science was something that occurred in the political, social, or military world, it was nevertheless supposed to be kept separate from what occurred in the scientific world. Physicist John Simpson has asserted that, until the Manhattan Project, "scientists were generally isolated by an extended time interval lying between their direct contributions in science and the applications of their contributions." Therefore, by the time a scientific discovery was applied, the discoverer had moved on to other things and was not available to lend comment, assume responsibility, or provide guidance. With the Manhattan Project, however, the "scientists along with others carried on the research through to the final application."[39] Because of overwhelming world

[38]Strickland, 142

[39]John Simpson, "The Scientists as Public Educators," *The Bulletin of the Atomic Scientists*, (September 1947): 243

affairs, the physicists had agreed to break that wall and bring the possibilities of their science to fruition.[40]

Physicist Louis Ridenour once wrote,

> By definition, science consists of a completely open minded probing into the unknown. The inventor or the engineer knows the goal of his work; the scientist has no goal but truth. This essential unknowability of the practical ends of scientific investigation makes it senseless to speak, as some do of 'the planning of science for human betterment.' We can plan science only to the extent of turning it on or off.[41]

The somewhat elitist definition of scientific "purity" contained in this statement would be questioned during the Manhattan Project. Fully conscious of the goal it would serve, the physicists had turned science on. They had brought science into contact with politics, and they would soon make such contact themselves.

Despite making professional contributions to the war effort, the physicists had not otherwise become directly involved in the issues at hand. Perhaps in reaction to their own professional activity the scientists initially avoided the implications of their project by hiding themselves in, or allowing themselves to be drowned by, the Project's militaristic compartmentalization and heavy workload. With the bureaucratization of this scientific project, the physicists lost their traditional right for free exchange of information. This compartmentalization meant that an individual interested in questioning the overall direction and implications of the Project would have to exert enormous effort to fit the pieces together against the will of the military and administrative leadership. The overwhelming workload, however, kept any one scientist from taking such initiative. The environment of secrecy and practical urgency demanded that the scientists regulate their

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[40]It is important to note that science had been militarized before: "World War I was in some senses the chemists' war, fought in the laboratories that were developing poison gas and high explosives. World War II was the physicists' war, shaped by radar, sonar, aerodynamics, the internal combustion engine, and communications." Alex Roland, "Hephaestus and History: Scientists, Engineers, and War in Western Experience," in Carl Mitcham and Philip Siekevitz eds., *Ethical issues Associated with Scientific and Technological Research for the Military* (New York: The New York Academy of Sciences, 1989), 56

[41]Louis Ridenour, "The Scientist Fights for Peace," *Atlantic Monthly*, (May 1947): 81

strongest capacity: that of asking questions. As historian Alice Kimball Smith has put it, the physicists were caught in a paradigm of scientific momentum where all their energies were put to the task at hand. This view is supported by numerous comments such as one from Los Alamos physicist Richard Feynman:

> You see, what happened to me - what happened to the rest of us - is we *started* for a good reason, then you're working very hard to accomplish something and it's a pleasure, it's excitement. And you stop thinking, you know; you just *stop*.[42]

Similar comments have been made by scientists from the various Project sites. Harold Urey said there was little political concern at Columbia, and John Simpson noted the same at Hanford and Oak Ridge.[43] However, the lack of interest in the implications of the bomb at Los Alamos is striking because, as the site where the "gadget" was being constructed and the Project's goal would be realized, more concern would be expected. On the contrary, notes Smith, "A few suggest that there was even some half-conscious closing of the mind to anything beyond the fact that they were trying desperately to produce a device which would end the war."[44]

However, most evidence does not point to a "closing of the mind" but rather an unavoidable absence of consideration. Physicist Robert Wilson attributes the lack of involvement to the high-paced environment:

> Once caught up in such a mass effort, one does not debate at every moment, Hamlet-fashion, its moral basis. The speed and interest of the technical developments, the fascinating interplay of brilliant personalities, the rapidly changing world situation outside our gates - all this worked only to involve us more deeply, more completely in what appeared to be an unquestionably good cause.[45]

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[42]Richard Feynman, *"Surely You're Joking, Mr. Feynman!"* ed. Edward Hutchings (New York: WW Norton, 1985), 137

[43]Smith, *A Peril and Hope,* 60

[44]Alice Kimball Smith, "Behind the Decision to Use the Atomic Bomb: Chicago 1944-45," *The Bulletin of the Atomic Scientists,* (Vol. 14, 1958): 310

[45]Wilson, 71

Indeed, for all the scientists this was the chance of a lifetime. The excitement of working on a fascinating scientific problem with the best minds in physics under wraps of secrecy with the chance to end a world war must have had a special effect on the younger scientists. Therefore, at a site like Los Alamos, where the average age of the scientists in 1945 was twenty-nine (the median was twenty-seven),[46] and where many of the outstanding physicists had been invited following recommendation by their academic mentors, the likelihood of dissent was slim at best.

Whatever the reasons, the scientists, save those in Chicago, were hesitant to question the Project even when given reason to. In May 1945, with the surrender of Germany, no disturbance in allegiance to the Manhattan Project was noted in Los Alamos. Given the fact that most scientists signed up for the Project in order to help beat Hitler, this is a peculiar observation. For Robert Wilson, the thought of resigning never arose:

> Surely, it seems that among those hundreds of scientists at Los Alamos it might have been expected that at least one would have left. I regret now that I did not do so. [However] we were at the climax of the project.... Every faculty, every thought, every effort was directed toward making that a success.[47]

There is even evidence that consideration of long-term implications was precluded by a trance-like dedication to the Project. To a certain degree, this is to be expected. These were, after all, scientists who had maintained a distance from political activity for most of their lives. Leo Szilard said of his fellow émigré physicist, "[Enrico] Fermi is a genuine scientist.... There is no greater praise I could bestow on anyone. The struggles of our times do not affect him very much and he is no fighter."[48] Evidence of the traditional scientific mentality can thus be found. But something more than mentality was at play here. The physicists were so intent on the Project that they became robot-like. Frank

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[46]Alice Kimball Smith, "Los Alamos: Focus of an Age" in Richard Lewis et al., *Alamogordo Plus Twenty-Five Years*, 34

[47]Wilson, 72-73

[48]Leo Szilard, *Leo Szilard: His Version of the Facts*, ed. Spencer Weart and Gertrud Weiss Szilard, (Cambridge: The MIT Press, 1978), 146

Oppenheimer (the director's brother) commented, "When VE day came along, nobody slowed up one bit.... We all kept working. And it wasn't because we understood the significance against Japan. It was because the machinery had caught us in its trap and we were anxious to get this thing to go." Likewise, Robert Wilson said that despite Germany's defeat, the thought of leaving "simply was not in the air... at the time, it just was not...part of our lives. Our life was directed to do just one thing. It was as though we had been programmed to do that, and we as automatons were doing it."[49] Paradoxically, the Project may have been so overwhelmingly important that the scientists could not detach and distance themselves from it to raise broader concerns. Physicist Freeman Dyson commented, "I have felt it myself, the glitter of nuclear weapons. It is irresistible if you come to them as a scientist."[50]

Reflecting on their days at Los Alamos, many Project administrators, perhaps in an attempt to hand off responsibility for the destruction of Hiroshima, depict the scientists as men without conscience. General Eaker, for example, commented, "Scientists are a lot like military men. They were challenged to a task and they went about it." Motivated by notions of patriotism and urgency, the scientists dedicated themselves to one job. "Scientists," wrote Eaker, "became so preoccupied with techniques of fighting the war that they did not ponder the ethics of their actions."[51] Some historians have taken these statements at face value and viewed them as representative of the Manhattan Project physicists as a group. Ronald Schaffer, for example, argues, "War scientists exhibited the kind of deference to higher authority that soldiers [do], subordinating to the national interest any qualms they might have had about the work they were doing."[52] However, as the evidence to be presented will show, such a view is untenable. Many physicists

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[49]Ronald Schaffer, *Wings of Judgment: American Bombing in World War II* (New York: Oxford University Press, 1985), 156

[50]Ibid., 157

[51]Ibid., 155

[52]Ibid., 157

eventually followed their scientific contributions into the political realm and made their voices heard.

Scientists Approach Politics

The scientists who took an interest in the implications of their work and did not repress any qualms they might have had fall into three categories: one group that *decided* it was not the scientists' duty to ask questions or intervene in matters they knew little about; a second group that was intent on asking questions in order to educate themselves, but who felt that scientists had no right to offer suggestions; and a third group that believed it was necessary to ask questions and that scientists were able and bound as citizens to provide input for decision-making.

The first group was quite small and may have included different scientists during the years 1939-1945. They gave two primary reasons explaining their non-involvement: hopelessness and inappropriateness. Explaining his inactivity to Leo Szilard, Edward Teller wrote in July 1945, "I have no hope of clearing my conscience. The things we are working on are so terrible that no amount of protestations or fiddling with politics will save our souls." Excusing himself from taking any action, Teller continued, "The accident that we worked out this dreadful thing should not give us the responsibility of having a voice in how it is to be used."[53] Putting faith in the specialization of official roles, other scientists simply "felt the leaders were reasonable and intelligent people, and would make responsible decisions."[54] Decision-making was the job of statesmen, the scientists' job was building a bomb. Finally, some émigré scientists were hesitant to become activists in a foreign land.

The second group, those who wanted to be informed of developments of government thinking, was also relatively small. At Los Alamos, for example, Frank Oppenheimer had

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[53]In Szilard, *Facts*, 208

[54]Lawrence Wittner, *One World or None: A History of the World Nuclear Disarmament Movement Through 1953* (Stanford: Stanford University Press, 1993), 29

a few conversations about the possibility of sparing civilians by arranging a demonstration of the bomb. In the same vein, physicist Oswald Brewster asserted that the bomb was something that should never be permitted on earth.[55] However, this group never went beyond raising consciousness. Robert Wilson wrote that the Los Alamos scientists had at most only "the verisimilitude of high moral purpose." He himself went only so far as to organize an educational meeting on "the impact of the Gadget on Civilization."[56]

The third group, however, was motivated to ask questions about the use and implications of the atomic bomb *and* struggled to offer input on political decision-making. This group, a distinct minority of Manhattan Project scientists, was located almost exclusively at Chicago's Metallurgical Laboratories, the Manhattan Project site in charge of research on nuclear fission. There were a few key facets to the Met Lab, as it was called, that made it a prime spot for the political mobilization of scientists. First, the site director, Arthur Compton, paid little homage to notions of scientific purity and was quite open to the airing of discontent. Second, Chicago hosted some of the most thoughtful and outspoken scientists. Third, and most importantly, the Met Lab finished its assignment months before the other sites and therefore had time to spare. As Met Lab physicist Leo Szilard noted, when the Chicago scientists finished their assignment, "[it] became possible for the physicists to take a more detached view, and some of us began to think about the wisdom of testing bombs and using bombs."[57]

The Met Lab physicists were concerned about the implications of the bomb, and they were quite aware of their role in unleashing the power of the atom's nucleus. Sociologist Edward Shils has argued that activism "originated within the Manhattan project and arose from the depths of a troubled concern about the application of their scientific work." As experts in the newest and most revolutionary field of scientific research, the physicists

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[55]Schaffer, 161
[56]Wilson, 72
[57]Szilard, *Facts*, 181

were "shaken... into a worried conviction that they alone possessed an awful knowledge which, for the common good, they must share...."[58] While scientists might not have the legitimacy to make political judgments themselves, those judgments should not be made, they felt, without the advice of the experts. Reaffirming the scientists' wartime beliefs, Linus Pauling declared years later, "As scientists we have knowledge of the dangers involved and therefore a special responsibility to make those dangers known."[59]

Furthermore, there were several events that triggered the scientists' re-evaluation of their allegiances to the Project. The first occurred in November 1944, when United States intelligence discovered that the German atomic bomb project was failing miserably. Because the information was highly classified and technical in nature, it could only be deciphered by outstanding physicists with security clearances: that is, physicists working on the American bomb project. Word of this report trickled down to numerous Manhattan Project personnel and created a crisis of conscience for a few scientists.[60] Germany without the bomb appeared much less dangerous, and the scientists consequently questioned what ends the bomb would serve. While most concerns about the use of the bomb did not surface until the spring of 1945, concerns about wartime conduct had been present for quite some time. Leo Szilard wrote,

> Misgivings about our way of conducting ourselves [the United States] 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.[61]

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[58]Edward Shils, "Freedom and Influence: Observations on the Scientists' Movement in the United States," *The Bulletin of the Atomic Scientists*, (January 1957): 13. Shils, like other social scientists and historians interested in the political activity of scientists, focuses on the physicists' postwar movement. His analysis, however, applies equally well to wartime activism.

[59]Linus Pauling, *No More War* (New York: Dodd, Mead, and Co., 1985), 161

[60]Ronald Radosh and Joyce Milton, *The Rosenberg File: A Search for the Truth* (New York: Holt, Rinehart and Winston, 1983), 17

[61]Leo Szilard, "President Truman did not Understand," *U.S. News and World Report*, (August 15, 1960)

For Met Lab physicists prone to political activism, the German surrender on May 7, 1945 turned out to be the greatest crisis of conscience. Now, "the compelling reason for creating this weapon with such speed[,] our fear that Germany had the technical skill necessary to develop such a weapon, and that the German government had no moral restraints regarding its use," was gone.[62] Chicago scientists, many of whom joined the Project to help defeat Hitler, began to see that the bomb had become a weapon of offense. While this may seem to be an empty distinction, it was quite important to the physicists. Hitler was seen as a ruthless imperialist, out to conquer the world. The bomb was thus developed to stop him and save the sovereign nations and was therefore supposed to be a weapon of defense.[63] Japan was viewed as less expansionist, and many scientists hesitated to endorse any sort of use against the island nation. Leo Szilard admitted,

> In the spring of 1945 it was clear that the war against Germany would soon end, and so I began to ask myself, 'What is the purpose of continuing the development of the bomb, and how would the bomb be used if the war with Japan has not ended by the time we have the first bombs?'[64]

For the scientists, "with the war [in Europe] won, it was not clear what we were working for."[65]

The final event that may have triggered concern, dissent, or action on the part of the scientists was the Trinity Test in Alamogordo, New Mexico. There, in the early morning of July 16, 1945, the world's first nuclear device was detonated. The scientists' work, research, speculation, tension, and hope suddenly became real, and the result was awesome. The valley floor was lit with the incandescence of four suns, a wave of heat and

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[62]Franck et al., 20

[63]Some physicists refused to join the project on the ground that no weapon is entirely defensive. Others, despite their qualms with applied military work, recognized the urgency of the situation. Los Alamos physicist Norman Ramsey said, "At all stages we were unhappy with wartime things. Radar can appeal to be a defensive thing. But really it's both. In fact, to worry in strictly objective terms, my work on radar probably killed or maimed more people by far than the atomic bomb did. We didn't like it on one hand. On the other hand, the war was moving along." Norman Ramsey, interview with the author, 1 January 1998, Cambridge, MA.

[64]Szilard, *Facts*, 181

[65]Ibid.

the roar of wind radiated from ground zero, a mushroom cloud loomed overhead, and Fermi quickly calculated the blast to be the equivalent of 10,000 tons of TNT. "Only with Trinity," wrote physicist Ferenc Szasz, "did the scientists comprehend the full potential of the forces they had unleashed. The power of the fissioned atom was greater than anyone had ever created." The reaction to the successful detonation, writes Victor Weisskopf, began with the "feeling... of elation, then we realized we were tired, and then we were worried."[66] More than opening the Pandora's box of atomic energy, the scientists had created an enormous weapon that was therefore an indiscriminate killer. In Alamogordo the scientists saw the horror of their creation, and many resolved to take the necessary steps to control it. When asked "why he decided to abandon the traditional hands-off policy of his profession towards matters of public policy," Leo Szilard answered,

> Science, by creating the bomb, has created a problem, and it has no solution to offer to this problem. Yet a scientist may perhaps be permitted to express opinions on the problem - not because he knows more about it than other people do, but because no one seems to know very much about it.[67]

There are two ideas here that inform the future activity of the atomic scientists: first, that by penetrating the wall of science and creating a "mess," the physicists assumed responsibility for cleaning it up; and second, that scientists might make good political lobbyists, if for no other reason than that they had built the bomb and were fairly competent and articulate thinkers. Bolstering this activism was an implicit knowledge of the magnitude of their invention. A section of the Franck Report serves as a prime example:

> In the past, scientists could disclaim responsibility for the use to which mankind had put their disinterested discoveries. We feel compelled to take a more active stand now because the success which we have achieved in

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[66]Ferenc Morton Szasz, *The Day the Sun Rose Twice: The Story of the Trinity Site Nuclear Explosion, July 16, 1945* (Albuquerque: University of New Mexico Press, 1984), 91

[67]Szilard, "The Physicist Invades Politics," 7

> the development of nuclear power is fraught with infinitely greater dangers than were all the inventions of the past.[68]

The physicists were abandoning the wall around science and following their invention into the political realm. By acknowledging the connection between nuclear fission and the contemporary world, the physicists were forced to recognize that they were both scientists with a legitimacy and citizens with a duty to help solve a crisis they helped to create. Wrote a group of Chicago scientists,

> We found ourselves... in the position of a small group of citizens cognizant of a grave danger for the safety of the country as well as for the future of all the other nations, of which the rest of mankind is unaware. We believe that our acquaintance with the scientific elements of the situation and prolonged preoccupation with its worldwide political implications, imposes on us the obligation to offer to the [Interim] committee some suggestions as to the possible solution to these grave problems.[69]

There were numerous elements of citizenship at play here. The scientists, to a degree, saw themselves as representing popular opinion and thereby filling a democratic vacuum that was necessarily created by the top-secret nature of the Project. For example, the scientists were "not certain that American public opinion, if it could be enlightened as to the effect of atomic explosions, would approve of our own country being the first to introduce such an indiscriminate method of wholesale destruction of civilian life."[70] The physicists realized that the spheres of science and domestic and international politics could no longer be separated. Harold Urey proposed the following analogy:

> It is as if a bacteriologist had discovered a dread disease which might lead to a disastrous epidemic. He would not be a 'politician' if he asked that the city health commission take measures to deal with a plague. He would merely be demonstrating common decency and social awareness.[71]

The scientists, now convinced that they possessed the duty and legitimacy to become political actors, had to decide in what way they wished to do so.

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[68]Franck et al., 19-20
[69]Ibid., 19
[70]Ibid., 24
[71]Boyer, 51

Scientists In Politics

For the category of atomic scientists who decided to ask questions and provide input there seemed to be two ways of spreading their message.[72] The first was to work within the bounds of government and military institutions. Los Alamos physicist Philip Morrison has written that these "insiders" sought to demonstrate what the facts of atomic energy implied for the current war and the future of international relations. The second group, the "dissenters," worked on their own to affect the direction of "insider" debate and in general relied more on individual commitment and passion than on facts or knowledge per se.[73] What Ronald Strickland has called "the split between organization-minded and the free-wheelers"[74] will be referred to here as the bureaucratic/freelance dichotomy. As will be shown, each had its own particular advantages and disadvantages, but both could agree on the need for a specific kind of action.

The scientists who assumed the bureaucratic approach believed that statesmen were fully capable and responsible for making all political and military decisions. Thus they restricted themselves to providing input through channels established by the military, the Manhattan Project, and the United States government. Their basic argument was that, because an unannounced and surprise U.S. attack with a new weapon of revolutionary power would send a threatening message to our allies and enemies alike, the United States should inform the governments of the world of our weapon and use this openness to negotiate an end to the war. By warning Japan of the destructive power of the atomic bomb, and informing Russia of our progress in its development, the scientists believed the United States could avoid military use while successfully concluding a bloody struggle.[75]

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[72]Just what their message was will be the topic of chapter two.

[73]In Anne Eisenberg, "Philip Morrison - A Profile," in Melba Phillips and Spencer Weart, *History of Physics* (New York: American Institute of Physics, 1985)

[74]Strickland, 6

[75]For sake of space, this paper cannot address the fascinating historical question of whether or not it was necessary to drop the bomb on Japan. Suffice it to say that many atomic scientists involved in the Manhattan Project did not believe it was.

This somewhat naive political stance extended the scientific tenet that "free exchange of information leads to truth" to conclude that openness would lead to effective diplomacy. In the pragmatic eyes of the statesmen, however, warning Japan was riskier than surprising them, and conveying secrets to Russia, although nominally an ally, appeared irrational as Cold War tensions began to build.

The ineffectiveness of the bureaucrat-scientists has two explanations: first, suggestions passed through bureaucratic channels tend to become increasingly watered-down as they near the point of application; and second, bureaucrat-scientists tend to be a self-selecting group that is unusually conservative. It may be an institutional truism that, as a policy approaches realization, and thereby assumes greater responsibility, it becomes increasingly innocuous. A simple but critical example will suffice. In the spring of 1945, the Scientific Panel (appointed to voice the concerns of the scientists) advised the Interim Committee (charged with deciding how and where to use the atom bomb) that, because the initial use "should be such as to promote a satisfactory adjustment of our international relations," the Soviet Union must be informed that the United States has the bomb before it is employed in battle.[76] Nine days later, when this message was passed from the Interim Committee to Secretary of War Henry Stimson, it read,

> *At the discretion of the Secretary of War*, he should inform the president that the Interim Committee had agreed that, in the coming conference [Potsdam] and *if suitable opportunity arose*, the president *might mention, subject to the agreement of the Prime Minister*, that this country is working in this field.[77]

One week later, Truman was told by Stimson "that he should look and, *if he found that he thought Stalin was on good enough terms with him*, he should... *simply* [tell] him that we were busy with *this thing* working like the dickens... and we were pretty nearly ready...."[78]

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[76]Oppenheimer, et al., "Recommendations on the Immediate Use of Nuclear Weapons," in Fanton et al., 150

[77]R. Gordon Arneson, "Memo to Harrison, June 25, 1945," in Fanton et al., 156 (Emphasis added)

[78]Henry Stimson, "Diary Entry for July 3, 1945," in Fanton et al., 171 (Emphasis added)

Finally, on July 24, 1945, Truman "*casually mentioned* to Stalin that we had *a new weapon* of unusual destructive force. The Russian Premier showed no special interest. All he said was that he was glad to hear it."[79] What the scientists intended as a critical first step in post-war relations became a token gesture to the existence of such hopes. Oppenheimer thought Truman's actions had carried "casualness rather far."[80] Szilard, as the freelance-scientists were prone to do, added some vitriol to his description:

> One could hardly say that the attempt to inform Stalin was a very rigorous one. Mr. Truman did not say, "Excuse me, Mr. Stalin, but you do not seem to understand. I am not speaking of just another bomb. I am speaking of something that will get Russia and the United States into the greatest difficulties after the war unless we find a solution to the problem which it poses." Mr. Truman said nothing of the sort. So the bomb was dropped on Hiroshima and caught the Russians by surprise.[81]

For bureaucrat-scientists on the lower rungs of the government's hierarchy (that is, most scientists), any hope of drastically changing policy was a faint one. Their message would be amended so many times before it was put into action that it would lose all strength.

The amending process can be illustrated in another brief example. In late 1944 Met Lab physicist John Simpson organized a series of seminars for his fellow scientists to discuss the implications of nuclear power and what scientists should do in the future. So many physicists turned out for these discussions that site director Arthur Compton assigned James Franck to head a committee on the social and political implications of the bomb. This committee quickly drew up a report detailing the scientists' opinion on if and how to use the bomb. They argued that the decision should not be based solely on tactical military grounds. An unannounced bombing of Japan, they warned, would have long-term consequences:

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[79]In Rhodes, *The Making of the Atomic Bomb*, 690 (Emphasis added)

[80]Ibid.

[81]Leo Szilard, "A Personal History of the Atomic Bomb," *The University of Chicago Round Table*, (No. 601. September 25, 1949): 15. Szilard's point may be overstated because, in fact, Stalin had learned of the U.S. bomb project before Potsdam through his spy network. Nevertheless, Szilard's argument that the U.S. forfeited an opportunity by refusing to take initiative stands.

> It may be very difficult to persuade the world that a nation which was capable of secretly preparing and suddenly releasing a new weapon as indiscriminate as the rocket bomb and a thousand times more destructive is to be trusted in its proclaimed desire of having such weapons abolished by international agreement.[82]

Arthur Compton was in charge of passing this report along to the Interim Committee. In doing so he put his own personal spin on their conclusions:

> I note that two important considerations have not been mentioned: (1.) that failure to make a military demonstration of the new bombs may make the war longer and more expensive of human lives, and (2.) that without a military demonstration it may be impossible to impress the world with the need for national sacrifices in order to gain lasting security.[83]

Thus the lower-level bureaucrat-scientists were ineffective because of the "conservatizing" effect of the channels open to them.

Furthermore, the self-selected, upper-level bureaucrat-scientists would often resort to status quo "decisions." In June 1945 the Interim Committee asked the Scientific Panel to consider the feasibility of an atomic bomb demonstration. The panel agreed that "the difficulties of making a purely technical demonstration that would carry its impact into Japan's controlling councils were indeed great."[84] The panel thereby employed psychological reasoning (a type of argument in which they had dubious credentials) so they could resort to the default military-political position. This comes out in the conclusion of the full Scientific Panel report of June 16, 1945:

> Those who advocate a purely technical demonstration would wish to outlaw the use of atomic weapons and have feared that if we use the weapons now, our position in future negotiations will be prejudiced. Others emphasize the opportunity of saving American lives by immediate military use, and believe that such use will improve the international prospects, in that they are more concerned with the prevention of war than with the elimination of this specific weapon. We find ourselves closer to those latter views; we can propose no technical demonstration likely to

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[82]Franck et al., 23

[83]Arthur Compton, "Letter to Henry Stimson, June 12, 1945," in Fanton et al., 138

[84]In Smith, "Behind the Decision to Use the Atomic Bomb," 298

> bring an end to the war; we see no acceptable alternative to direct military use.[85]

The appointment of Project administrators to be representatives on the Scientific Panel doomed the Manhattan Project to status quo decisions. Szilard wrote, "The selection of the physicists disturbed us, for while the physicists were all good men, they were men who could be expected to play ball on this occasion."[86] Indeed, the four scientists on the panel all took default positions on issues of the bomb's use: J. Robert Oppenheimer supported military use, Enrico Fermi was the "unconcerned genuine scientist," E.O. Lawrence's unknown stance was discomforting, and A. H. Compton was often intimidated by government powers.[87] In many ways, this self-selected group signed away their own claim to behave as active citizens and concerned scientists. In the same report cited above, the panel confessed,

> It is true that we are among the few citizens who have had occasion to give thoughtful consideration to these problems during the past few years. We have, however, no claim to special competence in solving the political, social, and military problems which are presented by the advent of atomic power. [Therefore], with regard to these general aspects of the use of atomic energy, it is clear that we, as scientific men, have no proprietary rights.[88]

The scientific panel simply bore too much responsibility to make anything but the safest, most conservative, most "status quo" decisions. Alice Kimball Smith explains this as a pragmatic choice: "[They] tended to deal first with the worst palpable peril -- the continuance of the war...."[89]

Freelance Scientists

It was in these ways that the bureaucrat-scientists were kept from effecting policy changes. Other scientists watching these failures come about, however, decided to take

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[85]"Scientific Panel Report, June 16, 1945," in Fanton et al., 150
[86]Szilard, *Facts*, 186
[87]Ibid.
[88]"Scientific Panel Report, June 16, 1945," in Fanton et al., 150
[89]Smith, *A Peril and a Hope*, 51

matters into their own hands and effect change from outside the system with an informal and freelance strategy. The freelance-scientists in general harbored great prejudicial distrust for governmental decision-making and great faith in scientific rationality. Paradoxically, this preference for democratic rather than hierarchical or bureaucratic systems manifested itself as scientific elitism. Wrote Leo Szilard, "By and large, governments are guided by considerations of expediency rather than by moral considerations. And this, I think, is a universal law of how governments act."[90] On the other hand, scientists considered themselves perfect candidates for political decision-making because they were non-partisan, rational, and excellent fact-finders. For physicists like Szilard, these beliefs engendered visions of a circle of scientists that would rise up, lead the world's governments, rescue the collapsing parliamentary democracies, and save civilization. Szilard thought that if his clan of scientists, ignoring emotion, passion, and elements of patriotism, could only bring logic and fact to the bargaining table, the perils of the bomb would be avoided. A friend and collaborator, Albert Einstein wrote, "[Szilard] tends to overestimate the role of rational thought in human life."[91]

For freelance-scientists, it made no sense to subject their concerns to bureaucratic channels; the obvious solution was to approach the policy-makers themselves. Writes Donald Strickland, "[Szilard's] expectation toward politics seems to have been that scientists, as exceptional, intelligent, and talented individuals, ought to approach the seats of power directly and present solutions to momentous policy problems." These scientists took stock in "overt political activity aimed at influencing public policy through personal contact."[92] So it was that in the spring of 1945, seeing no governmental consideration of the global implications of the atomic bomb, Szilard approached Einstein for the second

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[90]Szilard, "President Truman did not Understand." The physicists' faith that scientific logic would improve politics will be discussed in chapter two.

[91]In Allen Greb et al., *Towards a Livable World: Leo Szilard and the Crusade for Nuclear Arms Control* (Cambridge: The MIT Press, 1963), xix

[92]Strickland, 98

time to request an introduction to President Roosevelt. Szilard insisted on attaching a brief summary of his opinions to Einstein's letter of March 25, in which he asserted that the present international situation from the atomic perspective "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."[93] Literally five minutes after receiving clearance to meet with the busy Roosevelt, Szilard discovered that the President had died.[94] Once again, chance denied what could have been a pivotal moment in history.

However, at the time of Roosevelt's death on April 12, freelance-scientists had been bringing their concerns to statesmen for more than a year. For example, Niels Bohr had been using his neutral Danish citizenship to broach discussions with statesmen since the early 1940's. Bohr used his friendship with Sir John Anderson, the British Cabinet member responsible for scientific research, to arrange an interview with Winston Churchill. Writes Alice Smith, "Churchill expressed unalterable opposition to [Bohr's suggested] talks with Russia, and the episode was for Bohr a tragically frustrating experience."[95] Not defeated, Bohr used his acquaintance with U.S. Supreme Court Justice Felix Frankfurter to arrange a similar talk with Roosevelt on July 26, 1944. This discussion seemed, at least initially, to go much better than the one with Churchill. Bohr "left with the impression that Roosevelt took a favorable view of talking to Russia before the bomb was used."[96] Historian Martin Sherwin asserts that Roosevelt promised Bohr he would convince Churchill of the necessity of informing Stalin.[97] But Bohr's hopes would soon be upset. On August 19, 1943, Churchill and Roosevelt had stated their commitment to maintaining an Anglo-American atomic monopoly in the Quebec Agreement.

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[93]Szilard, *Facts*, 205-206

[94]Ibid., 182

[95]Smith, *A Peril and a Hope*, 9

[96]Ibid., 10. Many diplomatic historians have portrayed Roosevelt as a man who could make anyone believe he was on their side. In all likelihood, therefore, Bohr did not misunderstand the President in this meeting.

[97]Martin Sherwin, "The Atomic Bomb and the Origins of the Cold War: U.S. Atomic-Energy Policy and Diplomacy, 1941-1945," *American Historical Review*, (October 1973): 959

Consequently, at the Hyde Park Conference on September 18, 1944, they dismissed Bohr's request on the grounds that atomic information should not become public. As Smith has noted, "What Bohr had in mind was not, of course, telling the world but a very private communication between allied leaders."[98] Bohr merely wanted the U.S. to reveal its project before the time when "discussions appear coercive rather than friendly."[99] Oppenheimer called the Hyde Park agreement "a substantial if not total misunderstanding of what Bohr was after."[100] However, given the tone of the Aide-Memoire from this conference, any "total misunderstanding" on the part of Churchill and Roosevelt was a discriminating one. Reaffirming their dedication to maintain a monopoly of atomic knowledge, the allied leaders requested that "inquiries... 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."[101] Bohr's innocent request thus made him the object of suspicions of disloyalty.

Despite Bohr's ineffectiveness in dealing with statesmen, he had infected others with a concern for the coming atomic age. In September 1944, Frankfurter had been convinced by Bohr that Russia should be informed of the bomb. In a private memo to Roosevelt in April 1945, Frankfurter encouraged the President to invite the opinions of the atomic scientists. He explained that Bohr "was a man weighed down with a conscience and with an almost overwhelming solicitude for the dangers of our people."[102] Eventually such an invitation was extended by General Groves to Arthur Compton. Consequently, on July 12, 1945, the Met Lab administered a poll to half of its employees asking what policy should guide the United States' use of the atomic bomb. Five options were provided, ranging from a policy most guaranteed to bring about a Japanese surrender to a policy

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[98]Smith, *A Peril and a Hope*, 11

[99]Sherwin, 959

[100]Smith, *A Peril and a Hope*, 11

[101]"Hyde-Park Aide-Memoir, September 18, 1944," in Fanton et al., 70. Issues of loyalty will be addressed in chapter three.

[102]Felix Frankfurter, "Memorandum to Franklin Roosevelt, April 18, 1945," in Fanton et al., 67

denying any use of the bomb. On July 24 Compton reported that the poll revealed "the strongly favored procedure [to be] to 'give a military demonstration in Japan, to be followed by a renewed opportunity for surrender before full use of the weapon is employed.'"[103] While forty-six percent of the scientists polled selected this option, it was far from a conclusive response: many scientists were confused (and reasonably so) as to what a "military demonstration" was. The language then circulating in the Met Lab had differentiated between a "technical demonstration" and "full military use." Furthermore, the next option on the poll was to "give an experimental demonstration in this country, with representatives of Japan present; followed by a new opportunity for surrender before full use of weapon is employed."[104] It seems that many scientists may have skipped this option because a bomb drop in the U.S. sounded threatening.

In June 1945 the new director of the Met Lab, Farrington Daniels, asked for permission from the military to continue the meetings on the social and political implications of the bomb that had been started by John Simpson. When military officials refused to permit more than three people to enter into such discussions, Daniels asked the Tolman Committee to hold weekly interviews where the scientists could air their concerns with the knowledge that they would be passed along to the Scientific Panel. The scientists had thus found a loophole: the anteroom, near where the personal interviews were held, became a sort of meeting place for the freelance-scientists to discuss their concerns. Simpson writes, "A succession of about twenty people would, one at a time, enter the room to discuss these problems with a panel of two or three scientists selected for the evening."[105] Out of these discussions came the most concrete form of freelance activism before Hiroshima: Szilard's petition campaign.

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[103]Arthur Compton, "Memorandum on July 24, 1945," in Fanton et al., 174

[104]Arthur Compton and Farrington Daniels, "A Poll of Scientists at Chicago, July 1945," *The Bulletin of the Atomic Scientists*, (February 1948): 44

[105]Simpson, 243

Departing from the political appeals of the bureaucrat-scientists, Szilard's petition, as he stated on its cover letter, was "based on purely moral considerations" and asked the President "to rule that the United States shall not, in the present phase of war, resort to the use of atomic bombs."[106] Despite a somewhat pessimistic tone, the petition stated the need to act in a democratic vacuum and assume a stance on critical issues:

> However small the chance might be that our petition may influence the course of events, I personally feel that it would be a matter of importance if a large number of scientists who have worked in this field want [to go] clearly and unmistakably on the record as to their opposition on moral grounds to the use of bombs.... The fact that the people of the United States are unaware of the choice which faces us increases our responsibility in this matter since those who have worked on 'atomic power' represent a sample of the population and they alone are in a position to form an opinion and declare their stand.[107]

Szilard was in essence trying to get scientists to act like citizens. He was not sure, however, that he could get them to take such responsibility. In a letter to an associate at Los Alamos who was supposed to circulate the petition Szilard wrote, "I am sure you will find many boys confused as to what kind of a thing a moral issue is."[108] Indeed, Szilard found that many scientists did not understand the issues as he did. He became quite frustrated with a group of chemists who wanted, before signing the petition, to compare estimates of fatalities expected from a land invasion versus an atomic bomb detonation: "That some other issue might be involved in dropping a bomb... did not occur to any of the chemists with whom I spoke."[109]

When the petition was passed around the Met Lab, it received few signatures and even engendered a couple of counter-petitions. The complaints concerning Szilard's petition, however, were not based on the assumption that scientists should keep clear of political decisions. Rather, in an indication of how much scientific attitudes toward a role in

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[106]Szilard, "Petition Cover Letter," in *Facts*, 209

[107]Ibid., 172

[108]Szilard, "Letter to Creutz, July 10, 1945," in *Facts*, 212

[109]Ibid., 187

politics had changed, the dissenters argued that to drop the bomb and save American lives would "represent more truly... the majority of America and particularly those who have sons... in the foxholes and warships in the Pacific."[110] Scientists were, in effect, attempting to fine-tune their political recommendations so as to act as the most accurate representative body possible. Despite the constraints of secrecy and compartmentalization, and quite to the contrary of separating politics from science, the physicists were fashioning a micro-democracy in the laboratory. Consequently, Szilard revised his petition to include a warning that if Japan did not surrender, the United States would drop the atomic bomb. This revised petition was quite popular among the scientists at the Met Lab.

Szilard then tried unsuccessfully to circulate the petition at the other Project sites. In July 1945 he sent a copy to his fellow Hungarian Edward Teller in Los Alamos. Teller was hesitant to circulate it because of security considerations. When he approached Project director J. Robert Oppenheimer, the reasons for his hesitancy were confirmed:

> Oppenheimer told me, in a polite and convincing way, that he thought it improper for a scientist to use his prestige as a platform for political pronouncements. He conveyed to me in glowing terms the deep concern, thoroughness, and wisdom with which these questions were being handled in Washington. Our fate was in the hands of the best, the most conscientious men of our nation. And they had information which we did not possess. Oppenheimer's words lifted a great weight from my heart. I was happy to accept his word and his authority.[111]

This is just one example of the "half-conscious closing of the mind" to outside issues that Szilard feared at Los Alamos. Likewise, physicist Richard Feynman explained that a fellow scientist "gave me an interesting idea: that you don't have to be responsible for the world that you're in. So I have developed a very powerful sense of social irresponsibility

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[110]Smith, "Behind the Decision," 304

[111]Teller, 13-14

as a result...."[112] Teller, however, was not as sure of himself as was Feynman. In 1962 he wrote, "I did not circulate Szilard's petition. Today I regret that I did not."[113]

In any case, the Szilard petition, a product of the freelance-scientist, fell victim to the bureaucratic processes established by the military and government. The statement urging a warning to Japan in clear terms was passed from Szilard to Compton to Groves and did not arrive on Stimson's desk until August 1, 1945. "Nothing could have seemed more irrelevant to Stimson... on August 1 than further expositions of scientific opinion."[114] The bomb was dropped on Hiroshima five days later.

Any discussion of the limitations of freelance-scientists must acknowledge the incompatibility of political and scientific ethos and language. Scientific rationality excludes the nationalistic issues to which representational politics is often responsible. For example, in May 1945 Szilard, Harold Urey and Chancellor Bartky of the University of Chicago paid a visit to future Secretary of State James Byrnes at his home in Spartanburg. The three trained scientists presented their argument that warnings and openness must precede any military use of the bomb. Byrnes responded that a surprise use of the bomb would help to defeat Japan and put a leash on Russian expansion into Europe in the post-war era. There was no negotiating for either party, and both left the meeting frustrated and offended by the other's viewpoint. Szilard later wrote that Byrnes' "view that our possessing and demonstrating the bomb would make Russia more manageable in Europe I was not able to share. Indeed I could hardly imagine any premise more false or disastrous upon which to base our policy."[115] Byrnes thought the scientists were cocky intellectuals stepping outside their domain, while the scientists thought Byrnes did not understand the issues involved and thereby offended their sense of proportion. Alice Smith concluded,

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[112]Feynman, 132

[113]Teller, 14

[114]Richard Hewlett and Oscar Anderson, *The New World, 1939/1946* (Pennsylvania: The Pennsylvania State University Press, 1962), 399

[115]Szilard, "A Personal History of the Atomic Bomb," 15

> At no time did Byrnes impress the scientists who talked to him with his grasp of the significance of atomic energy. He has been variously reported as adopting the attitude that the bomb was a nice thing to have on your hip when you met the Russians, and as chiefly concerned about how to justify the expenditure of two billion dollars.[116]

Reaction to Hiroshima

In the end the scientists were unable to affect the decision-making process and were kept out of the information loop as demanded by security concerns. When the bomb was dropped, many were surprised and outraged despite their intimate knowledge of its workings. Reflecting on the bombing of Hiroshima, physicist Philip Morrison wrote,

> I thought, as did many other people, that there was going to be a warning. The military authorities rejected any demonstration as impractical. The military had made up its mind. It would have taken a very powerful political presence - one that wasn't available - to sway them. The United States therefore gave no explicit warning. I think this was a moral failure.[117]

Despite the lack of presence and the moral failure, the physicists did not leave the wartime era without a lesson. They realized that in the future the decisions they made would have a critical influence upon the world. Viewing their discoveries as integral to national and international affairs, the physicists vowed to develop a stronger political consciousness and be wary lest they once again conflate science and technology without serious consideration of the possible repercussions. As Szilard wrote after the war, "Great power imposes the obligation of exercising restraint, and we did not live up to this obligation. I think this affected many of the scientists in a subtle sense, and it diminished their desire to work on the [hydrogen] bomb."[118] The physicists had begun down a new path of responsibility with regard to the elements they would introduce to society. After the war they became public activists and continued to lobby in Washington for the national and international control of atomic energy. The physicists were transformed into experts

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[116]Smith, "The Decision to Drop the Atomic Bomb," 296

[117]In Eisenberg, "Philip Morrison - A Profile," 235

[118]Szilard, "President Truman did not Understand"

with a privileged knowledge and vision of the perils and hopes of the atomic age. Norman Ramsey reflected, "I think there was more of a feeling of responsibility and also [a] recognition, with technical things being a major part of the war, [of] an obligation to call attention to this knowledge.[119]" With the Manhattan Project came a new understanding of the scientists' role in politics.

[119]Ramsey, interview

Chapter 2: "Scientized" Politics

The first chapter described how the physicists of the Manhattan Project lost their innocence. They decided that, having brought their profession into contact with worldly politics, they too had to enter the political realm. The wall of scientific purity was broken by an overwhelming wave of circumstance, duty, and acknowledged expertise. This chapter will analyze the message of international organization and cooperation the physicists brought to Washington. They focused on long-term goals because they were less concerned with using the bomb to win the war than with its postwar implications. This shift of focus complicated the physicists' perception of their creation: in addition to an indiscriminate killer of thousands they now saw a tool of peace. The question facing the scientists was how to use the bomb so as to make it predominantly a tool of peace. This chapter will examine how this political question was formulated, presented, and answered. In doing so it will be necessary to unpack and analyze the influence of the scientific baggage the physicists carried into the political realm.

Greater Implications

The first question the scientists asked when they looked at the bomb politically was how would it be used. The second and more critical question, one that encompassed and dictated an answer to the first, was what would it mean for the postwar world. The physicists essentially took a step back to view the larger framework and the greater implications of the bomb. As Donald Strickland has acknowledged, "[The] flurry of concern in Spring of 1945 didn't concern how the bomb would be used as much as how to manage atomic energy in the postwar world."[120] That is, the scientists viewed the harnessing of nuclear energy as symbolic of the beginning of a new stage of civilization. A qualitative change in human affairs, they believed, would result from this revolution in scientific understanding. The final paragraph of the Smyth Report (a Met Lab document

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[120]Donald Strickland, *Scientists in Politics* (Lafayette: Purdue University Studies, 1968), 9

written to express postwar concerns but not released until after the bombing of Hiroshima) explained that the physicists had debated

> the political and social questions, and [recognized that] the answer given them may affect all mankind for generations. In thinking about them the men on the project have been thinking as citizens of the United States vitally interested in the welfare of the human race.[121]

The physicists saw that they had created a weapon so terrifying that both war and peace acquired new meaning. Writes Martin Sherwin, "By raising the consequences of war to the level of armageddon, the atomic bomb elevated the stakes of peace beyond historical experience."[122] Wars might appear "unwinnable" to the scientists, but that did not assure them that statesmen would pursue peace. The physicists had gotten themselves in over their heads: science could offer no solution to the postwar problems posed by the atomic bomb. However, the scientists felt that they *themselves* could and should offer such solutions. In unleashing unprecedented powers from the nucleus of the atom, writes John Simpson, "a large group of natural scientists have been brought face to face with the problems associated with a development so great potentially that it initiates a new era of our civilization."[123] Many physicists resolved to take action.

Relative Stages of Advancement

In the midst of World War I chemist Frederick Soddy began to feel "that governments and politicians, or man in general, was not yet fitted to use science." Referring to predictions of atomic weapons, he continued, "imagine, if you can, what the present war would be like if such an explosive had actually been discovered." Soddy described a contemporary scientific audience that was also "coming to feel that it was not enough simply to make discoveries." Society, he suggested, must be reshaped to use such

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[121]In Alice Kimball Smith, "Behind the Decision the Use the Atomic Bomb," *The Bulletin of Atomic Scientists*, (1958): 310

[122]Martin Sherwin, *A World Destroyed: The Atomic Bomb and the Grand Alliance* (New York: Alfred A. Knopf, 1975), xiii

[123]John Simpson, "The Scientists as Public Educators," *The Bulletin of Atomic Scientists*, (1947): 243

discoveries wisely. Spencer Weart added that Soddy "thought the world would be doomed unless it was reformed by the time the discovery came."[124] Soddy was making a comparison (one that had been made before and has been made since) between the relative stages of advancement of science or technology and humankind's political, moral, and social institutions.

With less subtlety Raymond Fosdick asked the same question in his 1929 text The Old Savage in the New Civilization:

> Will this intricate machinery which [man] has built up and this vast body of knowledge which he has appropriated be the servant of the race, or will it be a Frankenstein monster that will slay its own master. In brief, has man the capacity to keep up with his own machine.

Fosdick wrote that it would be hard, "for science is not standing still," and concluded, "This, then, is the problem: science will not wait for man to catch up. It does not hold itself responsible for the morals or capacities of its human employees."[125] Ironically, a decade later Fosdick would, as head of the Rockefeller Fund, sponsor the construction of a cyclotron in Berkeley, California under the direction of future Manhattan Project physicist and site leader, Ernest Lawrence.[126]

This concern that scientific progress was outstripping moral, social, and political advancement deeply affected the physicists of the Manhattan Project. One of the earliest expressions of such concern was voiced in the Jeffries Report on "Nucleonics" (a project organized by A.H. Compton to plan postwar research on the nucleus) in November 1944. "As we approach the nucleonics age," it began, "the existing gap between continued technological progress and our relatively static political institutions tends to widen."[127] The report concluded that this political dilemma needed to be solved on a worldwide

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[124]In Spencer Weart, *Nuclear Fear* (MA: Harvard University Press, 1988), 29

[125]Raymond Fosdick, *The Old Savage in the New Civilization* (New York: Doubleday, Duran and Co., 1929), 21-25

[126]Weart, 34

[127]Zay Jeffries et al., "The Impact of Nucleonics on International Relations and the Social Order," in Sherwin, *A World Destroyed*, 317

scale, or else the citizens of the world would have to face the future with the fragile hope that retaliatory fear would deter a first strike.[128] In essence, the physicists felt that their science had caused a harmonious system to falter. As political, social, and moral institutions remained static, the progress of scientific technology continued unabated. Wrote Niels Bohr,

> Man's increasing mastery of the forces of nature, which has provided ever richer possibilities for the growth of culture, may indeed threaten to upset the balance vital for the thriving of organized communities, unless human society can adjust itself to the exigencies of the situation.[129]

The physicists pleaded their argument to statesmen and administrative superiors in the ways outlined in chapter one: writing memoranda, serving on committees, making personal appeals, and holding informational sessions at their Project sites. This message, carried with persistence, was getting through to some of its targets. As chairman of the Interim Committee, Secretary of War Henry Stimson was subjected to these arguments repeatedly. In a memorandum to President Truman on April 25, 1945, Stimson wrote,

> The world in its present state of moral advancement compared with its technological development would be eventually at the mercy of such a weapon. In other words, modern civilization might be completely destroyed.[130]

From the scientists' perspective, nuclear weapons invested traditional methods of international conflict resolution with apocalyptic potential. That statesmen kept war among their diplomatic tools frightened many physicists who believed that the atomic bomb would change the nature of war. Consequently, the scientists argued, the struggle to preserve civilization would involve a change in methods and style of national policy and international diplomacy. One month after the Nagasaki bombing, Stimson reiterated his earlier argument to Truman,

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[128]Smith, "Decision," 291

[129]Niels Bohr, "A Challenge to Civilization," *Science*, (1945): 363

[130]Henry Stimson, "Memo Discussed with Truman, April 25, 1945," in Jonathon Fanton et al., *The Manhattan Project* (Philadelphia: Temple University Press, 1991), 96

> I think the bomb instead constitutes merely a first step in a new control by man over the forces of nature too revolutionary and dangerous to fit into the old concepts. I think it really caps the climax of the race between man's growing technological power for destruction and his psychological power of self-control and group control -- his moral power.[131]

Science and technology were dragging civilization into perilous worlds uncharted by human conscience. Edward Teller emphasized these differing rates of development when he asserted, "By being one generation behind our times, we are endangering peace; we may bring about World War 3."[132]

Tipping the Offense/Defense Scale

In 1932, once and future British Prime Minister Stanley Baldwin noticed that war was changing. Weaponry had advanced to the point where offense and defense were distinctly unequal. Because, as he said, "The bomber will always get through," Baldwin warned the House of Commons, "The only defense is in offense, which means that you have to kill more women and children more quickly than the enemy, if you wish to save yourselves."[133] The physicists would invoke a similar sense of madness in their 1940s crusade. They too emphasized that offense had outpaced defense; that war had become disgustingly brutal, bloody, and impersonal; and that survival was just as much a goal as was victory. The atomic bomb aggravated the disparity that Baldwin had noted a decade earlier. Future wars would be shorter, and the advantage would lie with the nation that struck first. Physicist and pacifist Albert Einstein claimed, "Modern weapons, in particular the atom bomb, have led to a considerable advantage in the means of offense or attack

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[131]Ibid., 267-268

[132]Edward Teller, *The Legacy of Hiroshima* (New York: Doubleday and Co., 1962), vii. This concern lasted beyond World War II. In 1970 Eugene Rabinowitch wrote, "For science to cease to be a threat to the survival of mankind, a fundamental change in these social values is needed. Competition between societies, whether or not masked by ideological warpaints, must be replaced by cooperation." Eugene Rabinowitch, "Twenty Five Years Later," in Richard Lewis et al., *Alamogordo Plus Twenty-Five* (New York: The Viking Press, 1970), 7

[133]In Weart, 27

over those of defense," resulting in the effect that "all the people living in cities are threatened, everywhere and constantly, with sudden destruction."[134]

For the physicists, any hope of defense was crushed by the possibilities of a new offense. They feared that a vicious circle of weapons and defense construction would escalate to the point of instability, where any movement perceived as threatening would result in total annihilation. W. A. Higinbotham, future chairman of the Federation of Atomic Scientists, wrote, "For every defense there will be an improved offense." He asked rhetorically, "What prospect of freedom from fear does this offer to humanity? What will this lead us to if mankind fails to set up controls against war?"[135] The scenario of pre-apocalyptic escalation heightened the scientists' insecurities because it denied that science itself could play a prophylactic role. Higinbotham concurred, "In this age we cannot protect our cities by soldiers or by science."[136] Defense was a pipe-dream; international diplomacy was the only answer. By creating a problem they could not solve, the physicists had placed civilization in jeopardy. As the Franck Report admitted, science could no longer protect nations against the weapons of science. It concluded, "Protection can come only from the political organization of the world."[137]

The "Secret" of the Bomb

According to many Manhattan Project physicists, science was developing powers beyond the bounds of human control, defense was being outstripped by offense, and secrecy was an impossibility. This last belief divided the thinking of the scientists from that of the statesmen. Whereas the statesmen saw the atomic bomb as a national secret to be protected, the physicists saw it as a natural secret that so far had only been discovered by scientists from a few countries. Knowledge of nuclear fission did not belong to any

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[134]In The Federation of Atomic Scientists, *One World or None* (McGraw-Hill Book Co., 1946), 76

[135]W.A. Higinbotham, "There is No Defense Against Atomic Bombs," *The New York Times Magazine*, (November 3, 1946): 11

[136]Ibid., 49

[137]James Franck et al., "A Report to the Secretary of War," in Morton Grodzins and Eugene Rabinowitch, *The Atomic Age*, (New York: Basic Books, 1963), 20

individual or country; it was simply accessed by them. Historian of science Robert Gilpin has asserted that the scientists believed

> There would be no way to prevent other nations from developing and utilizing atomic weapons. Even in a divided and secretive world there was no secret to the atomic bomb which the U.S. could hope to withhold from other nations for long. The secrets of nature are accessible to competent scientists in all nations.[138]

This concept was clear to the physicists and acceptable to administrators with scientific background, but rejected by many statesmen. For example, Niels Bohr convinced Vannevar Bush, the director of the Office of Scientific Research and Development (OSRD), that communication with the Russians was advisable because they would soon acquire nuclear secrets and, in order to prevent a nuclear arms race, the United States should enlist their help in controlling weapons production. On September 30, 1944 these proposals were passed along to Secretary of War Stimson in a memorandum that cast doubt on the President's plan of continued Anglo-American atomic monopoly.[139] However, as will be shown later in the chapter, such arguments carried no weight among the statesmen.

Crossroads

The physicists saw a bomb of unprecedented power, one that was too powerful to be used by nations with underdeveloped moral, political, and social institutions, that denied the possibility of defense, and that would be discovered by other nations in the not-so-distant future. To top it off, the physicists had built the bomb. Their contributions to creating such a perilous world situation made the physicists eager to help solve it. Gerald Holton commented, "The urgency that these people felt was a very important urgency: they were trying to prevent a terrible disaster in history."[140] However, this was a result

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[138]Robert Gilpin, *American Scientists and Nuclear Weapons Policy* (Princeton: Princeton University Press, 1962), 40

[139]Alice Kimball Smith, *A Peril and a Hope* (MA: MIT Press, 1970), 15

[140]Gerald Holton, interview with author, 31 December 1997, Cambridge, MA.

not simply of the terrible peril but also of a great hope: if mankind could avoid the disaster, it could also usher in a new, brighter era of civilization. Wrote Niels Bohr, "The fate of humanity will depend on its ability to unite in averting common dangers and jointly reap the benefit from the immense opportunities which the progress of science offers."[141] That is, the creation of the atomic bomb represented a critical moment in history where drastically varying paths opened up, offering the scientists in the Manhattan Project two options: the path of fear or destruction, and the path of peace and international cooperation.

Because atomic energy is commonly associated with atomic weapons, it is often regarded with trepidation. However, the physicists knew that they had tapped an unusual energy source that promised much. Consequently, the scientists began to consider their invention as a powerful tool of worldwide peace. Bohr had grand visions of an everlasting peace wrought by the hands of science:

> Indeed, it need hardly be stressed how fortunate in every respect it would be if, at the same time as the world learns of the formidable destructive power which has come into human hands, it could be told that the great scientific and technological advance has been helpful in creating a solid foundation for a future peaceful cooperation between nations.[142]

The physicists wanted to help address a problem that science could not solve. Writes Gilpin, "The mutual impact of science and society has stimulated in the scientist a desire to assist society in the solution to the problems created by science."[143] This was the foundation of the scientists' movement that would flourish in the postwar era.

Path of Fear

Beneath the scientists' crusade lay their fear of nuclear warfare. In a paper delivered to his colleagues in September 1942, Leo Szilard argued, "The existence of these bombs... will bring disaster upon the world even if we anticipate them and win the war, but lose the

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[141]In The Federation of Atomic Scientists, *One World or None*, ix

[142]Neils Bohr, "For an Open World," *The Bulletin of Atomic Scientists*, (July 1950): 215

[143]Gilpin, 26

peace that will follow." He concluded, "Perhaps it would be well if we devoted more thought to the ultimate political necessities which will arise out of our present work."[144] The novelty of atomic bombs meant for Szilard that an armed peace represented a prewar rather than a postwar position. Traditional conceptions of peace, he stated, had become outdated. Faster delivery systems, offensive advantage, and increased destructive capabilities all added up to an unstable game that could explode too easily. In essence, Szilard envisioned a cold war.[145] In any case, the fear with which the scientists held the future of civilization was real. Los Alamos physicist Philip Morrison put it simply:

> If the bomb gets out of hand, if we do not learn to live together so that science will be our help and not our hurt, there is only one sure future. The cities of men on earth will perish.[146]

Scientized Politics

The physicists thus saw in the bomb both a peril and a hope. The remainder of this chapter will be devoted to an investigation of how the scientists perceived and fought for that hope. However, before assessing the physicists' plan to avoid the perils of the nuclear age, it is necessary to examine how they approached political questions. Three arguments will be proposed: the physicists thought they would make good politicians; they believed that contemporary politics needed to be 'scientized'; and they were peculiarly unpragmatic when faced with issues of war and peace.

Perhaps naively, the physicists of the Manhattan Project thought that the methods and assumptions of science would function well within the political realm. Empiricism, rationality, the search for truth, and a lack of dogmatism seemed to them to be the obvious and only criteria for solving problems, conducting diplomacy, and formulating policy. Writes Gilpin, "The scientist regards himself as being able to approach political issues with the same dispassionate, objective state of mind that he believes he displays in his scientific

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[144]Leo Szilard, "What is Wrong with Us?" in Szilard, *Leo Szilard: His Version of the Facts* (Cambridge: MIT Press, 1978), 154

[145]Ibid., 188

[146]In The Federation of Atomic Scientists, One *World or None*, 6

endeavors."[147] As in the laboratory, physicists have a tendency to believe that "the facts" can be objectively discovered and therefore reproducible to a universal audience. Bohr, for example, "was convinced that if statesmen could be made to understand the political and military implications of atomic energy, they would respond to a new international situation just as scientists responded to new discoveries."[148] Furthermore, many assumed that given the same set of facts all people will derive reconcilable, if not identical, conclusions. Gilpin continues,

> The scientists have viewed themselves as searchers for solutions based on facts and therefore acceptable to all; they see themselves as discovering the truth and educating the world to it. Scientists reason that once others have been educated to the facts, they will find the solution of a particular problem as obvious as do the scientists themselves.[149]

In the words of Met Lab physicist John Simpson,

> We arrived in Washington all of one mind and with the conviction that if any person were willing to sit down and examine the few simple facts which led us to our conclusions, that they too would become actively interested in the problem of controlling atomic energy.[150]

Here was a naive attempt to apply to *politics* the *scientific* assumption that facts will affect a universal audience in similar ways.

Sociologist Edward Shils heralded the scientists' "chief instruments [of] enlightenment and rational persuasion" and put great faith in their political prospects because they "face each problem with [their] best abilities and without any commitment to a paralyzing doctrine or a set of unrealistic principles...."[151] Though this may sound like hyperbole or political naiveté, statements by Manhattan Project physicists reaffirm the existence of such a mentality. Hans Bethe asserted, "Since [the scientists] don't have, *a priori*, a professional interest one way or the other, they should be able to consider non-military

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[147]Gilpin, 4
[148]Sherwin, *A World Destroyed*, 94-95
[149]Ibid., 21
[150]Simpson, 245
[151]Edward Shils, "Freedom and Influence," *The Bulletin of Atomic Scientists*, (January 1957): 18

factors, political as well as ethical ones. Their opinion is therefore valuable in arriving at a balanced decision."[152]

When the physicists entered the political realm, they did not adjust their methods, assumptions, or beliefs. Political problems therefore appeared comparable in complexity and dimension to problems posed by natural phenomena. In the same vein, Gilpin has argued that the physicist "believes *a priori* that there is a solution to be found to every problem and he expects to find the solution to the problem of atomic weapons just as he expects to find the solution to a problem in physics...."[153] The Manhattan Project scientists saw the political world as a system with variables to be manipulated. If only the facts of this system could be isolated, any rational being could order them to attain stability and mutual benefit. That is, the physicist "accepts the notion that as the social world is the creation of man himself it is within man's power to change those things which are contrary to the common interest of mankind, providing only that mankind is willing to use his reason."[154] The Manhattan Project physicists, believing they would make fine politicians because of their scientific framework of thought, decided that with the stakes so high it was time to influence the decision-makers.

In addition to the claim that scientists make good politicians, the physicists argued that, given their contemporary historical situation, politics dearly needed to be "scientized." Atomic weapons, claimed the nuclear physicists, made violent international conflict absurdly destructive. Hence the need for greater emphasis on internationalism than nationalism. This fit well with the scientific tenets of openness and free exchange of information that had prevailed within the numerically small but geographically diverse community of physicists before the war. Atomic energy, wrote Niels Bohr, "should be regarded not merely as a new danger added to a perilous world, but rather a forceful

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[152]In Gilpin, 18
[153]Gilpin, 29
[154]Ibid., 30

reminder of how closely the fate of all mankind is coupled together."[155] For Bohr, writes Martin Sherwin, security "was only possible in an open world." Sherwin continues, "In essence, his argument was based on the proposition that the values of science... had to govern international relations after the war, if the accomplishments of scientists were not to destroy the world."[156] The physicists may have conceded that science could not solve the problems posed by nuclear weapons, but they clung to the belief that the *logic* of science would prevail. Essentially they believed that a "scientized" world needed a "scientized" politics to function smoothly.

In order to prevent a nuclear arms race the physicists believed an international organization of cooperation and open communication was necessary. To these ends, Bohr suggested that the scientific belief in objectivity and uninhibited collaboration would sow the seeds for renewed friendly political relations. Scientists would, in a sense, serve as political ambassadors and use their professional connections to foster an international organization. Bohr drafted memoranda to various diplomats and statesmen promoting the concepts of mutual confidence and international communication. In a letter to Roosevelt in July 1944, he argued that the divisive issues surrounding atomic energy could be resolved with "whole-hearted cooperation and open exchange of ideas and information between all nations."[157] Four months before the bomb was dropped on Hiroshima, he reaffirmed his belief that the abuse of atomic energy could be prevented through "early consultations between the nations allied in the war about the best ways jointly to obtain future security."[158] In the early 1940s, the internationalism of physics seemed to offer just what national politics demanded. Los Alamos scientist George Kistiakowski commented, "Science also provides a sometimes unique opportunity for cooperative endeavors that can contribute in a major way to the reduction of tension between nations and, more

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[155]Bohr, "A Challenge to Civilization," 364
[156]Sherwin, *A World Destroyed*, 94
[157]Niels Bohr, "For an Open World," 213
[158]Ibid., 214

positively, to close relations between the U.S. and other countries."[159] In almost repentant fashion, Bohr offered the services of the physicists to help clean up the political mess they had helped to create. In the pursuit of international control, he wrote,

> 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.[160]

Journalist Robert Jungk asserted, "Bohr hoped for the rise of a family of nations through the spirit of a reunited family of atomic scientists."[161] However, the physicists offered not only the spirit of their profession but its very avenues that had been established for expressly scientific pursuits. The politics of the nuclear age would employ not only the logic of science but also the scientists themselves as ambassadors of the international spirit.[162] Grasping for the only visible hope, the physicists invested dearly in the promise of 'scientized' politics. Met Lab scientist Eugene Rabinowitch provided a prime example:

> Because of the similarity in outlook of scientists all over the world, their increased influence on the national policies of the different countries should increase the ease of international communication. Their greater than average capacity for abstraction and generalization will favor policies based on long-range, rational planning - policies in which the enlightened self-interest of individual nations or political systems is bound to become coordinated with the common well-being of mankind.[163]

The final major consequence of scientific logic in the political realm is that it rejected war as a means of conflict resolution or problem-solving. Albert Einstein argued that the atomic bomb created no *new* problem; it merely made old problems more urgent. The

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[159]In Gilpin, 32

[160]Niels Bohr, "Memorandum to President Roosevelt, July 1944," in Robert Jungk, *Brighter than a Thousand Suns* (New York: Harcourt, Brace and Co., 1956), 346

[161]Jungk, 174

[162]Physicist Theodore Hall, for example, remembered "reading that Bohr tried to persuade Roosevelt to send him to Stalin to work out a peace-directed alliance and policy." In Joseph Albright and Marcia Kunstel, *Bombshell: The Secret Story of America's Unknown Atomic Spy Conspiracy* (New York: Times Books, 1997), 90

[163]In Gilpin, 31

explosive power of the nucleus, he said, was a quantitative, not qualitative, change. War was now more dangerous but just as irrational as it had ever been.[164] The same ideas were promoted by John Simpson:

> It has been difficult to maintain perspective on the problem and realize that atomic energy is only a part of the *main* problem of preventing war throughout the world. It was also difficult at times to realize that no *new* problems existed. Atomic energy had merely intensified the old ones by adding... unique factors.[165]

The point was that war never would, nor did it ever, serve mankind. The physicists hoped that the atomic bomb would shock the world into realizing the futility of war. Years later Linus Pauling would reaffirm his belief that because of the escalated power of man over nature, "we are truly forced into abandoning war as the method of solution of world problems, the method of resolution of disputes among nations." "The time has now come," he continued, "for man's intellect to win out over the brutality, the insanity of war."[166] Explicit in Pauling's argument is the assumption that war shows man at his worst, his least rational, and therefore his least human. Concluded Strickland, "The futility of war is especially clear to scientists, for war, as a method of solving problems, is out of harmony with the rational spirit and objective methods of science."[167]

Scientific ethos holds that all problems have rational answers. War is not one of those answers and is therefore irreconcilable with scientific thinking. Pauling asserted that scientists "believe that international problems should not be solved by war, but by the application of man's power to reason - through arbitration, negotiation, international agreements, international law...."[168] For the scientists, the "problem" of the bomb was like the "problem" of an unsolved equation. Consequently, they went about acquiring the

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[164]Albert Einstein, "Einstein on the Atomic Bomb," *The Atlantic Monthly*, (November 1945): 43

[165]Simpson, 246

[166]Linus Pauling, *No More War* (New York: Dodd, Mead, and Co., 1985), 13

[167]Strickland, 14

[168]Pauling, 164. Similar cultural assumptions persist to this day. For example, Norman Ramsey commented in 1998, "force is a terrible way of settling problems." Norman Ramsey, interview with author, 1 January 1998, Cambridge, MA

knowledge needed to solve the equation. As a first step, Pauling proposed a program of "research for peace." He encouraged physicists of the Manhattan Project to strive "in every possible way to discover what the facts are, to learn more and more about the nature of the world, and to use all information that can be obtained in the effort to find the solution to difficult problems."[169]

Solving problems by fighting (as opposed to reasoning) was not in the repertoire of the physicists. It was irreconcilable with their beliefs and methods. Had it not been for Hitler and German aggression, the scientists would never have involved themselves in the processes of weapons construction; it simply was not in their nature. Circumstance put the nuclear physicists in an awkward position. In the summer of 1945, Los Alamos scientist Norman Ramsey found himself on the island of Tinian assembling the first bomb that would ever be used for its designed purpose. When asked about this conflict of interests Ramsey explained the "terrible situation: it was disconcerting for several reasons to work on military things. One was I wasn't intrinsically interested in that area."[170] It was with such prejudices that the scientists began their crusade for international organization and control of the atom. As stated earlier, the scientists believed the bomb created both a peril and a hope. The hope was of an international organization to control atomic weapons and help prevent the future outbreak of war. Such visions of world government and global cooperation flowed naturally from scientific ethos and were formulated into a vague plan for the postwar world.

Path of Peace

Internationalism as a plan was present in the scientists' minds from the early years of the Manhattan Project. For some scientists the hope that the bomb might engender more cooperative endeavors encouraged them to join the Project in the first place. Eugene Wigner wrote that his colleagues "realized that, should atomic weapons be developed, no

[169]Pauling, 195

[170]Ramsey, interview

two nations would be able to live in peace with each other unless their military forces were controlled by a common higher authority." He believed that the controls abolishing atomic warfare would be strong enough to abolish all other forms of warfare. "This hope," Wigner asserted, "was almost as strong a spur to our endeavors as was our fear of becoming the victims of the enemy's atomic bombings."[171] Early considerations of the postwar implications of nuclear weapons led other physicists to take action as well. Niels Bohr was constantly concerned with postwar security and acted to ensure that atomic energy "is used to the benefit of all humanity and does not become a menace to civilization."[172] As early as 1942, scientists such as Szilard and Bohr conveyed their concerns and hopes to the statesmen in charge.[173]

Niels Bohr took a particular interest in sharing scientific information with the Soviets before the first use of the bomb. In a memo to President Roosevelt on July 3, 1944, Bohr argued that not to tell the Russians "would mean [the] loss of a unique opportunity to take the initiative and to forestall an atomic arms race."[174] Bohr stressed that postwar planning must begin early and be approached with thoughtful dedication because Soviet perceptions of American intentions were key to future cooperation. Bohr was also attempting to reach the statesmen through personal connections and word of mouth. In 1944 he convinced Supreme Court Justice Felix Frankfurter that unless a plan for the international control of atomic energy was made immediately, an atomic armaments race would be inevitable.[175] Consequently, Frankfurter, "infected with [Bohr's] solicitude," went to the White House on April 18, 1945:

> I saw the President and told him in full detail... the central worry of Professor Bohr, that it might be disastrous to the whole endeavor of

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[171]Eugene Wigner, "The Atomic Age," *Saturday Review of Literature*, (November 17, 1945): 28

[172]Sherwin, *A World Destroyed*, 92

[173]Lawrence Wittner, *One World or None* (Stanford: Stanford University Press, 1993), 22

[174]In Smith, "Behind the Decision," 292

[175]Martin Sherwin, "The Atomic Bomb and the Origins of the Cold War," *American Historical Review*, (October 1973): 954-955

> achieving sound international relations with Russia, if Russia should learn on her own about [the atomic bomb] rather than that the existence of [the atomic bomb] should be utilized by this country and Great Britain as a means of exploring the possibility of effective international arrangements with Russia.[176]

There is evidence that the activism of physicists like Bohr was meeting with some success. High-level presidential advisers took note of the scientists' worries and discussed the issues with the President and among themselves. Vannevar Bush recorded that at a meeting on September 22, 1944,

> The President, in fact, felt that legislation [on international control of atomic energy] should be obtained while the war was on.... Both Conant and I feel that the very broad world-wide implications of this subject need careful evaluation, and that while good relations with Britain are certainly important in this it is certainly far from being the entire story.[177]

Furthermore, Bush and Conant argued directly to Roosevelt that relations with Britain should not impede the release of "basic information" to the Soviets aimed at legislating international control.[178] The two then arranged a meeting with Secretary of War Stimson on September 25, 1944, at which they advocated postwar control. Stimson asked them to draw up a report and, five days later, he received a memorandum much akin to the Franck Committee Report. It argued that because of the bomb's magnitude, the United States' present advantage, the fact that secrecy could not be maintained in the future, and that bipolar control could spark an arms race, a program of free, international exchange of scientific information should be initiated.[179] For these reasons, historians such as Alice Smith have argued that seasoned administrators and political "realists" like Conant and Bush put faith in the scientists' claim that the unprecedented threat of the atomic bomb

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[176]Felix Frankfurter, "Private Memo, April 18, 1945," in Jonathon Fanton et al., 67-68

[177]Vannevar Bush, "Memo of Conference, September 22, 1944," in ibid., 72-73

[178]Richard Hewlett and Oscar Anderson, *The New World, 1939/1946* (Pennsylvania: Pennsylvania State University Press, 1962), 326

[179]Vannevar Bush and James Conant, "Memo on Atomic Energy to Secretary of War, September 30, 1944," in Fanton et al., 78-79

along with a knowledge of that threat provided both the need and possibility for international cooperation and control.[180]

Stimson was impressed and affected by the arguments offered. On March 15, 1945, he took action: "I told [Roosevelt] that [a postwar atomic plan] must be settled before the first projectile is used and that he must be ready with a statement to come out to the people on it just as soon as that is done. He agreed to that."[181] There are also indications that Stimson began to feel a responsibility to let the scientists know that he understood and agreed with their arguments. In a diary entry for May 31, 1945, recounting that day's crucial Interim Committee Meeting with the scientific panel, he wrote,

> I told [the scientists] that we did not regard [the bomb] as a new weapon merely but as a revolutionary change in the relations of man to the universe and that we wanted to take advantage of this; that the project might even mean the doom of civilization or it might mean the perfection of civilization. I think we made an impression upon the scientists that we were looking at this like statesmen and not like mere soldiers anxious to win the war at any cost.[182]

Stimson's comments, asserts Smith, indicate "that he had up to this point been fairly accurately informed of what the scientists were thinking."[183]

However, the many attempts to sway presidential opinion were all in vain. While Roosevelt assured his subordinates that he took their arguments seriously and was concerned for the postwar world, he kept to himself the conclusions of his numerous meetings with Churchill. Writes Sherwin, "In 1943 [Roosevelt] rejected the counsel of his scientific advisers and began to consider the diplomatic component of atomic-energy policy in consultation with Churchill alone." That is, he adopted Churchill's "monopolistic, anti-Soviet views."[184]

The Question of First Use

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[180]Smith, *A Peril and a Hope*, 14

[181]Henry Stimson, "Diary Entry, March 15, 1945," in Fanton et al., 86

[182]Henry Stimson, "Diary Entry, May 31, 1945," in ibid., 121

[183]Smith, "Behind the Decision," 295

[184]Sherwin, "The Atomic Bomb," 948

The question facing the scientists was how to conduct the war so as to create favorable conditions for postwar international cooperation. The first use of the bomb, they correctly reasoned, would set the tone for its future. Not surprisingly, some Manhattan Project physicists advocated using the atomic bomb to end the war. Their argument was based upon the scientific tenet that conclusions cannot be drawn until all data are in. That is, postwar peace was unattainable unless the peoples of the world learned what the new bomb meant. Met Lab director Arthur Compton wrote to Stimson in June 1945, "If the bomb were not used in the present war, the world would have no adequate warning as to what was to be expected if war should break out again."[185] Similarly, Arthur Dempster dissented from the Franck Report's hope to avoid an atomic bomb drop because he believed that the bombing would serve as a basis for education and foster the public perception of a need for change.[186] It is quite clear that the scientists were acutely aware of how their research would affect the postwar peace. Summarizing a conference in Los Alamos, Robert Wilson wrote,

> The thought most expressed at our discussion was that the U.N. could be set up on a proper basis only in the knowledge of the reality of nuclear weapons; that the only way this reality could become manifest would be by actually exploding a bomb; that our responsibility for a stable peace required that we work as hard as possible to demonstrate a bomb before the opening of the charter meeting scheduled to be held in San Francisco in April of 1945.[187]

The question of first use did produce some unexpected answers. In an anomalous statement given his anti-armament stance, Leo Szilard advocated use in a January 1944 letter to Vannevar Bush: "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." Concerning international control he continued, "It will hardly be

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[185]In Ronald Powaski, *March to Armageddon* (New York: Oxford University Press, 1987), 16

[186]Smith, *A Peril and a Hope*, 47

[187]In Richard Lewis and Jane Wilson and Eugene Rabinowitch, *Alamogordo Plus Twenty-Five Years* (New York: Viking Press, 1970), 72

possible to get political action along that line unless... atomic bombs have actually been used in this war and the fact of their destructive power has deeply penetrated the mind of the public."[188] Others shared this opinion. In 1970 Eugene Rabinowitch reflected, "Many thought that the shock of these two holocausts would awaken men to a realization of the obsolescence of war and make them aware of the need to establish a viable, permanently peaceful world system."[189]

Other physicists, however, believed that postwar international control of atomic weapons began with *not* dropping the bomb. Such a use, they thought, would jeopardize the trust necessary to create an era of global peace. Rabinowitch, who drafted the Franck Report, argued against an atomic bomb drop because, he asserted, it would begin an armaments race and prejudice support against international control.[190] Proposing alternate first steps, Niels Bohr suggested in July 1944 that the United States use its temporary monopoly of scientific information to initiate peace talks: "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."[191] Six years later, Bohr reflected on how crucial the first steps were. He maintained that the U.S. monopoly of atomic information put the nation "in a special position to take the initiative by a direct proposal of full mutual openness."[192]

The argument that dropping the bomb could jeopardize U.S. moral legitimacy and therefore postwar cooperation was drawing the attention of leading statesmen and diplomats. By spring 1945 mid-level government officials and even military leaders were questioning the costs and benefits of using atomic weapons against Japan. Some concluded that it was not worth "shocking world opinion" in order to end the war.[193] For

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[188]Szilard, *Facts*, 163
[189]In Lewis et al., 8
[190]Smith, *A Peril and a Hope*, 45
[191]In Jungk, 346
[192]Bohr, "For an Open World," 216
[193]Wittner, *One World or None*, 28

example, Undersecretary of the Navy Ralph Bard dissented from the Interim Committee's recommendation to use the atomic bomb and argued that to help Japan capitulate by altering the terms of surrender would preserve the United States' place "as a great humanitarian nation."[194] Secretary of War Stimson agreed that the greatest chance for peace in the future was "the reputation of the United States for fair play and humanitarianism."[195]

Aside from the anomaly mentioned above, Leo Szilard frequently advised the government not to use the bomb. He acknowledged that bombing might end the war and was a legitimate military decision, but insisted that it would injure U.S. global status. In a petition on July 17, 1945 he warned the President, "Thus a nation which sets the precedent of using these newly liberated forces of nature for purposes of destruction may have to bear the responsibility of opening the door to an era of devastation on an unimaginable scale."[196] He argued that a violation of humanitarian obligations of restraint in the use of revolutionary weapons would lead to a weakened moral position and the consequent forfeiture of opportunities for international control. He advised the government to make its decision "in the light of this... as well as all the other moral responsibilities which are involved."[197] The Franck Committee report, however, provided the strongest argument against a wartime use of the bomb. It asserted that, given the goal of

> an international agreement on the prevention of nuclear warfare - the military advantages and the saving of American lives achieved by the sudden use of atomic bombs against Japan may be outweighed by the ensuing loss of confidence and by a wave of horror and repulsion sweeping over the rest of the world and perhaps even dividing public opinion at home.[198]

The report went on to conclude in no uncertain terms:

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[194]In Ronald Schaffer, *Wings of Judgment* (New York: Oxford University Press, 1985), 165

[195]In ibid., 167

[196]Leo Szilard, "A Petition to the President of the United States, July 17, 1945," TMs (photocopy)

[197]Szilard, *Facts*, 212

[198]In Morton Grodzins and Eugene Rabinowitch, *The Atomic Age* (New York: Basic Books, 1963), 24

> If the United States were to be the first to release this new means of indiscriminate destruction upon mankind, she would sacrifice public support throughout the world, precipitate the race for armaments, and prejudice the possibility of reaching an international agreement on the future control of such weapons.[199]

Although it is unclear if Stimson ever read the Franck Report, there is evidence that he absorbed its ideas through other interaction with the scientists. In a memo to Truman on April 25, 1945 he wrote, "If the problem of the proper use of this weapon can be solved, we would have the opportunity to bring the world into a pattern in which the peace of the world and our civilization can be saved."[200]

Concern over how the bomb was to be used and its effect on postwar international relations rose through the hierarchy of scientists in upper administrative positions. They advocated use with precautions, such as warnings, so as to end the war quickly without prejudicing too much the spirit of international trust necessary for postwar cooperation and organization. In spring 1945 Arthur Compton asked the scientific panel to recommend to the Interim Committee a plan for the bomb's use. After a meeting in Los Alamos on June 16, the panel released its "Recommendations On the Immediate Use of Nuclear Weapons":

> This [initial] use, in our opinion, should be such as to promote a satisfactory adjustment of our international relations. To accomplish these ends we recommend that before the weapons are used not only Britain, but also Russia, France, and China be advised that we have made considerable progress in our work on atomic weapons, that these may be ready for use during the present war, and that we would welcome suggestions as to how we can cooperate in making this development contribute to improved international relations.[201]

The scientists were coming to grips with the implications of the bomb's first use for the postwar era. Often this involved heated debate. J. Robert Oppenheimer opened a fiery

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[199]In ibid., 27

[200]In Fanton et al., 96

[201]J. Robert Oppenheimer et al., "Scientific Panel: Recommendations on the Immediate Use of Nuclear Weapons," in Sherwin, *A World Destroyed*, 304

argument with Szilard in May 1945 with, "The atomic bomb is shit." By that he meant that it would make "a very big bang - but it is not a weapon which is useful in war." Szilard writes, "[Oppenheimer] 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." To Szilard, though this seemed reasonable, "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?" Szilard responded, "They'll understand it only too well."[202] That is, Szilard realized that the parting shot of World War II was also the opening exchange of the Cold War. In his petition to Truman in July, 1945, Szilard pleaded that the Japanese be warned of the bomb and given a chance to surrender, and even then the use of the bomb should only follow a "serious consideration of [the] moral responsibilities involved."[203]

All this is to say that the Manhattan Project physicists were more concerned with postwar peace than wartime decisions, but they recognized that the two were related. Therefore, they were offended when statesmen referred to one without acknowledging the other. It was even worse when that statesman was the President. Citing Truman's statement in the August 7, 1945 New York Times, Szilard said, "To put the atomic bomb in terms of having gambled two billion dollars and having 'won' offended my sense of proportions, and I concluded at that time that Truman did not understand at all what was involved."[204]

The Bomb of Peace

The physicists knew that the atomic bomb could cause unprecedented damage. However, they believed that this knowledge could help bring about the renunciation of

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[202]Szilard, *Facts*, 185

[203]Ibid., 211

[204]Leo Szilard, "President Truman Did Not Understand," *U.S. News and World Report*, (August 15, 1960): 71

war as an institution. The "good news of damnation" was that the new weapon might be so powerful as to make war obsolete. The physicists of the Manhattan Project saw an opportunity to abolish man's deadliest game.

This ironic twist was not, however, an original one. In 1892 the inventor of dynamite and the man whose award was held by numerous Manhattan Project scientists, Alfred Nobel, wrote, "My factories may make an end to war sooner than your congresses."[205] Spencer Weart asserts that "The scientists' dream of inventing weapons to deter war [is] a persistent part of the nuclear legends." It seems that such dreams may have resulted from a mixture of mild guilt and overwhelming faith in scientific ethos. Weart continues, "Belief in the virtues of science and technology could be so strong that even a threat of destruction might sound like a promise of peace."[206] In any case, the scientists did believe that the bomb they were building could put an end to the institution of war. Richard Rhodes has even implied that many physicists joined the Project just because of this: "To recruit his remarkable team, Oppenheimer had whispered that the bombs they would build would not only end World War II but might also end war itself."[207] Stimson himself argued that the "bomb could bring peace."[208] How was this possible?

Atomic weapons were so powerful that they redefined the scale of possible destruction. Writes Rhodes, "Small... and portable, with essentially unlimited destructive capacity, nuclear weapons deny advantage to aggressor and defender alike."[209] This

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[205]In Weart, 27-28. The hypothesis that war had become too dangerous to fight had been proposed "upon the introduction of previous 'ultimate' weapons, such as gunpowder, the rifle, ironclad ships, the machine gun, the tank, aircraft and poison gas, only to have them included in the arsenals of the day - and used." Lawrence Badash, *Scientists and the Development of Nuclear Weapons: From Fission to the Limited Test Ban Treaty, 19393-1963* (New Jersey: Humanities Press, 1995), 1

[206]Weart, 28. Likewise, in 1681 John Donne celebrated the virtues of cannons because, "since their introduction, wars were shorter and hence less deadly and destructive." Alex Roland, "Hephaestus and History: Scientists, Engineers, and War in Western Experience," in Carl Mitcham and Philip Siekevitz, *Ethical Issues Associated with Scientific and Technological Research for the Military* (New York: The New York Academy of Sciences, 1989), 58

[207]Richard Rhodes, "The Atomic Bomb," *Newsweek Extra*, (Winter 1997-1998): 58

[208]Henry Stimson, "The Decision to Use the Atomic Bomb," *Harper's Magazine*, (February 1947): 100

[209]Rhodes, "The Atomic Bomb," 60

redefined scale of destruction meant that civilization, never mind individual nations, was faced with a real threat: the nuclear 'first strike' would spur a counter-strike, and both parties would experience untold damage. The one bomber that penetrates the defense would level a city, not a city block, and the effects of radiation would linger for months after the actual explosion. The scientists hoped such a doomsday scenario would lead to a popular recognition of the futility of war. Eugene Rabinowitch declared, "The bomb has reduced *ad absurdum* the traditional concept of war as means for achieving political objectives."[210] War itself, it seemed, had become obsolete.

Met Lab chemist Glenn Seaborg asserted that this view was the naive result of the way scientists pose problems:

> Perhaps it was natural that many of us, recognizing from close at hand the significance of nuclear weapons, set out to advise the world that nuclear war was out of the question. To us, the data were unequivocal, the conclusions indisputable, and the course of action clear.[211]

That is, where scientists perceived an unwinnable war, they reasoned that no one would enter into one. It followed for the scientific mind of the 1940s that the various powers would establish some form of international organization to prevent such a war.

The oxymoronic term "weapon of peace" was based on an irony in which the scientists saw great opportunity. As Alice Smith has pointed out, the scientists' movement essentially struggled "to control the forces which scientists had struggled so hard to unleash."[212] John Simpson described the Met Lab seminars in 1945 as attempts to plan how to use the bomb's "influence in attaining its own control."[213] Ever the optimist, Niels Bohr asserted that the "Advancement of science [has] created opportunities for a future [of] harmonious international cooperation."[214] Bohr's tenor was not, however, indicative

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[210]Rabinowitch, 5
[211]In Gilpin, 3
[212]Alice Kimball Smith, "Los Alamos," in Lewis et al., 38
[213]Smith, "Behind the Decision to Use the Atomic Bomb," 293
[214]Bohr, "For an Open World," 214

of the scientists' mood. Discarding the euphemisms, Philip Morrison wrote, "We have a chance to build a working peace on the novelty and terror of the atomic bomb."[215] It was *because* of the terror, not despite it, that the bomb appeared to the scientists of the Manhattan Project to provide civilization with its greatest chance to abolish its least honorable institution.

Anachronistic Nationalism

In addition to ending war, the scientists believed that the bomb could bring about the demise of harmful and divisive nationalism. This hope, like so many others, arose from the scientific tenets of internationalism and cooperation. And once again, it was hardly an original idea. H.G. Wells' The World Set Free, published in 1914, describes the destruction of Germany by atomic bombs to end a European war in the 1950s. Paul Boyer describes Wells' depiction of the aftermath:

> Terrified, the nations of the world outlaw war and set up an international organization to enforce peace. Warfare had already become anachronistic as a means of settling international disputes, Wells says, but people "did not see it until the atomic bombs burst in their fumbling hands." Not only in his prediction of the atomic bomb, but also in his anticipation of the uses to which its horror would be put by advocates of peace and international cooperation, Wells... proved himself an uncanny prophet.[216]

Leo Szilard was an apostle of Wells' message, and copies of The World Set Free could often be found around the Met Lab. The two men spread the message that international conflict could prove disastrous when mixed with weapons of mass destruction.

This message was adopted by Szilard's colleagues. Edward Teller wrote, "It has become necessary to create a lawful world community.... Most people agree that our globe has become too small, too crowded, too dangerous to accommodate many sovereign governments - each of them a law unto itself."[217] Niels Bohr agreed that the development of new weapons demanded new international relationships. A universal

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[215]Philip Morrison, "Beyond Imagination," *New Republic*, (February 11, 1946): 180

[216]Paul Boyer, *By the Bomb's Early Light* (Chapel Hill: University of North Carolina Press, 1985), 75

[217]Teller, vii

agreement to prevent unwarranted use of these weapons will "demand the abolition of barriers hitherto considered necessary to protect national interests but now standing in the way of common safety against unprecedented dangers."[218] He acknowledged the inertia of the situation (national barriers) but asserted that the benefits (international safety) were overwhelming. Linus Pauling combined the arguments that both war and nationalism were institutions of the past. Civilization, he asserted, has moved toward "a world in which war and the threat of war no longer have a rightful place as the instrument of national policy. We must all, including the diplomats and national leaders, change our point of view. We must recognize that extreme nationalism is a thing of the past."[219] J. Robert Oppenheimer reiterated Pauling's point:

> [The scientists] have thought that this spectacular and terrifying technological development would force upon the people of this country and all the war-weary peoples of the world a recognition, first, of how imperative it has become to avert future wars, and second, how the cooperation and understanding between nations which has seemed desirable for so long has become a desperate necessity.[220]

Science appeared to offer a solution to global diplomatic problems. Free exchange of information and international cooperation seemed to the physicists the only way out of the dilemma created by the Manhattan Project. Politics, they argued, needed to be "scientized":

> Scientists tend to believe that scientific advance is taking mankind into a new period of history where the old rules of the statesmen no longer apply. They believe further that the scientist has a special understanding of this emerging new world which his science is creating; they envision the development of a new set of political rules based on the facts of a truly scientific age.[221]

Only when global politics resembled an idealized scientific community, the physicists assumed, would civilization be safe. Because, as Bohr said, barriers "thought necessary

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[218]Bohr, "A Challenge to Civilization," 363

[219]Pauling, 208

[220]J. Robert Oppenheimer, "Atom Held Peace Agent," *The New York Times*, (August 9, 1945): 8

[221]Gilpin, 29

for the defense of national interests now obviously stand in the way of common security," it was necessary, as Albert Einstein wrote, to "progressively immunize nationalism."[222]

Rising Internationalism

The Manhattan Project physicists believed the only way for civilization to survive in the nuclear age would be through international cooperation and control of the atom. Nations would have to sacrifice secrets and monopolies, but there really did not appear to be another option. In his memorandum to President Roosevelt in July 1944, Niels Bohr set out the basic first steps for such a plan:

> The prevention of a competition prepared in secrecy will therefore demand such concessions regarding exchange of information and openness about industrial efforts, including military preparation, as would hardly be conceivable unless all partners were assured of a compensating guarantee of common security against dangers of unprecedented acuteness.[223]

The scientists argued that only if the United States' intentions were made clear would the Soviets join in fostering an open environment. They firmly asserted that unless free exchange of scientific information (a given before World War II) was reestablished, suspicions of American intentions would spur unhealthy competition and jeopardize mutual security. In June 1945 George Harrison, special consultant to Henry Stimson, wrote to his superior,

> It is interesting that practically all of the scientists... feel great concern for the future if atomic energy is not controlled through some effective international mechanism. Accordingly, most of them believe that of the effective steps in establishing such a control is the assurance that, after this war is over, there shall be a free interchange of scientific opinion throughout the world....[224]

These ideas were taken seriously in high-level diplomatic meetings. At the critical Interim Committee meeting on July 19, 1945 Bush and Conant presented a memorandum

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[222]Bohr, "For An Open World," 216. Einstein in The Federation of Atomic Scientists, *One World Or None*, 77

[223]In Jungk, 345

[224]George Harrison, "Memo to Stimson, June 26, 1945," in Fanton et al., 160

"dealing with the question of establishing in the United Nations organization some mechanism for international control in this field [atomic energy].[225] Two days later, Stimson, as chair of the Interim Committee, registered both the issue and the seriousness of the moment in his diary:

> Upon successful control of [atomic] energy depends the future successful development or destruction of the modern civilized world. [The Interim Committee] has pointed this out in no uncertain terms and has called for an international organization for that purpose.[226]

The scientists saw a crossroads: the nations of the world could choose the path of fear and competition and risk the perils of a nuclear war, or they could forfeit a measure of national autonomy and seek peace through global communication and cooperation. As Bohr stated in a March 1945 letter to the President (a letter that was an almost verbatim duplicate of another sent in July 1944), "Measures [must be] taken to prevent competition of formidable armaments and establish international control."[227] Less than a year after the bombings of Hiroshima and Nagasaki, Albert Einstein made perhaps the most eloquent appraisal of the prospects for a new era of global unity:

> The atomic bomb has altered profoundly the nature of the world as we knew it, and the human race consequently finds itself in a new habitat to which it must adapt its thinking. In the light of new knowledge, a world authority and an eventual world state are not just *desirable* in the name of brotherhood, they are *necessary* for survival. Today we must abandon competition and secure cooperation.[228]

The scientists were ready to dedicate their time, energy, and professional channels of communication to the formation of an international organization, if not world government, that would safeguard the nations of the planet from mutual antagonisms and nuclear weapons. Writes one historian of the movement, the scientists were committed to

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[225]R. Gordon Arneson, "Notes of Interim Committee Meeting, July 19, 1945," in ibid., 197

[226]Henry Stimson, "Diary Entry, July 21, 1945," in ibid., 208

[227]Bohr, "For An Open World," 213

[228]Albert Einstein, "The Real Problem is in the Hearts of Men," *The New York Times Magazine*, (June 23, 1946): 7

working towards "an unprecedented, international political morality, the pinnacle of which would be the abolition of war, and a totally new concept of limited national sovereignty."[229] Science had created an urgent situation that *it* could not resolve. The *scientists*, on the other hand, believed they knew the way out. Ten days after the bomb was dropped on Nagasaki, Oppenheimer wrote to Stimson,

> [Safety] can be based only on making future wars impossible. It is our unanimous and urgent recommendation to you that, despite the present incomplete exploitation of technological possibilities in this field, all steps be taken, all necessary international arrangements be made, to this one end.[230]

Reality

Obviously, the scientists' hopes for international control of the atom and reduced sovereignty were never realized. Roosevelt had made commitments to an Anglo-American monopoly before the scientists began their crusade in earnest, and the nature of international diplomacy probably would have crushed their dreams in any case. Truman, many historians have argued, merely continued Roosevelt's policies with a firmer voice. Furthermore, the obstacles that stood before an international armaments agreement and global organization were not simply issues of trust and communication, but involved the imbalance of state power and forces of patriotism and national identity. Consequently, the reaction to the physicists' requests at the highest levels was often quite sharp. In response to Bohr's persistent arguments Churchill and Roosevelt wrote, "The suggestion that the world should be informed regarding Tube Alloys [the codename for the bomb], with a view to an international agreement regarding its control and use, is not accepted. The matter should continue to be regarded as of utmost secrecy"[231]: national interests and

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[229]Martha Kessler, "The Development of Moral and Political Consciousness in the Physical Scientists" Community" (MA Thesis, University of Oklahoma, 1970), 23

[230]J. Robert Oppenheimer, "Letter to Secretary of War, August 17, 1945," in Fanton et al., 255

[231]Franklin D. Roosevelt and Winston Churchill, "Aide-Memoire, September 18, 1944," in ibid., 70

international politics and diplomacy had no room for scientific idealism. With the detonation of nuclear weapons over Hiroshima and Nagasaki, such hopes met their death.

Despite this "loss," military, diplomatic, and scientific experts convinced by the arguments of the Manhattan Project physicists registered their disappointment. Admiral William Leahy wrote in a 1950 memoir, "My own feeling was that in being the first to use it, we had adopted an ethical standard common to the barbarians of the Dark Ages."[232] Likewise, the Swiss Legation in charge of Japanese interests approved a scathing letter written by the Japanese government to the U.S. Department of State one day after the Nagasaki bomb was dropped: "The bombs in question, used by the Americans, by their cruelty and by their terrorizing effects, surpass by far gas or any other arm the use of which is prohibited by the treaties for reasons of their characteristics." The use of the atomic bombs "alone means that [the Americans] have shown complete defiance of the essential principles of humanitarian laws, as well as international law."[233] It seems that the trust and good will the scientists believed was needed to build an international organization vanished with the wartime use of the bomb.

In many respects the scientists believed that the United States had lost its moral footing. Physicist Leo Szilard commented fifteen years later, "I thought it would be very bad to set a precedent for using atomic energy for purposes of destruction. And I think that having done so we have greatly affected the postwar history." The chance to take a non-offensive initiative in promoting a postwar agreement and peaceful worldwide organization was lost. Using the bomb, Szilard continued,

> made it very difficult for us to take the position after the war that we wanted to get rid of atomic bombs because it would be immoral to use them against the civilian population. We lost the moral argument with

[232]In Barton Bernstein, "Understanding the Atomic Bomb and the Japanese Surrender," *Diplomatic History*, (Spring 1995): 266

[233]Swiss Legation, "Memo to Department of State, August 11, 1945," in Fanton et al., 244

> which, right after the war, we might have perhaps gotten rid of the bomb.[234]

Just as the physicists had opened a Pandora's box with the discovery of sustainable nuclear fission, the United States had unleashed a weapon of indiscriminate destruction, and there was no turning back. The future of nuclear armaments would be one of competition, not cooperation. Two weeks after the bombing of Nagasaki, Stalin addressed his nation's top physicists: "A simple demand of you, comrades: provide us with atomic weapons in the shortest possible time. You know that Hiroshima has shaken the world. The equilibrium has been destroyed.... Provide the bomb - it will remove a great danger from us."[235] Whether a realistic opportunity for internationalism existed or not, the Manhattan Project physicists felt one had been missed. Niels Bohr, who did as much for the movement as any other individual, reflected: "I find it difficult to convey with sufficient vividness the fervent hopes that the progress of science might initiate a new era of harmonious cooperation between nations, and the anxieties lest any opportunity to promote such a development be forfeited."[236]

The Manhattan Project entailed the fusion of politics and physics. When the scientists realized neither would be the same again, they fought to protect civilization from the bomb, and physics from secrecy and political demands. In this fight the scientists themselves were politicized. However, in entering the political realm, the Manhattan Project physicists did *not* check their scientific ethos at the door. This ethos of openness, exchange, collaboration, and cooperation led the physicists to scientifically logical solutions to the problems the bomb created for international politics and civilization. Such an ethos does not, however, necessarily translate into politically viable solutions. This is what happened to the wartime atomic scientists' movement. Looking back on his own

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[234]Szilard, "President Truman did not Understand," 70

[235]In The Santa Barbara Study Group, "Your Career and Nuclear Weapons: A Guide for Young Scientists and Engineers," TMs (photocopy), 1984

[236]Bohr, "For An Open World," 215

experience, Philip Morrison had this to say: "On the whole they were not successful. They were very unsuccessful. And the reason is, I think, that they depend too much upon their logical structure and their reasoned position and that just isn't enough for politics."[237]

[237]Philip Morrison, interview with author, 6 January 1998, Cambridge, MA

Chapter Three: Political Science

The first chapter of this thesis described the collision of physics and politics. The development of international hostilities coincided temporally with great progress in understanding the nucleus of the atom. It was the haunting specter of Nazism that encouraged the physicists to direct their scientific investigations toward the goal of constructing a weapon of mass destruction. Numerous conscientious scientists subsequently acknowledged their right and their obligation to overcome the resistance of scientific purity and decided to voice concerns about the bomb and its effect on the postwar world. The second chapter explained the physicists' call for a 'scientized' politics. The ethos and assumptions of science pressed some physicists to propose the international control of the atom and a world government to prevent future global wars. This chapter will argue that nuclear physics and its practitioners did not exit the war unscathed: military demands of secrecy, combined with political demands of loyalty, took their toll and helped to politicize science. This politicization stripped the scientists of their right of free exchange of information and also called into question the allegiance of the physicists themselves. The political climate of the 1940s transformed the scientists' professional loyalty into national disloyalty.

The Early Stages of Secrecy

Whereas issues of loyalty revolve around allegiances and thereby focus on individuals, issues of secrecy revolve around controlling the flow of information and thereby place restrictions on the information itself. Even before the Manhattan Project existed, its scientists were working to control secrets. Lawrence Wittner claims this extended as far back as 1933, when Szilard conceived of a sustainable nuclear chain reaction.[238] Szilard apparently realized that given the pending hostilities, the knowledge of the possibility of

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[238]Lawrence Wittner, *One World or None: A History of the World Nuclear Disarmament Movement Through 1953* (Stanford: Stanford University Press, 1993), 5

such a weapon should be closely guarded. Consequently, in the late thirties he contacted the relatively few experts in the field and requested that they refrain from publishing relevant papers.[239] This informal ban continued with varying success (many of the less political physicists were hesitant to forfeit their due credit) until it was made formal by Project administrators. Physicists like Szilard found clever ways to assure secrecy without abandoning control. Writes Carol Gruber,

> Discoveries in nuclear physics in the 1930s suggested to him the desirability of using patents as a means of control, in a field that had enormous social implications. When [Szilard] conceived the idea of the chain reaction in late 1933, he applied for a patent and then assigned it to the British Admiralty, to keep the discovery from being disclosed.[240]

The physicists assumed that their clean record would ensure that the Manhattan Project's laboratories would be allowed to function like other scientific laboratories: with open discussion and free exchange of information. However, the wartime military administrators had other ideas. From the start, General Leslie Groves complained about "certain scientists of doubtful discretion and uncertain loyalty."[241] The physicists replied that the tight community of scientists was so trustworthy that withholding information from certain members would not increase Project security. Szilard wrote in February 1944, "Many of [the scientists] have known each other for over twenty years. It is inconceivable that any of these scientists should disclose technical information to the enemy."[242] The scientists strongly resisted the imposition of restrictions that were

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[239]Barton Bernstein, in Allen Greb et al., *Towards a Livable World: Leo Szilard and the Crusade for Nuclear Arms Control* (Cambridge: The MIT Press, 1987), xxx-xxxi

[240]Carol Gruber, "Manhattan Project Maverick: The Case of Leo Szilard," *Prologue*, (Summer 1983): 83. There is a long tradition of scientists hiding the seeds of possible military devices. In the seventeenth century British mathematician John Napier, the founder of the theory of logarithms, concealed his findings of a new, more destructive artillery shell. Likewise, Leonardo da Vinci destroyed personal designs he had made for a prototype of the modern submarine because he feared it could be used for destructive ends. See Rosemary Chalk, "Drawing the Line: An Examination of Conscientious Objection in Science," in Carl Mitcham and Philip Siekevitz, *Ethical Issues Associated with Scientific and Technological Research for the Military* (New York: The New York Academy of Sciences, 1989), 65

[241]Wittner, *One World Or None*, 31

[242]Leo Szilard, *Leo Szilard: His Version of the Facts* (Cambridge: The MIT Press, 1978). Laboratory restrictions caught the scientists off guard because "In the 1930s nuclear physics research was

antithetical to their profession. Writes sociologist Edward Shils, "The community of science is build around the free communication of ideas.... Without it science could not exist." Science is not simply the collection of results from isolated researchers over time and space. Instead, Shils writes,

> science is the product of a very informal community of many scientists working on similar or related problems - matching their own results with one another's or using them as the point of departure for their own investigation. This has been harshly misunderstood by the custodians of loyalty and security.[243]

However, when politics and science collide, governmental demands of national security take precedence over such freedoms. As Shils argues, it was when the U.S. government began to notice the prospects of nuclear physics "that the trouble began." Though the field would gain respect (and its companion, financial support), "it began to find itself working under rather embarrassing and constricting circumstances."[244] Spencer Weart asserts that Groves taught "the scientists a new meaning for the word 'security'":

> To Groves, security meant hundreds of miles of fences with armed guards and special passes, censorship of private letters, and Army counterspies complete with hidden microphones.... He had the ideas of control, secrecy, and safety all twisted up together, all knotted around and concealing the facts of atomic energy.[245]

However, Groves was too smart to accept criticism personally for restrictions he knew would offend the eccentric physicists. Instead, he used Robert Oppenheimer and other site directors as screens. Gerald Holton commented, "Groves shrewdly understood that... Oppenheimer had a weak point for authority and that he would therefore do what authority wanted and Groves played that magnificently: he knew how to make

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international in scope, with scientists from many different countries working to unlock the secrets of the atom. Information among this select group flowed easily during this decade." Herbert York and Allen Greb, "Scientists as Advisors to Governments," in Joseph Rotblat *Scientists, the Arms Race and Disarmament: A UNESCO/Pugwash Symposium* (London: Taylor & Francis Press, 1982), 84

[243]Edward Shils, *The Torment of Secrecy: The Background and Consequences of American Security Policies* (Illinois: Free Press, 1956), 176-177

[244]Ibid., 182

[245]Spencer Weart, *Nuclear Fear: A History of Images* (Cambridge: Harvard University Press, 1988), 119-120

Oppenheimer do what the war department wanted." Oppenheimer became more obsessed with regulations than the other leaders, but his example is nonetheless informative. Holton explained that when Groves asked that Los Alamos be regimented,

> Oppenheimer had the idea that all the scientists there would wear uniforms [and be] regarded as members of the war effort, and he had a uniform made by his favorite tailor. Of course when the people like Hans Bethe and Richard Feynman arrived they would have none of that.[246]

More troubling than the fences and military guards, however, was the compartmentalization that restricted the flow of information to a "need-to-know" basis. This threatened science by denying the opportunity for scientific connections to be made. With regard to the flow of information, governmental and scientific assumptions and preferences were irreconcilable. According to Martin Sherwin, compartmentalization "was not an unreasonable principle, indeed it was quite sound, from the security standpoint: the problem, however, was that it undermined many equally sound principles of scientific investigation."[247]

Scientific Discontent

The Manhattan Project had much stricter security regulations than its precursor, the Uranium Committee. Nevertheless, writes Gruber, Szilard believed that "the bomb would have been ready eighteen months sooner without the prohibitions on communication" that were levied by the National Defense Research Committee (the group in charge of the Uranium Committee).[248] Even when the Project began in earnest, military and political administrators could not agree with the scientists on how to build the bomb most efficiently. In the early 1940s, the physicists blamed their slow pace and frustration on the bureaucratization and compartmentalization of the Project. In an address to his colleagues in September 1942 (appropriately titled "What is Wrong with Us?") Szilard declared, "The

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[246]Gerald Holton, interview with author, 31 December 1997, Cambridge, MA.

[247]Martin Sherwin, *A World Destroyed: The Atomic Bomb and the Grand Alliance* (New York: Alfred Knopf, 1975), 59

[248]Gruber, 77

trouble at Chicago arises out of the fact that the work is organized along somewhat authoritative rather than democratic lines."[249] A postwar review panel appointed by the Atomic Energy Commission argued likewise: "[Compartmentalization] may work against progress since often one person or group will be in possession of information of great value to others."[250] In response to this problem, Oppenheimer decided to construct a Project site in the New Mexico desert where information could flow freely, "where the waste and frustration and error of the many compartmentalized experimental studies could be eliminated."[251]

On the other hand, Groves believed compartmentalization was needed to focus his eccentric physicists. He wrote, "If I brought [the scientists] into the whole project they would never do their job. There was just too much scientific interest, and they would just be frittering from one thing to another."[252] While Groves may have intended only to make "our people stick to their knitting,"[253] his required compartmentalization deeply offended the scientists. Because it defied the nature and autonomy of science, it was deemed an enemy of the discipline and its practitioners. Eugene Wigner, for example, asserted that his colleagues perceived these restrictions as signs of disrespect: "[They] thought that the purpose of compartmentalization was to keep us subordinate, to enhance control over us."[254] Physicists such as Szilard believed that such designs arose from prejudice or a "mistaken attitude on part of the administration towards the scientists... who form the basis of the project."[255] This distrustful violation of professional rights served to compound the physicists' frustration. Writes Shils, "The autonomy of science is

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[249]Szilard, *Facts*, 156

[250]In Walter Gellhorn, *Security, Loyalty, and Science* (New York: Cornell University Press, 1950), 39-40

[251]In Jonathon Fanton et al., *The Manhattan Project: A Documentary Introduction to the Atomic Age* (Philadelphia: Temple University Press, 1991), 30

[252]In Jean-Jacques Salomon, *Science and Politics* (Cambridge: The MIT Press, 1973), 165

[253]Gruber, 77

[254]In ibid., 77

[255]Szilard, *Facts*, 164

infringed... on when scientists are unable to discuss, publish, or circulate their work to other scientists...."[256] The dilemma was that such restrictions were necessary for wartime military work. That is, with regard to secrecy the physicists and the political-military administrators held irreconcilable cultural beliefs and pragmatic requirements. Historian Ellen Schrecker writes,

> Professionally, intellectually, politically, the two groups inhabited such different worlds that it would have been surprising had they not come into conflict. The hierarchical, authoritarian practices of the military alienated many scientists; the more iconoclastic among them had real trouble accommodating themselves to what they considered were the unreasonable regulations imposed by the security men.[257]

There is much evidence to support Schrecker's claim. For example, James Franck commented, "I know only too well that science and military organizations do not always mix and difficulties are bound to arise if one does not learn the art of only swearing in an empty room."[258] Likewise, Robert Oppenheimer cited a deep ideological confrontation between science and the restrictions on information implemented by administrators:

> I think that the almost unanimous resistance... to the imposition of control and secrecy comes from the fact that secrecy strikes at the very root of what science is, and what it is for. It is not good to be a scientist, and it is not possible, unless you think that it is of the highest value to share your knowledge....[259]

Norbert Wiener went even further in describing this threat: "The measures taken during the war in restricting the free intercourse among scientists... have gone so far that it is clear that if continued in time of peace this policy will lead... ultimately to the death of science."[260]

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[256]Shils, *Torment*, 178

[257]Ellen Schrecker, *No Ivory Tower: McCarthyism and the Universities* (New York: Oxford University Press, 1986), 131

[258]In ibid., 131

[259]J. Robert Oppenheimer, "Speech to the Association of Los Alamos Scientists, Los Alamos, November 2, 1945, " in Alice Smith and Charles Weiner *Robert Oppenheimer: Letters and Recollections* (Cambridge: Harvard University Press, 1980), 317

[260]Norbert Wiener, "A Scientist Rebels," *Atlantic Monthly*, (January 1947): 46

Patriotic Violations of Secrecy

The physicists had to choose either to obey security restrictions or to work in the manner that in their eyes would produce the bomb most efficiently. This represented one of many choices between the bureaucratic methods of secret government projects and the unrestricted methods of scientific inquiry. The answer was clear. "After the war," writes Martin Sherwin, "Szilard testified before a congressional committee that in the interests of speed he and other scientists had purposefully violated Grove's security regulations."[261] In September 1945 Szilard asserted that scientists working for the government in the future would have to differentiate between keeping secrets from the enemy and from each other. To obey the letter of the law, he said, "would have sabotaged our work and there were a great number of patriotic violations of these rules of secrecy, i.e., unauthorized disclosure of information in the best interest of our work."[262]

Some physicists also violated the rules of secrecy in attempts to initiate discussions with statesmen on the postwar impact of the bomb. One of the most intense administrator-scientist confrontations during the Project arose over the unofficial visit Szilard, Harold Urey and University of Chicago Chancellor Bartky paid to future Secretary of State James Byrnes (as mentioned in chapter one). Groves sounded his outrage in a June 16, 1945 report on the incident:

> [Bartky] appeared to be totally incapable of appreciating the fact that each and every one of them individually and collectively had broken their signed oaths and contracts and even if they had broken such oaths or contracts that there was nothing wrong with it in any way.[263]

The scientists were dissatisfied with the lack of consideration they believed was being demonstrated by powerful policy-makers. As in the case of disobeying

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[261]Sherwin, *A World Destroyed*, 59

[262]Szilard, *Facts*, 232

[263]In Gruber, 82

compartmentalization, the physicists approached Byrnes because of their allegiance to a deeper cause. Wrote Arthur Compton,

> I believe the reason for their actions is that with regard to the Project their responsibility to the nation is prior to and broader than their responsibility to the Army, and they felt that a situation had developed in which they could not perform their duty to the nation working through me or through the Army.[264]

By sharing secret information within isolated laboratories the scientists insured the rapid development of the bomb. Likewise, by tracking down influential statesmen, they attempted to ensure its proper use. In both cases the physicists of the Manhattan Project were assuming unprecedented responsibility, and their intentions remained pure at least in their own eyes. Concluded Compton,

> The scientists will be held responsible, both by the public and by their own consciences, for having faced the world with the existence of the new powers. The fact that the control has been taken out of their hands makes it necessary for them to plead the need for careful consideration and wise action to someone with authority to act. There is no other way in which they can meet their responsibility.[265]

National security demands might overcome desired scientific freedoms, but they could not "cut the conscience" of the physicists themselves.

Disloyalty Fears

The physicists' political activity was enmeshed in a wartime atmosphere where loyalty was suspect. Xenophobia and the early stages of anti-communism took their toll on both the scientific profession and the physicists themselves. The assertion that the scientific ethos of internationalism led the Manhattan Project physicists to untenable political conclusions (as presented in chapter two) has an accompanying argument: that politicians and military administrators became interested in the discretion and political leanings of the scientists themselves.

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[264]In ibid., 79

[265]Ibid.

The first related issue most wartime scientists encountered was the administrative fear of otherness. That is, to be legitimately on the American side and part of the Project, the scientists would ideally be American, supportive of the war effort, and explicitly loyal to their country. Albert Einstein, an émigré and pacifist, failed at least two of these tests and was therefore never asked to join.[266] Likewise, Szilard was not issued a security clearance until after answering allegations of "pro-Germaness" and "anti-Americanism."[267] These precautions were normal for many wartime military-scientific projects. The OSRD had prioritized their projects and rated the degree of loyalty of each scientist within their prospective pool. They consequently assigned the most loyal physicists to the most important projects. Interestingly, the Manhattan Project in its early stages was low priority (because it was not guaranteed to succeed) and therefore received the most "questionable" scientists. This explains why the scientists who built the bomb formed such a heterogeneous group. Referring to the émigré physicists, Norman Ramsey commented, "Precisely because they were immigrants, they were not permitted to work on the most secret projects, such as radar, and were thus left free to work in the field they knew best, nuclear physics."[268] However, in an atmosphere of fear of disloyalty the heterogeneity of the Project may have jeopardized its success. Lyman Briggs, wartime Director of the National Bureau of Standards, was forced to disband the Uranium Committee (that he had appointed) in May 1940 "because not all its members were U.S. citizens of long standing." Sherwin explains, "If... the Briggs Committee supported a substantial research effort and it failed, the presence of Szilard, Fermi, and Wigner... would prove an embarrassment in case of a congressional investigation."[269]

An even greater concern, however, was the Soviets. Though Japan and Germany were the nominal wartime enemies, and the Soviet Union the ally, loyalty concerns did not

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[266]Wittner, *One World or None*, 10-11
[267]Ibid.
[268]In Sherwin, *A World Destroyed*, 18
[269]Ibid., 30

reflect this. Precisely because the émigré and native scientists viewed the enemies with such disgust, the military and political leadership took no precautions against any betrayal in an Axis direction. The Soviets thus became the primary threat. Leslie Groves admitted, "There was never from about two weeks from the time I took charge of this Project any illusion on my part but that Russia was our enemy and the Project was conducted on that basis."[270] Consequently, Project administrators took all possible offenses seriously, prosecuting them quickly and firmly and with care not to start a commotion. During the war the Manhattan Project's division of the Army Counter-Intelligence Corps handled approximately one hundred cases of "probable" wartime espionage.[271] For example, shortly after Met Lab physicist Clarence Hiskey was observed interacting with suspected Soviet spy Arthur Adams, Hiskey was drafted and sent to a military base in Mineral Wells, Alaska on the border of the Arctic Circle.[272] Likewise, "another scientist was forced to resign from the Project after attending a small party given by the soviet vice-consul in a San Francisco restaurant for the Russian-born violinist Isaac Stern."[273] As the war progressed and it became clear that the Allies would win, penalties for disloyalty, especially with regard to the Soviet Union, were taken more seriously. By 1946, Congress had passed a bill that permitted the death penalty for those who revealed atomic secrets.[274]

In the 1940s U.S. culture placed a high premium on national identity and loyalty and was therefore hypersensitive to indications of deviance from this expectation. As sociologist Kai Erikson has argued,

> Every human community has its own special set of boundaries, its own unique identity, and so we may presume that every community also has its

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[270]In ibid., 62

[271]Joseph Albright and Marcia Kunstel, *Bombshell: The Secret Story of America's Unknown Atomic Spy Conspiracy* (New York: Times Books, 1997), 106

[272]Ibid.

[273]Sherwin, *A World Destroyed*, 63

[274]Weart, 121

> own characteristic styles of deviant behavior. Societies which place a high premium on ownership of property, for example, are likely to experience a greater volume of theft than those which do not....[275]

In many ways the disloyalty scare and consequent crackdown on Manhattan Project physicists resulted from a socially constructed hysteria where fears, expectations, and evidence of disloyalty were mutually reinforcing.

Entrapment

Groves' crackdown on disloyalty quickly assumed tones of a crackdown on civil liberties. As Henry Wallace noted, "Groves could use the plea of protecting against Russian spies to do almost anything he wants... to almost any extreme."[276] Specifically, scientists were admonished not to talk of the social or political implications of the bomb, but rather to demonstrate unflagging dedication to the Project and nation by building it. Loyalty was thus defined in the undemocratic terms of political non-participation and uncritical faith. Historian Ronald Powaski writes of Groves, "The security system he established had a detrimental impact on future efforts to control the nuclear arms race. In effect, the system of secrecy he imposed on the Manhattan Project... prevented public debate on the question of building and using atomic weapons."[277] The physicists were trapped. On the one hand, they *were* dedicated to the project of constructing the bomb as quickly as possible. On the other hand, they had concerns for its use and postwar effects that they believed were not being properly addressed. To raise issues in the lab, however, would have been a violation of secrecy regulations, and to appeal to others outside the Project would have appeared to the political and military administrators to be an act of disloyalty. In April 1945 a group of Met Lab scientists declared, "[Regulations of military supervision] become intolerable if a conflict is brought about between our conscience as

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[275]Kai Erikson, *Wayward Puritans: A Study in the Sociology of Deviance* (New York: MacMillan Publishing Co., 1966), 19

[276]In Ronald Powaski, *March to Armageddon: The United States and the Nuclear Arms Race, 1939 to the Present* (New York: Oxford University Press, 1987), 39

[277]Ibid., 7. Also see Sherwin, *A World Destroyed*, 57-58

citizens and human beings and our loyalty to the oath of secrecy."[278] The physicists thus developed a divided conception of loyalty: they recognized both a basic loyalty to the bureaucratic Project hierarchy and a higher loyalty to ensure the proper handling of the bomb.

As he did when regulating the flow of scientific information, Groves used his scientific-administrative subordinates to regulate the discussion of political issues. In spring 1943, after Groves expressed displeasure concerning the weekly colloquiums in Los Alamos on the effect of the bomb, Oppenheimer instructed the physicists "to avoid matters that, *whatever their importance in other ways*, were of little scientific interest."[279] From the perspective of the average scientist in Los Alamos, these decisions seemed rather patronizing. Physicist Roy Glauber wrote that, following a request to resume these meetings, "the word came back from Oppenheimer that he really took a very dim view of that sort of thing, and he was sure that General Groves wouldn't like it at all."[280]

Concern for disloyalty manifested itself as fear of dissent from, or mutiny against, the Project. The case of Joseph Rotblat (who later founded Pugwash), the only physicist known to have quit the Project, provides a fine example. Disconcerted by the possibilities of using the bomb *on* Japan and as a diplomatic tool *against* the Soviet Union, Rotblat requested a permanent leave. At this point, he writes, the Project administrators revealed

> a thick dossier on me with highly incriminating evidence. It boiled down to my being a spy. Fortunately for me, in their zeal the vigilant agents had included in their reports details of conversations with data, which were quite easy to refute and to expose as complete fabrications. The chief of intelligence was rather embarrassed by all this and conceded that the

[278]Alice Kimball Smith, "Behind the Decision to Use the Atomic Bomb: Chicago 1944-45," *The Bulletin of Atomic Scientists*, Vol. 14 (1958): 294

[279]Sherwin, *A World Destroyed*, 62

[280]Albright and Kunstel, 87. Similar scenarios have been noted at the Met Lab. See John Simpson, "The Scientists as Public Educators: A Two Year Summary," *The Bulletin of Atomic Scientists*, (September 1947): 243

> dossier was worthless. *Nevertheless, he insisted that I not talk to anybody about my reason for leaving the project*.[281]

The compartmentalization of scientists and the classification of documents denied physicists the right to substantive discussion of the moral, political, and social consequences of, and responsibilities for, the bomb. For instance, the Franck Report, one of the most concise and well-reasoned political arguments proposed by a group of scientists during the war, was not discussed openly until after the bomb was dropped on Hiroshima.[282]

However, it was not just the physicists that were isolated but also the individual Project sites. Groves instituted regulations that classified many documents and instructed the site directors to censor the flow of related information. For example, Rotblat writes,

> The Franck Report was submitted to the American government, but since nuclear energy was still an official secret, the Report instantly became a classified document and as such could not be used to canvass support among scientists in the other laboratories of the Manhattan Project.[283]

Administrators were quite conscious of, and deliberate in, their attempts to keep information from flowing freely between Manhattan Project sites. There were only a handful of top physicists at each site who were fully informed and capable of raising serious issues. It seems the military administration sought to prevent the convergence of a critical mass of these scientists. One or two physicists (per site) asking questions was tolerable, but if they knew of each other's concerns, a unified movement might arise. In any case it is quite clear that the administrators did not trust their charges. In January 1944 Szilard wrote Conant to complain that, while the scientists were dedicated to their work, there was a lack of administrative thought about the bomb's implications. Conant forwarded this message to Bush along with a note reading, "One might ask how come he

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[281]Joseph Rotblat, "Leaving the Bomb Project," *The Bulletin of Atomic Scientists*, 41 (August 1985): 18-19. (Emphasis added)

[282]Smith, "Behind the Decision," 303

[283]Joseph Rotblat, *Scientists, the Arms Race and Disarmament*, 117

knows so many details as to how matters are being handled at the sites." Conant interpreted Szilard as being "interested primarily in building a record on the basis of which to make a 'stink' after the war is over.... He and [Eugene] Wigner et al are very anxious to build a record against the management and I want a full hearing on that when the time comes!"[284]

Scientists Investigated

Conant and Bush were not the only ones concerned with the loyalty of the scientists. Indeed numerous physicists were investigated when any suspicions arose. Szilard was constantly asking questions about how the United States would use the bomb and what preparations were being made for its future control. Groves thought Szilard was overstepping the bounds of his legitimate domain and attempted to stifle the bothersome physicist. Writes Carol Gruber, "As soon as Szilard... moved from Columbia to the [Met Lab], Groves tried to secure an order through the secretary of war to have him arrested and locked up for the war's duration." When Stimson rejected this request in October 1942, Gruber continues, "Groves became dogged in his efforts to secure evidence against Szilard through surveillance that far surpassed the routine watch that was placed on the Project's foreign-born scientists": his mail was opened, his personal files read, and agents followed him in public.[285]

The investigation of Szilard was horrifying in an absurd way. Szilard, as demonstrated above, always acted to ensure that secrets were kept from the 'wrong' hands and that the bomb was constructed as quickly as possible. Consequently, his empty-handed investigators concocted lengthy reports noteworthy for their unintended humor as much as their dubious integrity. One twelve-page document from June 1943 "reveals" that Szilard

> ... is of Jewish extraction, has a fondness for delicacies and frequently makes purchases in delicatessen stores, usually eats breakfast in drug stores

[284]Gruber, 78
[285]Ibid., 79-80

> and other meals in restaurants. [He] walks a great deal when he cannot secure a taxi, [and] usually is shaved in a barbershop.[286]

Upon reading the report Groves concluded, "The investigation of Szilard should be continued despite the barrenness of the results."[287]

What got Szilard in trouble were his arguments for international control of the atom and for global organization aimed at preventing future wars. One military intelligence report to the FBI asserted, "Although this office has no evidence of un-American activities on the part of Szilard, he has constantly associated with known 'liberals'... and has been outspoken in his support of the internationalization of the atomic energy program."[288] What appeared to the military and political administrators as betrayal of national interests was to Szilard loyalty to a more inclusive community: a community spanning the globe like the discipline of physics. He valued the safety and prosperity of mankind over an Anglo-American monopoly of nuclear weapons.

Groves continued his investigation by questioning Szilard's past acquaintances for evidence of poor discretion. On July 4, 1945, Groves asked Lord Cherwell (Churchill's science adviser and Szilard's boss at Oxford's Clarendon Laboratory from 1935-1938) about a visit with Szilard in the United States in 1943. Groves volunteered, "Frankly, Dr. Szilard has not, in our opinion, evidenced whole hearted cooperation in the maintenance of security."[289] Cherwell replied on July 12,

> My impression is that his security was good to the point of brusqueness. He did... complain that compartmentalization was carried to undue lengths in America, but on the other hand, when I asked him about some point... he replied that he was not at liberty to discuss it as he had passed into the employment of the American Government.[290]

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[286]Ibid., 80

[287]Ibid.

[288]Ibid., 87

[289]Leslie Groves, "Letter to Frederick Lindemann: July 4, 1945," Online, November 15, 1997, Available <http://www.peak.org/~danneng/decision/lrg-fal.html>

[290]Gruber, 81. Under similar circumstances, Justice Felix Frankfurter vouched for Niels Bohr on April 18, 1945: "[Bohr] never disclosed anything that might be deemed a piece of information regarding

The conversation between Cherwell and Szilard reveals much about how the physicist conceived of his loyalties. In 1943 Cherwell told Groves that Szilard "always had rather a bee in his bonnet" and was "mainly concerned with a topic which has inflamed so many scientists' minds, namely what sort of arrangements could be made to prevent an arms race with all the disastrous consequences to which this would lead."[291] Following up his earlier conversation with Cherwell in August 1944, Szilard wrote, "[This letter] may be a breach of etiquette from the official point of view, but as I see it something more important than etiquette is at present involved."[292] That is, Szilard believed he could justify violations of petty secrecy restrictions because they endangered a larger cause. His international loyalties clearly outweighed his domestic oaths. From the scientific point of view, Szilard was a hero: a superb physicist and a conscientious human being. From a political or military perspective, however, he was a security risk and possibly a traitor. In May 1946 Met Lab director Farrington Daniels recommended Szilard for an army citation rewarding his civilian war service. Daniels claimed that Szilard was "truly a pioneer in the field of atomic energy... and has given serious thought and attention to the political and social implications of future uses of atomic energy." Groves rejected this recommendation even after it received the approval of the Manhattan District Decorations Board because, "it was quite evident that... [Szilard] showed a lack of support, even approaching disloyalty to his superiors."[293]

In the Matter of Niels Bohr

The international ethos of science and the national military and political ethos necessarily have distinct definitions of loyalty. These definitions are contrasted in the wartime interaction between Churchill, Roosevelt and Niels Bohr. Bohr advocated an

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[the bomb] nor ever discussed any technical matter with me." Felix Frankfurter, "Private Memo, April 18, 1945," in Fanton et al., 67

[291]Frederick Lindemann, "Letter to Leslie Groves, July 12, 1945," Online, November 15, 1997, Available <http://www.peak.org/~danneng/decision/lrg-fat.html>

[292]Szilard, *Facts*, 195-196

[293]Gruber, 86

inclusive community within which scientific information would be passed and postwar planning would occur. Gerald Holton asserts,

> Bohr thought that if you leave the Russians out of it they will become even more dangerous and his hope was that if they were brought into the knowledge at least they would not feel so threatened and he tried to present these ideas to people like Roosevelt and Churchill and you know the result of that.[294]

After the war Bohr advocated the effective abandonment of national boundaries because "no control can be effective without free access to full scientific information and the granting of the opportunity of international supervision."[295] Bohr viewed the statesmen's faith in safety through atomic monopoly as foolish. War, secrecy, and traditional forms of international diplomacy were becoming anachronistic and dangerous, and the United States had to take the initiative in preparing for a safe atomic age: "The continued secrecy and restriction deemed necessary for security reasons hampered international cooperation to an extent which split the world community of scientists into separate camps."[296] The scientific tenets of free exchange of information and openness were needed: "The barring of intercourse has led to distortion of facts and motives, resulting in increasing distrust and suspicion between nations and even between groups within many nations."[297]

As mentioned in chapter two, these hopes were crushed by Churchill in a personal interview, and, though they appeared to be welcomed by Roosevelt, they were denied in the Hyde Park Aide-Memoire signed by both national leaders. Indeed, the arguments for internationalism proposed by Bohr aroused suspicions of indiscretion and disloyalty. The aide-memoire written on September 18, 1944 concludes, "Inquiries should be made regarding the activities of Professor Bohr and steps taken to ensure that he is responsible

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[294]Holton, interview

[295]In Federation of Atomic Scientists, *One World or None* (Whittlesey House: McGraw-Hill Co., 1946), x

[296]Niels Bohr, "For an Open World," *The Bulletin of Atomic Scientists*, 6:7 (July 1950): 215

[297]Ibid., 216

for no leakage of information particularly to the Russians."[298] The next day, Churchill wrote in a personal memo, "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."[299] Most histories of the political activity of Manhattan Project scientists focus primarily on their postwar crusade. Those that touch on the pre-Hiroshima activity generally regard it as insignificant, unorganized, and destined to fail. Consequently, these histories often cite the Churchill-Bohr incident as symbolic of the crushing failure of wartime political activities.[300] This paper, without denying the *ineffectiveness* of the physicists' pre-Hiroshima movement, argues that it succeeded in promoting a political voice grounded in scientific ethos and in this way drew the two worlds closer together and formed the language of the atomic age.

Fundamental differences between the assumptions and foundations of politics and science led the statesmen and the physicists to construct irreconcilable notions of loyalty. Addressing this topic of the "incompatible basis for argument," Gerald Holton concludes,

> I think that's an interesting question: namely how to dramatize... the fact that there [was] in the extreme case of Niels Bohr confronting Churchill [a] complete mismatch of the basis from which they spring and the things which motivate that - what I call the fundamental suppositions. A person like Bohr who looks for unity in science... also wanted unity of mankind, political unity, international versus national [unity]. For him all these things were just obvious. To a person like Churchill the very opposite is obvious - he is trying to hold on to what little particularity his island has. And so it's a very much more pragmatic and indeed in a sense, much more realistic way to think.[301]

Because the pragmatism of power politics could not permit British or U.S. statesmen to forfeit the atomic energy monopoly, Bohr was ignored.

Loyalty Transgressed?

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[298]Franklin D. Roosevelt and Winston Churchill, "Aide-Memoire, September 18, 1944," in Fanton et al., 70

[299]In Albright and Kunstel, *Bombshell*, 88

[300]See, for example, Alice Kimball Smith's *A Peril and a Hope* (p 9), Lawrence Wittner's *One World or None* (pp 21-22), or Martin Sherwin's "The Atomic Bomb and the Origins of the Cold War" (p 958)

[301]Holton, interview

While Bohr and Szilard and other physicists *advocated* the sharing of information and the declassification of secrets, a few scientists decided to cross the boundaries of national loyalty. These unpatriotic violations of secrecy were perpetrated by the atomic spies of the Manhattan Project. Scientist-spies of the 1940s are usually depicted as evil but politically unsophisticated men enslaved to Communist ideology as servants of the Kremlin. This is, however, too simplistic a portrayal. Despite taking serious risks by endangering themselves and their nation's security, the atomic spies shared many of the beliefs of their colleagues.

The case of Los Alamos physicist Theodore Hall is a revealing one.[302] In 1941, at the age of sixteen, Hall was a junior at Harvard living in Leverett House, "a magnet for leftist intellectuals that was widely known as 'Moscow on the Charles.'" One year later, Hall was recruited for an undetermined position at a mysterious laboratory in the west. That same day, his Communist roommate Saville Sax told him, "If this turns out to be a weapon that is really awful, what you should do about it is tell the Russians." This prophetic remark stuck with Hall, and by 1943 he began asking along with other physicists, "Wouldn't the postwar world be more stable if the bomb were shared with the Russians?" Rotblat has confirmed that Hall was present for discussions in which he and Bohr "talked of this idea that we should share the knowledge with the Russians, to bring them in before the bomb was made." In October 1944 Hall made initial contact with Soviet spies and continued to pass secret information about the U.S. bomb project throughout the next decade.[303]

Hall did not believe he was betraying his country, but rather acting in its greater interest by acknowledging loyalty to a deeper cause. Write biographers Albright and Kunstel,

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[302]Hall was not publicly known to have been a spy until the mid-1990s. He kept his secret for half a century before the Freedom of Information Act made available the Venona Files (decoded Soviet telegrams of the 1940s) in which he was named. Two journalists, Marcia Kunstel and Joseph Albright, then conducted hundreds of hours of interviews and pages of correspondence which led to the 1997 publishing of *Bombshell*.

[303]Albright and Kunstel, *Bombshell*, 1-87

> In 1945, [Hall] had been so passionately convinced that a U.S. atomic monopoly was dangerous to the world that he decided to contact America's wartime ally, the Soviet Union. He felt that by passing information, he was giving some insurance against future war to millions of Americans, as well as to the rest of the world.[304]

These beliefs are evident in Hall's own admissions: "It seems to me," he wrote, "that an American monopoly was dangerous and should be prevented. I was not the only scientist to take that view: for example Einstein and Bohr both felt keenly that the best political policy was to reach an understanding - the opposite of the Cold War."[305] Hall clearly differentiated between various levels of loyalty:

> If you care very much for the well-being of the people of your country and you take a step with the intention of keeping them from a horrible catastrophe, that is not disloyalty. The experiences of Auschwitz and the Gulag and Vietnam remind us that blind obedience to authority is not always a good kind of loyalty.[306]

Likewise, atomic spy Emil Klaus Fuchs is notable not for his differences from, but because of his similarities to, the other physicists. Writes Robert Jungk, Fuchs became convinced "during their debates that the new weapon forced mankind to transcend national boundaries in their thinking and to take altogether exceptional action, contrary to hitherto-accepted ideas of patriotism and national loyalty."[307] Fuchs, along with other scientists, believed that the bomb made traditional forms of diplomacy anachronistic and that a new era of internationalism was needed if civilization were to survive. By betraying national secrets, Fuchs aimed to initiate this new era. Writes biographer Margaret Hager, "Apparently disloyalty can be deeper loyalty than the common type."[308]

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[304]Ibid., xi

[305]Ibid., 90

[306]Ibid., 284

[307]Robert Jungk, *Brighter than a Thousand Suns: A Personal History of the Atomic Scientists* (New York: Harcourt, Brace and Co., 1956), 188

[308]Ibid., 190

Fuchs, like Hall, initiated contact with Soviet connections following discussions with Manhattan Project colleagues.[309] These examples suggest a depiction of the atomic spies less as unthinking tools of the Kremlin and more in line with the beliefs of their conscientious colleagues. Like Bohr and Szilard, Hall and Fuchs recognized security restrictions and expectations of loyalty, yet they also noted the desirability of opening up scientific information and working towards a global community of peace.[310] Explaining the disloyal behavior of the spies, Kunstel and Albright write, "They had done it because they believed they were surrounded by circumstances in which the greater good of society was incompatible with the laws governing them."[311] More conventional physicists like James Franck faced this same dilemma: security measures became intolerable because "a conflict is brought about between our conscience as citizens and human beings and our loyalty to the oath of secrecy."[312] The heroes and the villains of the Project were not as different as popular memory insists. Once again, it is helpful to invoke Erikson's sociological theory of deviance:

> The deviant and his more conventional counterpart live in much the same world of symbol and meaning, sharing a similar set of interests in the universe around them. ...the traitor and the patriot act in reference to the same political situations, often use the same method, and for that matter are sometimes the same person. Nor is this a trivial observation, for these pairs of adversaries are so well attuned to one another that they can and often do reverse roles with minor shifts in the historical climate.[313]

It is critical to note that, though the atomic spies were certainly deviating from the norm by passing secrets to the Russians, they were in no sense wholly deviant. That is, Hall and Fuchs were labeled "deviants" because on ten or fifteen occasions they deeply violated and

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[309]Ronald Radosh and Joyce Milton, *The Rosenberg File: A Search for Truth* (New York: Holt Rinehart and Winston, 1983), 17-18

[310]Wrote Theodore Hall, "I shared a common belief that the horrors of war would bring our various leaders to their senses and usher in a period of peace and harmony." In Albright and Kunstel, *Bombshell*, 90

[311]Albright and Kunstel, *Bombshell*, 8

[312]Smith, "Behind the Decision," 294

[313]Erikson, 20. Keep in mind that neither Fuchs nor Hall were recruited to be spies. They slipped into that role because contemporary events seemed to demand it.

offended national expectations. They spent most of their days, however, working feverishly on the bomb with their colleagues and sharing the political and social beliefs of a community of progressive physicists. Erikson continues, "and thus it can happen that the most feared and most respected styles of behavior known to a particular age often seem to mirror one another...."[314]

Nevertheless, it is the traditional opinion of atomic spies that prevails. To a degree, this is because the spies actually did jeopardize U.S. security. The 1951 United States Joint Committee on Atomic Energy published a report on atomic espionage that asserts, "It is hardly an exaggeration to say that Fuchs alone has influenced the safety of more people and accomplished greater damage than any other spy, not only in the history of the United States but in the history of nations."[315] Nonetheless, much of the reputation of the atomic spies was a construction of Cold-War, Red-Scare culture. Consequently, this reputation is built primarily on anti-Soviet hysteria and cultural stereotypes of deviant traitors. It is interesting to note that popular memory of the atomic spies has never progressed beyond the arguments proposed by the Attorney General prosecuting Fuchs:

> The prisoner is a Communist, and that is at once the explanation and indeed the tragedy of this case. It is a tragedy that one of such high intellectual attainments as the prisoner possesses, should have allowed his mental processes to have become so warped by his devotion to communism that, as he himself expresses it, he became a kind of controlled schizophrenic, the dominant half of his mind leading him to do things which the other part of his mind recognized quite clearly were wrong.[316]

The only strong argument in this monologue is the implication that Fuchs' conscience, like that of all conscientious physicists building the first nuclear weapons, was divided.

Building Bombs, Talking Peace

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[314]Ibid., 21

[315]In R. W. Reid, *Tongues of Conscience: War and the Scientists' Dilemma* (London: Reader Union Constable, 1970), 244

[316]In H. Montgomery Hyde, *The Atom Bomb Spies* (London: Hamish Hamilton, 1980), 109

In terms of their relation to secrecy and loyalty, the scientists divided themselves into three camps. The majority of Manhattan Project physicists gave in to secrecy restrictions and never questioned the Project. The second group was tormented by a balanced division of loyalty. They simultaneously recognized the danger the bomb presented for the postwar world *and* the need for wartime expediency and secrecy. The third group, the atomic spies, clearly chose to privilege their sense of an international definition of loyalty (one of humanity and civilization) over a national definition (one that valued an Anglo-American monopoly of atomic power). In order to extend this fruitful discussion of loyalty issues it is necessary to go beyond the time frame established for this paper. In the immediate postwar period, the physicists were given an intellectual and disciplinary challenge to bring their activities back in line with the ethos of their profession. Men like A.J. Muste and Bertrand Russell asked that the scientists not apply their research to military purposes but instead advocate the necessity of global cooperation and international control of the atom.

Muste, a Quaker and pacifist, in particular stressed the public role the physicists could play. If they refused to continue building bombs, he wrote,

> The American people would at last realize that you were deadly serious about the bomb.... What is infinitely more important, they would be shaken out of their moral lethargy and despair and would become capable of inspired action to abolish war and build a democratic society, because they would behold the spectacle of men who do not try to shift the responsibility for their actions onto the military or the state.[317]

The scientists had a chance to lead a reformation of society and to regain the purity they believed they had lost when science and technology corrupted an ill-prepared world:

> [There is] a deep cleavage in our souls and our society because our moral and social development has not kept pace with technological advance. That cleavage must be healed first and basically within the morally

[317]In Milton Katz, *Ban the Bomb: A History of SANE, the Committee for a Sane Nuclear Policy, 1957-1985* (New York: Greenwood Press, 1986), 8

> responsible human being. It will be healed in the scientist who becomes a prophet, a man whose words and actions are in true accord.[318]

The "new purity," however, was not based on the belief that science "has no ends but truth," but instead it acknowledged that science and its practitioners are closely connected to societies and cultures and the lives of all. The "new purity" demanded that scientists recognize this new relation between science and the political world and work to ensure that science is used properly. Muste insisted that the choice was in the hands of the scientists:

> [Mankind's destiny] is being decided by scientists who take, or fail to take, upon themselves the awful responsibility of being prophets, conscientious objectors, persons, whole human beings, and not technicians or slaves of a war-making state, albeit heavy-hearted and unenthusiastic ones.[319]

Albert Einstein took this advice to heart: "I do not believe that we can prepare for war and at the same time prepare for a world community."[320] When choosing between national loyalty to state or international loyalty to mankind, scientific ethos led the physicists to choose the latter. Thus Einstein concluded, "Non-cooperation in military matters should be an essential moral principle for all true scientists."[321]

However, as the Red Scare picked up momentum, such perspectives became dangerous ones to assume. As Milton Katz has argued, by 1946 the internationally minded had been labeled "not loyal" and were "afraid of being accused of being communists." Much of the momentum of the postwar atomic scientists' movement was killed when in March 1947 President Truman issued his Loyalty Order. Finally, argues Katz, the scientists were divided on issues of loyalty when, following the election in 1948, Truman adopted a more militarily confrontational stance toward the Soviet Union.[322]

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[318]In ibid.

[319]Ibid.

[320]Albert Einstein, "The Real Problem is in the Hearts of Men," *The New York Times Magazine*, (June 23, 1946): 7

[321]In Katz, 8

[322]Ibid., 8-12

This division is reflected in the opposition between physicists Hans Bethe and Edward Teller on the question of whether or not to help build the hydrogen bomb. Bethe wrote, "I believe the most important question is a moral one. Can we, who have always insisted on morality and human decency, introduce this weapon of total annihilation into the world?" Teller, on the other hand, argued, "It is not the scientists' job to determine whether the hydrogen bomb should be constructed, whether it should be used or how it should be used. This responsibility rests with the people and with their representatives."[323]

Some scientists disagreed with Teller because they believed historical change had altered the scientist's job. For example, Norbert Wiener declared,

> In the past, the comity of scholars has made it a custom to furnish scientific information to any person seriously seeking it. However, we must face these facts: the policy of the government itself during and after the war, say in the bombing of Hiroshima and Nagasaki, has made it clear that to provide scientific information is not a necessarily innocent act and may entail the gravest consequences.[324]

Scientific ethics themselves, it was argued, must be updated: "The interchange of ideas, one of the greatest traditions of science, must of course receive certain limitations when the scientist becomes the arbiter of life and death."[325] Wiener concluded, "I must take a serious responsibility as to those to whom I disclose my scientific ideas. I do not expect to publish any future work of mine which may do damage in the hands of irresponsible militarists."[326] Wiener thus became "a prophet, a man whose words and actions are in true accord."

Many scientists since the 1940s, however, have taken a different stance. They see themselves primarily as servants and citizens of a democratic state that should determine its course regardless of scientific opinion. Here, loyalty is defined in the narrower terms of nationhood. This definition of scientific obligation has condoned and even defended the

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[323]In Ibid., 10
[324]Norbert Wiener, "A Scientist Rebels," 46
[325]Ibid.
[326]Ibid.

role scientists have taken since the Manhattan Project in weapons construction.[327] Louis Ridenour has taken such a stance:

> Wiener wishes to dissociate himself utterly from any activity connected with preparation for war, even to the extent of doing everything he can to make those preparations ineffective. I regard it as deplorable that our nation is preparing for war, and I prefer to leave to others the actual work involved; but so long as it is the policy of our nation to prepare for war, I shall certainly not attempt to impede such preparations. I do not believe in the wisdom, propriety, or effectiveness of attempts to sabotage the preparation of arms when these arms are as widely believed to be necessary as they are today.[328]

Political Science

While science certainly brought new forces to bear on international politics and diplomacy, it did not escape the war unscathed. The profession and its practitioners were politicized. The laboratory was regimented and compartmentalized, and its freedom restricted to the point where it became inefficient. The physicists of the Manhattan Project were subjected to absurd investigations, their loyalty was questioned, and many of their careers were disrupted or destroyed. The policy makers and military administrators distrusted the scientific community from the start. Physicists seemed especially idealistic and aloof and were suspected of using questionable discretion. The scientists' assumptions of internationalism and global cooperation appeared naive, and they therefore suffered the brunt of the disloyalty purges of the 1940s. Writes Spencer Weart,

> The concern about loss of secrets harmed scientists more than anyone. ...no group was more closely inspected or forced so often to prove their loyalty. Because of this attention, physicists and mathematicians made up more than half of the people who were identified as communists in congressional hearings. Hundreds of scientists were mercilessly pursued, often losing their jobs, some of them ending in exile or suicide.[329]

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[327]The relation between science and weapons construction since World War II will be discussed in the conclusion.

[328]Louis Ridenour, "The Scientist Fights for Peace," *Atlantic Monthly*, (May 1947): 80-81

[329]Weart, 121

By stepping outside of the scientific domain, the physicists opened themselves to political criticism. In 1950 Oppenheimer and Bethe voiced personal opposition to the hydrogen bomb project. Writes physicist Ralph Lapp, this "brought forth a political attack upon their patriotism. It was partly responsible for Oppenheimer's late expulsion from the Government's advisory councils."[330]

When the atomic bomb was dropped on Hiroshima, physics assumed a new relation to politics. In a sense, it was appropriated by politics. The politicization of science affected not just the profession but also its practitioners. After the war Ridenour asserted,

> The scientist... is in a different position at the present time. Because he wishes to re-establish the traditional internationalism of his profession, he is a communist. Because he is concerned over the damage that an uncritical policy of continued secrecy can do to our scientific and technological progress as a nation... he is an idealist who wants to give the bomb to Russia. Because some scientists are devout pacifists, the scientist is an un-American fellow who cannot be trusted.[331]

On the one hand, it is true that political opinions based on scientific assumptions of international cooperation were so incompatible with the national climate of the early 1940s that they raised suspicions of disloyalty. National climate was not, however, the only variable. When their science became unambiguously political, the physicists acknowledged their role in the political world. While some fought to adapt international diplomacy and politics to the threat of new weapons, the political world crept into their laboratories and stripped them of their claim to innocence. Neither politics nor science would be the same again.

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[330]Ralph Lapp, *Kill and Overkill: The Strategy of Annihilation* (New York: Basic Books, 1962), 19-20. Writes one historian, "A panel under the aegis of the Atomic Energy Commission conceded that Oppenheimer had shown himself to be a loyal citizen who had never divulged any secrets, but declared him a 'security risk,' primarily because he opposed both the air force's reliance on strategic bombing and the development of the hydrogen bomb." Stephen J. Whitfield, *The Culture of the Cold War* (Baltimore: The Johns Hopkins University Press, 1996), 181

[331]Ridenour, 83

Conclusion

This conclusion must address two questions: how has the structural relationship between physics and politics changed as a result of the Manhattan Project, and consequently, how has the physicists' political self-conception (i.e., culture) changed. To do this, it is necessary to review the arguments of all three chapters and examine how they hold up to the test of time.

Part I: The Collision

In the late 1930s a small European community of atomic physicists began to discover the secrets of the nucleus as war threatened to erupt around them. When these scientists, responding to the threat of Nazism, decided to apply science to governmental and military ends, they brought themselves into contact with the political world. They thus came face to face with their own conceptions of scientific purity. Should they choose the separation of science from politics, or accept responsibility for the national and international implications of science? The physicists' understanding of purity was revolutionized when in the Manhattan Project they carried scientific investigation through to technical application, invention, and weapon construction. As has been shown, many decided to assume new responsibilities and thus changed the way they thought of themselves politically.

The Postwar Careers of Manhattan Project Physicists

When security restrictions were eased after the Japanese surrender, the physicists brought their arguments for international control and organization to the American public. Walter LaFeber asserts, "Many scientists, their political awareness made acute by their participation in the A-bomb project, had moved into Washington after 1946 to lobby long and earnestly for the imposition of strong controls upon the development and use of

atomic energy."[332] There they had a pivotal role in defeating the May-Johnson bill and assuring the success of its rival, the McMahon bill. In doing so, they took the reins of nuclear science out of the hands of the military and established a civilian atomic energy program in the U.S. The physicists began to speak in front of Senate and House, lobby political representatives, and argue to whoever would listen. Their limited victory on domestic issues, however, was quickly followed by an unequivocal failure on international planning. Many physicists contributed ideas to the Acheson-Lilienthal plan to de-nationalize nuclear science and establish a global organization to protect humanity from future wars. Bernard Baruch was appointed to present this plan to the Soviets within the United Nations, and for political reasons the plan (containing bits of scientific idealism) failed. U.S. and Soviet national security demands were irreconcilable, and cooperative talks quickly came to a standstill.

Nevertheless, the physicists continued their political activity. Just after the war, they established the Federation of Atomic Scientists and its journal, The Bulletin of Atomic Scientists. The Bulletin, writes Alex Roland, "is representative of the institutional apparatus that is now available not only to conduct a debate on the proper role of scientists and engineers in war, but in fact to stimulate the debate."[333] It continues to this day (many Manhattan Project alumni are on its directing board) to bring the message of disarmament and internationalism to both the public and policy-makers. Likewise, Joseph Rotblat's Pugwash conferences and Leo Szilard's Council for a Livable World have helped to raise the consciences of scientists and advocate the peaceful uses of science.

In the history of physics, this organized political activity is a modern phenomenon. A sense of urgency compelled the builders of bombs to talk peace. Gerald Holton has

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[332]Walter LaFeber, *America, Russia, and the Cold War, 1945-1980* (New York: The McGraw-Hill Companies, Inc., 1997), 177

[333]Alex Roland, "Hephaestus and History: Scientists, Engineers, and War in Western Experience," in Carl and Philip Siekevitz, *Ethical Issues Associated with Scientific and Technological Research for the Military* (New York: The New York Academy of Sciences, 1989), 57

asserted, "Many scientists made this not just a part-time hobby but really threw themselves in with full force, and that I think was fairly unique."[334] Interestingly, the physicists' postwar arguments were not much different from those proposed during the Manhattan Project. For example, the primary aims of the Federation of Atomic Scientists were

> to urge the U.S. to initiate and perpetuate an effective and workable system of world control of nuclear energy based on full cooperation among all nations; to strengthen international cooperation among scientists; [and] to study the implications of scientific developments which may involve hazards to enduring peace and the safety of mankind.[335]

The postwar political activity of Manhattan Project physicists arose not simply from guilt but from the knowledge that science had had a hand in killing, waging war, and threatening world security, and that this conferred a measure of responsibility on the scientists who were acknowledged experts in the field. In 1965 Oppenheimer described the forces acting on the consciences of the physicists:

> I think when you play a meaningful part in bringing about the death of over 100,000 people... you naturally don't think of that... with ease. I believe we had a great cause to do this. But I do not think that our consciences should be entirely easy at stepping out of the part of studying nature, learning the truth about it, to change the course of history.[336]

That is, the physicists were not guilty of building a bomb but rather of abusing science. Years earlier, Oppenheimer described "this troubled sense of responsibility":

> The physics which played the decisive part in the development of the atomic bomb came straight out of our laboratories and our journals. In some sort of crude sense which no vulgarity, no humor, no overstatement can quite extinguish, the physicists have known sin; and this is a knowledge which they cannot lose.[337]

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[334]Gerald Holton, interview with author, 31 December 1997, Cambridge, MA

[335]Joseph Rotblat, *Scientists, the Arms Race and Disarmament: A UNESCO/Pugwash Symposium* (London: Taylor & Francis Press, 1982), 118

[336]In Barton Bernstein, "Understanding and Atomic Bomb and the Japanese Surrender: Missed Opportunities, Little-Known Near Disasters, and Modern Memory," *Diplomatic History*, 19:2 (Spring 1995): 270

[337]In *Time Magazine*, "Expiation," (February 23, 1948): 94

Oppenheimer's cryptic statement has drawn much attention and speculation. Richard Rhodes, for example, argues, "He meant their pure science had fallen into a world of hard consequences." There is support for this conclusion, but it seems something more was at stake: that is, the physicists had proudly lent their skills (hubris) to a military project without considering its implications (até), and this decision was now coming back to haunt them (nemesis). Oppenheimer has confirmed this reading:

> Long ago, I said once that... physicists had known sin, and I didn't mean by that the deaths that were caused as a result of our work. I meant that we had known the sin of pride. We had the pride of thinking we knew what was good for man, and I do think that it has left a mark on many of those who were responsibly engaged. This is not the natural business of a scientist.[338]

The Manhattan Project physicists, concluded Alice Smith, experienced "so widespread a reaction that I venture to say few Los Alamos scientists have taken a job or accepted a research position in the past twenty-five years without thinking about its greater implications."[339]

Purity Twenty-Five Years Later

The tension over the contested terrain of scientific purity arose in the community of physicists again in the late 1960s. Indeed, many traditional notions of purity (involvement in Vietnam) and responsibility (ensuring civil rights) were called into question during the decade. Patrick Catt has argued,

> [The atmosphere of the sixties] made American physicists acutely aware of their science's social ramifications. Insofar as they could not escape the turbulence of the times, it led them to the realization that their work, no matter how esoteric, did not end in the library.[340]

There was, however, resistance against the discussion of political issues within the community of scientists. A letter from Charles Schwartz to the editor of Physics Today in

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[338]In Bernstein, 270

[339]Alice Smith, "Los Alamos: Focus of an Age," in Richard Lewis et al., *Alamogordo Plus Twenty-Five Years* (New York: The Viking Press, 1970), 45

[340]Patrick Catt, "Putting the Social into the American Physical Society: The Creation of the Forum on Physics and Society, 1967-1972," TMs (photocopy), 1996, 1

May 1967 on the issue of Vietnam was rejected on the grounds that it "did not deal with physics as physics or physicists as physicists."[341] The question raised here (as in many other academic disciplines) is what right do scientists *as such* have to answer political or social questions. Do physicists have any special competence to deal with particular worldly issues? Many answered 'no,' but some scientists fought back. Philip Morrison has commented,

> This cry for relevance, you see, was so completely awry. [Some people] had the feeling, 'Well, all this stuff is not relevant.' But in fact the... consequences of science were *extremely* relevant, intensely relevant, all too relevant, and that confusion persists in some ways to this day.[342]

Indeed, criticism of the scientists' political activity extends back to the beginnings of the postwar movement. An article in the New York Times from 1945 asserted that if a physicist comments on politics, "The science part of the statement wouldn't mean a thing. If anything, it would strongly imply a rather unscientific bit of sentiment in an eminent scientist." Only when the physicist speaks of science, it continued, does he deserve "great respect; because he is speaking [within] his domain."[343] Catt argues that it has become more common for physicists to claim that they "do have special competence in many areas of public policy, particularly aspects of weapons development and arms control...."[344] Scientific knowledge enabled the physicists to foresee future possibilities and prescribe policy solutions. Asserts Norman Ramsey, "They can understand the forecasts. They can understand the roughly quantitative things involved."[345] Between the late 1930s and the late 1960s, many scientists acknowledged their connection to political, military, and governmental issues. Charles Schwartz argues,

> By now the role of physics in the national sense has grown into something enormously large and important. The whole rationale for physics as an

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[341]Catt, 2
[342]Philip Morrison, interview with author, 6 January 1998, Cambridge, MA
[343]*The New York Times*, "When Scientists Speak," October 21, 1945, E8
[344]Catt, 3
[345]Norman Ramsey, interview with author, 1 January 1998, Cambridge, MA

> isolated subject must be looked at in the true context of the real world today; and I just do not see how the old myth of purity can stand any longer.[346]

The profession had undergone changes in its structural relationship to the political world, and its practitioners would have to make corresponding cultural adjustments. Catt argued that this change can be seen in the newly-born "progressive physicist[:] those who argued that every aspect of 'doing' physics is a social and political process having *vice versa* ramifications."[347] In another letter to Physics Today from Herbert Fox in March 1968, this mentality is evident: "If there ever was an academic isolation of physicists, it is not now. To take [a] position on public issues is not a matter of choice, it is essential to our being physicists."[348]

The varying styles of political activity, however, proved somewhat divisive. In 1971 members of the Scientists and Engineers for Social and Political Action (SESPA) protested at MIT by asking faculty to sign a pledge "That I will not participate in war research or weapons production. I further pledge to counsel my students and colleagues to do the same."[349] The MIT-based Union of Concerned Scientists (UCS) replied "that signing such a pledge is a matter for personal conscience, not collective intimidation" and criticized SESPA for employing "tactics so alien to civil libertarians."[350] The UCS advocated the use of democratic channels, not coercion, and consequently encouraged scientists to actively educate the public. Echoes of the Manhattan Project physicists' political dilemmas resound. Does scientific purity demand that physicists renounce

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[346]Charles Schwartz, "Professional Organization," in Martin Brown, *The Social Responsibility of the Scientist* (New York: Free Press, 1971), 26

[347]Catt, 11

[348]In Schwartz, 23

[349]In Thomas Southwick, "Visitors Ask M.I.T. Faculty to Renounce Military Research," *Science*, 171:3967 (January 15, 1971): 156. Likewise, in April 1957 eighteen German atomic scientists published a declaration that they would not help in the production, testing, or application of nuclear weapons and called on the Federal Republic of Germany to renounce possession of all such armaments. This group included Max Born, Werner Heisenberg, Max von Laue, and the discoverers of nuclear fission, Otto Hahn and Fritz Strassman. See Rosemary Chalk, "Drawing the Line: An Examination of Conscientious Objectors in Science," in Mitcham and Siekevitz, 64

[350]Lee Grodzins, "MIT Confrontation," *Science*, 172 (April 16, 1971): 214, 216

military work? Or are physicists servants of the state? Or is professional work a matter of personal choice?

Manhattan Project Legacy

The physicists' fear of the prideful sin Oppenheimer alluded to left a legacy of concern and responsibility for what occurred in the laboratory and for the applications that arose therefrom. In the early 1980s John Ziman argued, "We can only understand the scientific/technological complex if we accept that the discovery of knowledge and its application are merely different phases in a single social activity, different aspects of a single, coherent social institution."[351] Historically, this was a novel argument for physicists to make. This newfound, close relationship between science and politics engendered new duties for the physicist. Argued Ziman,

> In the heyday of academic science, there was little experience of deliberately organized 'research and design' to solve specific problems, or to achieve pre-conceived practical goals. A simple 'discovery' conception of science was appropriate. But the world has been changed by science, and science itself has changed in the process. The 'instrumental' conception of science, as a positive means of getting things done, is now a practical reality manifest in numerous mature social institutions, such as industrial research laboratories and government scientific agencies.[352]

Scientific investigation was no longer perceived to be an isolated activity cut off from the rest of society. The interaction of science and society demanded concessions from both sides: the preservation of civilization demanded the censorship of scientific freedom that, in turn, implicitly revoked traditional notions of purity. Ziman concluded, "There is no way of justifying the means of inquiry without reference to its ends. If those are dangerous, or malicious, or otherwise socially undesirable, then any research directed towards them can properly be called into question."[353]

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[351]John Ziman, "Basic Principles," in Rotblat, *Scientists, the Arms Race and Disarmament*, 177

[352]Ibid.

[353]Ibid., 165

Science is such a widespread institution, however, that censorship of research would need to be self-imposed to be successful. The lessons of the Manhattan Project provided the impetus for this. Norman Ramsey has asserted that one of the biggest changes experienced by his colleagues is that they "are [now] concerned about the misuse of scientific things."[354] Ultimately, the Manhattan Project's legacy for physicists is that they "increasingly believe that they have a responsibility for the social implications of their scientific activities and that they can no longer leave to society alone the task of assuring that scientific advance will be beneficial to mankind."[355]

Part II: "Scientized" Politics

The second chapter of this paper asked how the Manhattan Project physicists who believed scientific purity demanded involvement in the real-world implications of the bomb went about formulating such political issues. The scientific ethos of open exchange of information and global collaboration led them to advocate using the bomb as a tool to initiate a new era of international control of weapons of mass destruction and humane cooperation under a system of world government. They feared so strongly that scientific and technological progress was outstripping moral, political, and social advancement, that new offensive means made defense impossible, that the bomb was not a national secret so much as a partially understood natural truth, that they were compelled to envision two paths: one of antagonism, fear, and eventual destruction, and another of cooperation, organization, and unprecedented peace. They argued that if only the statesmen acknowledged the facts of atomic energy, they would quickly sacrifice national boundaries for the promise of a stable internationalized future.

Hopeful Naiveté

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[354]Ramsey, interview

[355]Robert Gilpin, *American Scientists and Nuclear Weapons Policy* (Princeton: Princeton University Press, 1962), 23-24

The physicists' later reflections on their wartime political activity have been quite candid. They acknowledge the presence of a new relationship between physics and politics and a change in the scientists' perceptions of themselves as political actors. They also acknowledge the limitations of their wartime political movement. John Simpson asserted quite simply, "We were sincere in our efforts, but on many subjects were quite naive."[356] The scientists became caught up in the moment. They were working under stressful conditions on a top-secret project that could, they believed, change the course of human history. They consequently inflated the global implications of the bomb and perceived the solutions for this threat through lenses of scientific idealism rather than political realism. Spencer Weart blames this mindset for the creation of the scientists' unattainable goal of world government: "It was as if nuclear energy were such a cosmic force that it would sweep away history, instantly replacing the web of international tensions with a millennial age of peace."[357] For scientists like Glenn Seaborg, the threat of nuclear war seemed to demand the outlawing of battle: "We felt the world would quickly see this - and seeing it, do something about it." The experience of postwar political activity, however, educated the scientists as to how governments function. Seaborg continued, "The half-life of disillusionment varied from individual to individual. Few have changed their minds about nuclear war. But many have become more sophisticated, if less idealistic. Much of what has been described as naiveté has rubbed off."[358] Nonetheless, many physicists still believe that scientific rationale and argument are necessary to solve political problems in the atomic age. Concluded Seaborg, "We should remember that idealism, happily, has not been limited to scientists. Perhaps sophisticated statesmen,

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[356]John Simpson, "The Scientists as Public Educators: A Two Year Summary," *The Bulletin of Atomic Scientists*, (September 1947): 245

[357]Spencer Weart, *Nuclear Fear: A History of Images* (Cambridge: Harvard University Press, 1988), 115

[358]In Gilpin, 3

aided by sophisticated scientists in an age of science, may be able to combine realism and idealism."[359]

World government is no longer the focal point of most physicists' activism, but many continue to advocate ways to reduce the threat of nuclear war and prevent the use of atomic weapons through free exchange of information and international cooperation. A speech delivered by Joseph Rotblat in 1997 reveals that hopes for a "scientized" politics persist to this day:

> Scientists are well qualified to take the lead in the education for world citizenship. They transcend geographic frontiers and ideological divides. Respect for facts and abhorrence of prejudices are inherent in the scientists' morality. All this makes the scientific community a model for the world community of nations that we want to create.[360]

Part III: Political Science

While physicists were attempting to "scientize" politics, the demands of military and governmental work were taking a toll on their profession. The third chapter addressed this question of what effect the scientists' change of venue had upon the principles and practices of their discipline. The answer is that physics was politicized: it was appropriated by the political world, subject to political and military restrictions, and most importantly made to serve political goals. The legacy of the Manhattan Project thus disturbingly includes what many see as the corruption of science.

Science Corrupted

Before World War II, asserts Richard Feynman, "nobody knew what a physicist even was, and there weren't any positions in industry for physicists.... It's interesting that very soon, after the war, it was the exact opposite."[361] When the atomic bombs destroyed Hiroshima and Nagasaki and ended World War II, the government and people of the

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[359]Ibid.

[360]In Mike Moore, "Forty Years of Pugwash," *The Bulletin of Atomic Scientists*, 53:6 (November/December 1997): 45

[361]Richard Feynman, *Surely You're Joking, Mr. Feynman!* (New York: WW Norton, 1985), 53

United States realized that science (particularly physics) would play a critical role in the future of international relations. Norman Ramsey has asserted, "A couple of things have changed a lot [because of the Manhattan Project]. [In the] first place, there is, on the part of the government, a recognition that science has made contributions and that science cannot be ignored."[362] With recognition came funding: federal support of scientific research and development skyrocketed after 1945. Asked if scientists felt the increased interest, Philip Morisson responded, "Oh, sure! That's evident: the whole thing, the National Science Foundation, the Office of Naval Research...."[363] Funding, in turn, has served to shift the focus of exploration: "The center of gravity of scientific pursuits has moved from basic research to the technological application of knowledge. This is especially the case in military research and design."[364] Finally, when the discipline shifted emphasis, its practitioners followed. As early as 1948 scientists like Norbert Wiener saw the detrimental effects: "It is clear that the degradation of the position of the scientist as an independent worker and thinker to that of a morally irresponsible stooge in a science-factory has proceeded even more rapidly and devastatingly that I had expected."[365]

Fulfilling a new scientific role, the physicists recalibrated their psychological and cultural norms. Paul Forman asserted, "The most striking and characteristic change in the physicists' self-image is their abandonment, almost immediately and nearly totally, of their claims for the moral value of doing physics, for the moral virtuousness of those so

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[362]Ramsey, interview

[363]Morrison, interview. Some would argue that the National Science Foundation (NSF) is evidence that science was not corrupted. Indeed the idea behind it was "a federally funded, civilian-controlled foundation through which scientists, independent of the distortions introduced by military interests, might determine funding priorities." However, the NSF's founding legislation dictates that it promote not only "scientific progress" but also "national defense." Furthermore, whereas the Department of Defense, between 1950-1985, controlled between sixty-five and seventy percent of federal research and development funds, the NSF controlled between one and three percent. Carl Mitcham, "The Spectrum of Ethical Issues Associated with the Military Support of Science and Technology," in Mitcham and Siekevitz, 4

[364]Ivan Supek and Ignacy Malecki, "Scientists in the Contemporary World," in Rotblat, *Scientists, the Arms Race and Disarmament*, 174

[365]Norbert Wiener, "A Rebellious Scientist After Two Years," *The Bulletin of Atomic Scientists*, 4:11 (November 1948): 338

occupied - i.e., of themselves."[366] That is, pre-war physicists were sustained by the belief that they searched for natural truths. After the Manhattan Project, however, many were transformed into tools whose purpose it was to serve national interests. Younger cohorts of physicists quickly forgot what science was rumored to be and began to manifest a modern definition of scientific status: one where the importance of a project was measured in terms of dollars. Argued Wiener, "We are raising a generation of young men who will not look at any scientific project which does not have millions of dollars invested in it."[367] This prediction has played itself out in disturbing ways. Since World War II, many scientists have neglected the responsibility for reflecting on the implications of research in the "real world." Even Edward Teller, a proponent of military strength, declared, "We have two clear-cut duties: to work on atomic energy under our present administration and to work for a world government which alone can give us freedom and peace. It seems difficult to take on these responsibilities. To take on less, I believe, is impossible."[368] Nevertheless, younger scientists have continued to serve military and governmental ends *without acknowledging* the expectations of political involvement established by their elders: the Manhattan Project physicists. Joseph Rotblat asserted in August 1997,

> Many scientists are still not willing to face reality; they continue the pretense of living in the ivory tower. Many of them are actually opposed to the involvement of scientists with anything they consider to be outside the field of pure science. Worse yet, they discourage, or actively hamper, young scientists from being concerned with the social impact of science. It seems that we have a big task on our hands, a task to which we have paid too little attention in the past, to educate a significant proportion of the scientific community about the reality of science.[369]

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[366]Paul Forman, "Social Niche and Self-Image of the American Physicist," in Michelangelo De Maria, *Proceedings of the International Conference on The Restructuring of the Physical Sciences in Europe and the United States, 1945-1960* (Singapore: World Scientific, 1989), 102

[367]Wiener, "A Rebellious Scientist After Two Years," 338

[368]In Gilpin, 24

[369]In Moore, 45

Daniel Kevles has concluded, "In the postwar United States, physicists had become more the creatures than the makers of national security policy."[370] Because, as Oppenheimer asserted, weapons construction is not "the natural business of physicists," it is relevant to cite the statistic that, in the mid-1980s, one in nine scientists and engineers in the United States was employed by nuclear weapons programs[371] as evidence that, beginning with the Manhattan Project, science has slowly been corrupted.

The question remains as to how a corrupted science could maintain an image of purity in the eyes of its practitioners. The answer to this question is beyond the scope of this paper, but one possible explanation is that on the micro-level physicists still perform the same functions they always have: they hypothesize, experiment, and collaborate. Yet they refrain (or, as in the case of the Manhattan Project, they are actively discouraged) from stepping back and examining the macro-level direction of their work. As Paul Forman has asserted,

> Although in fact basic research is sustained as a (rather minor) adjunct to a vast program of national aggrandizement through military-industrial-technological innovation, the conditions of day-to-day scientific life sustain in the basic researcher the illusion of autonomy and purity.[372]

For example, many scientists who receive grants from the DOD claim that the source of their funding does not direct their research and does "not imply any special military relevance or applications of their work."[373] The Mansfield Amendment to the fiscal 1970 military appropriations bill, however, demanded of the DOD that "none of the funds authorized by this act may be used to carry out any research project or study unless such a project or study has a direct and apparent relationship to a specific military function or

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[370]Daniel Kevles, "Cold War and Hot Physics: Reflections on Science, Security and the American State," in Michelangelo De Maria, 12

[371]The Santa Barbara Study Group, "Your Career and Nuclear Weapons: A Guide for Young Scientists and Engineers," TMs (photocopy), 1984, 1

[372]Forman, 102

[373]Bernard Roth, "The Moral Arguments Against Military Research," in Mitcham and Siekevitz, 24

operation."[374] Consequently, projects proposed to receive DOD funding have been judged by military scientists on the basis of "whether or not the successful completion of the proposed work will help their work" using guidelines such as the army's "Military Themes for Oriented Research of High Scientific Merit."[375]

Universities Polluted

Physicists may also continue to believe that science is pure because of its strong association with the university, the traditional bastion of unadulterated freedom of investigation and expression. After the Second World War, many Manhattan Project physicists rejected all military-government work and fled to the ivory tower. "The withdrawal of scientists into the [university] village," wrote Jean-Jacques Salomon, "is a sort of phantasm of return of science to its maternal breast, the return of a science as innocent and pure as on the first day, that is to say, dissociated from its effects, its social function, its influence on world affairs, in a word, pure *theoria*."[376] This was, however, pure illusion. When money followed the scientists into the ivory tower, it influenced and directed the supposedly free exploration of natural phenomena. A study of all DOD contracts at Stanford University active on February 9, 1971 (111 contracts worth $14.1 million) concluded that, while

> Individual scientists paid with DOD money did indeed view themselves as being involved in objective searches for scientific truth... [this] study demonstrated that the military had developed a rational, well-administered program to define research priorities in terms of current and projected military needs and to purchase R&D from universities based on these needs. Thus, while the scientific process as reflected in each individual project proceeded objectively, funding availability biased scientist's choices on which projects to pursue.[377]

Similarly, three high-level military bureaucrats involved in scientific funding commented,

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[374]In Stanton Glantz and Norm Albers, "Department of Defense R&D in the University," *Science*, 186:4165 (November 22, 1974): 706

[375]Ibid., 707

[376]Jean-Jacques Salomon, *Science and Politics* (Cambridge: The MIT Press, 1973), 207

[377]Glantz and Albers, 706

> The DOD is not simply accepting scientific and technological products coming from a random pattern of independent research activities in the universities. Rather DOD interest in some particular area can stimulate growth and development planned to fill specific short-term and/or long-term technical gaps in the military's capability. Thus, given the large amounts of funding involved, and the large percentage of all engineering research these funds account for, the DOD plays a powerful role in shaping the profile of engineering research at Stanford and many other universities.[378]

Universities in competition for funding sold themselves as providers of technological services. By the late 1940s, for example, the military in conjunction with the Atomic Energy Commission funded eighty-five percent of the MIT research budget.[379] "The availability of these large sums of money led many universities to adopt policies that would encourage faculty members to develop research interests that would be 'fundable'; and this, in turn, led to affluence and rapid growth in many areas of science."[380] Many physicists have asserted that such financial support corrupted the intellectual purity of their profession. In 1949 Oppenheimer commented on the University of California,

> It is a great liberal university that is the only place in the world... that manufactures, under contract with the U.S. government, atomic bombs. I have sometimes asked myself whether we can find any analogy to this situation in the practice of the monastic orders that devote a part of their attention and derive part of their sustenance from the making of their private liqueurs.[381]

Enormous grants lured prestigious professors into potent science departments at the nation's finest schools. Quality became associated with financial support and therefore with governmental and military funding. Project physicist Ralph Lapp wrote in 1962,

> A generation ago most scientists would have scorned military work. But in 1960 one of our leading universities accepted more than $40 million of defense funds, 40 other universities received more that $1 million each, and there was hardly an institution of higher learning in the country which was

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[378]In ibid., 710

[379]Kevles, "Cold War and Hot Physics," 9

[380]Glantz and Albers, 706

[381]In ibid., 8

> not directly or indirectly a beneficiary of the Pentagon's interest in military science.[382]

Thus the Manhattan Project has also left a legacy in which the ivory tower too has been polluted. Concluded Lapp, "This subsidization of university sciences has had a... disturbing effect[:] it has sadly undermined our universities as oases of pure learning."[383]

The Lesson of Scientific-Political Fusion

The haunting and prophetic words of Frederick Soddy presented on the first page of this paper have come full circle to its conclusion. Mankind was relatively unprepared in a moral, political, and social sense to handle the power of the nucleus when it became accessible to scientists in the late thirties and early forties. When Project physicists gave the bomb to national statesmen, they initiated the corruption of their science. As their laboratories were politicized, they tried in vain to scientize politics. In many ways, nuclear weapons appear to have dragged civilization forward into threatening situations, and mankind has stumbled behind, constantly failing in its attempts to find a secure footing. Eisenhower's warning in his 1961 farewell address of "the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex" may have gone unheeded: in 1985 the Department of Defense's budget ($306 billion) was twenty-nine percent of the total federal budget.[384] During the Cold War the nuclear arms race escalated to absurd proportions. Weapons became more destructive (the typical warhead of the 1980s was approximately half a megaton: forty times more powerful than the Hiroshima bomb), and more were built (the United States and Soviet Union combined had more than 15,000 nuclear warheads in 1984). A group of scientists wrote in horror, "The total power of these weapons is more than a thousand times the total of all the bombs used

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[382]Ralph Lapp, *Kill and Overkill: The Strategy of Annihilation* (New York: Basic Books, 1962), 17
[383]Ibid., 18
[384]The Santa Barbara Study Group, 11

in World War II, leaving each side with the capability to destroy the other many times over."[385] Just one-fiftieth of the U.S. stockpile could cause a global nuclear winter.

Indeed, despite the optimism and unprecedented activism of the Manhattan Project physicists, this paper must end with more pessimism than hope. Soddy's wish that mankind would learn to use science in politically wise ways was crushed in the case of the Manhattan Project, and it is unclear if it will succeed in the future. Because of his prominence as scientist and activist, Project physicist Leo Szilard deserves the last word:

> I have been asked whether I would agree that the tragedy of the scientist is that he is able to bring about great advances in our knowledge, which mankind may then proceed to use for purposes of destruction - my answer is that this is not the tragedy of the scientist; it is the tragedy of mankind.[386]

[385]Ibid., 7

[386]Leo Szilard, *Leo Szilard: His Version of the Facts* (Cambridge: The MIT Press, 1978), 229

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