Einstein and the Bomb - Hiroshima the Hidden Story

PEJ News - F.H. Knelman, PhD - The generations that followed Hiroshima and Nagasaki are the generations who have the most to lose unless the record is set right and the lessons learned. By all measures, the U.S. decision to use atom bombs against Japan was the mother of all ?cardinal choices? and literally one which could determine ?whether we live or die.? There are two closely intertwined strands to the story of how this choice was made, the political and the scientific.

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From a paper I presented at an international Einstein conference.

Best regards,

Fred

EINSTEIN AND THE BOMB: THE HISTORICAL CONTEXT

F.H. Knelman, Ph.D.

?One of the most bizarre features of any advanced industrial society in our time is that the cardinal choices have to be made by a handful of men, in secret and, at least in legal form, by men who cannot have a first-hand knowledge of what those

choices depend upon or what their results may be. When I say ?advanced industrial society,? I am thinking in the first place of the three in which I am most interested - the United States, the Soviet Union and my own country. And when I say the ?cardinal choices,? I mean those which determine in the crudest sense whether we live or die.?

- C.P.Snow, Science and Government

Hiroshima: The Hidden History

The generations that followed Hiroshima and Nagasaki are the generations who have the most to lose unless the record is set right and the lessons learned. By all measures, the U.S. decision to use atom bombs against Japan was the mother of all ?cardinal choices? and literally one which could determine ?whether we live or die.? There are two closely intertwined strands to the story of how this choice was made, the political and the scientific.

Several historical watersheds provide the political context of the ultimate interaction of science and politics leading to the development and use of atomic bombs. In 1917, Tsarist Russia collapsed and the October Revolution ushered in the first communist state, the Soviet Union, with its promise to create a totally new society. In 1933, Adolph Hitler took power in Germany installing Nazism, a pernicious organized system of fascism. In the course of the next two decades, it became abundantly clear that the Western democracies were more fearful of Communism than of fascism. However, it is important to remember that, after false starts by both the West and the Soviet Union, they ended up as allies against the Axis powers in World War II with the Soviets bearing the brunt of the human costs, counting at least 7.5 million dead, more than the other Allied powers combined.

What can be discerned from Clement Leibovitz?s brilliant book, *The Chamberlain-Hitler Deal,*
1 is a historical continuum that links Munich to Hiroshima and Nagasaki, a continuum that now continues and includes Grenada, Panama and the Gulf War and, of course, Iraq, Leibovitz reveals the linkages and the dynamics of those interrelated events of such great moment, which inevitably laid the groundwork for the next period of the Cold War with its terrible social and environmental costs. The misguided yet deliberate policy of the ?free hand? was a primary cause for World War
II
. After the war, the ?free hand? evolved into the policy of containment - the ?steel curtain? based on the fear that the ?virus? of Communism would infect the body politic of the ?civilized? peoples - and then into the obscene nuclear arms race, based as much on mutually assured delusions as mutual assured destruction (MAD), in which the world itself became a pawn in this madness.

Leibovitz also documents the close relationship that existed between the British ruling class and the Nazis, a component of the Munich Pact.2 Leibovitz also exposes the role of Neville Chamberlain, the English Prime Minister who signed an ?infamous deal? on September 30, 1938 in Munich.3 Both Chamberlain and Churchill openly welcomed the rise to power of Mussolini in Italy.4 Albert Einstein entered the arena of history of events leading to the atomic bombing of the Japanese cities. He had established his reputation as a world-class scientist before the beginning of World War I. In particular, his 1905 elucidation of the special theory of relativity, which included the most famous equation in history - E=mC2. By that time his fame had established him as one of the most famous scientists of his time with major contributions to physics and astronomy. A seeming contradiction in the life of Albert Einstein was his acceptance of a nomination to head the prestigious Kaiser Wilhelm Institute for Physics in Berlin on December 7, 1913. Nine months later, in August, 1914, World War I began. Einstein took up residence in Berlin, some three months before the war began. Nevertheless, Einstein supported the Allies in the war5

As a result of Munich, Hitler was permitted to violate the Treaty of Versailles by rearming and to violate the Locarno Treaty by remilitarizing the Rhineland. It sanctioned anschluss, the annexation of Austria, and the dismembering of

Czechoslovakia by first occupying the Sudetenland and then invading the Czechs on March 15, 1939, just six months after the Munich agreement. On September 1, 1939, Hitler invaded Poland and the period known as the ?phony war? began. This was another form of the free hand given Hitler in the hope that he would destroy the Soviet Union. All too late, the world recognized that Hitler?s plans were to dominate the world, not merely Europe. The direct result was the Holocaust and the incredible ravages of World War II, capped by Hiroshima and Nagasaki. The ultimate cost was almost fifty years of the Cold War.

The Chain of Discovery

The scientific march toward the atomic bomb began towards the end of the nineteenth century with a series of critical discoveries. A group of brilliant scientists from a number of different countries began to unravel the structure of atoms into the sub-atomic particles of which they are composed. Their work led to the discovery of the phenomenon of radioactivity, the spontaneous emission of energy, in the form of particles or waves or both, from the atomic nucleus of certain elements and the related discovery of how to unleash the enormous force locked in the nucleus of certain atoms. This period has rightfully been called the golden age of nuclear physics. The men and women who contributed to these discoveries were brilliant, some of them geniuses, and in the beginning of this voyage of discovery they were interested only in extending the frontiers of new science. They formed a unique transnational culture and shared a common interest in a highly specialized area of nuclear physics. They spoke a complex and mathematical common language. They attended the few schools that excelled in this research and they openly shared their discoveries through key journals.

The first link in the chain of discovery occurred in 1896 when Henri Becquerel, professor of physics at both Ecole Polytechnique and Muse? d?Histoire Naturelle in Paris, conducted an experiment exposing photographic plates to light passing through certain crystals in order to study the effects of these salts. He was following a procedure suggested by W.C. Roentgen?s discovery of X-rays when he was experimenting with cathode tubes. Becquerel tried several luminescent

crystals and found that only uranyl sulfate, a salt of the heavy metal uranium, emitted radiation naturally. Becquerel wondered if the emanation was similar to X-rays. At the time Becquerel was convinced that it was the exposure to light that activated the uranium salt. Then a propitious accident occurred. On February 26 and 27, 1896, Becquerel left some of the uranium salts in a drawer wrapped with paper but in contact with a photographic plate. Becquerel developed the photographic plate on March 1, expecting to find very faint images. On the contrary, the silhouettes appeared with great intensity. From this, Becquerel hypothesized the existence of a completely new type of natural radiation. In 1898, Marie Sklodowska, better known as Marie Curie, gave the name ?radioactivity? to the phenomenon.

Gradually the three types of radiation involved in radioactivity were discovered, i.e. beta, gamma and alpha. These rays were gradually identified by simple experiments, such as whether they were deflected in a magnetic field, which led to identifying beta rays as negatively charged electrons. In the same period in Britain, Ernest Rutherford discovered the nature of alpha rays, positively charged particles, which provided a kind of magic bullet to fire at other atoms and observe the resulting phenomena. It was in this way that the nucleus was discovered to contain positively charged basic sub-atomic particles, the protons. By 1909, Rutherford confirmed that the alpha particle was the nucleus of helium and had double the positive charge of protons. After suggestions that gamma rays were similar to X-rays, in 1914, Rutherford and colleagues confirmed that gamma rays were very short light waves and thus a form of electromagnetic radiation.

The theoretical link between their collective endeavours and the ultimate destructive application was based on Albert Einstein?s great work on special relativity in 1905 and, in particular, his famous equation linking mass and energy, E=mC2. In the process of certain nuclear reactions, if some mass is destroyed, it will be transformed to a level of energy beyond any other human source; the destroyed mass (m) is multiplied by the speed of light squared (C2), where the speed of light is 186,000 miles per second. Thus, compared to conventional high explosives, this energy is many million times greater. Einstein said of this revolution in physics: ?With the splitting of the atom, everything in the world changed except our way of thinking. Now we are drifting to unparalleled

catastrophe.5

A key centre of excellence for nuclear physics were Rutherford?s laboratories at McGill in Montreal and later at the famous Cavendish Laboratory at Cambridge University in Britain. Still other schools of excellence were the Kaiser Wilhelm Institute of Physics in Berlin, with the eminent scientists Werner Karl Heisenberg and C.F. Von Weiszacker, a group under Niels Bohr, one of the great nuclear physicists, at Copenhagen; the Paris group with Frederick Joliot; and Enrico Fermi?s group in Rome.The U.S. universities of MIT, Chicago and California were home to many outstanding physicists. Possibly the most remarkable school of theoretical physics was the ancient Georgia Augusta University in G?ttingen, Germany. Virtually every well-known nuclear physicist and scientist in related fields attended G?ttingen at one time or another. The list of scientists reads like an encyclopaedia of the famous. Between 1923 and 1932, the following were in residence: Max Born, Niels Bohr, Arthur Holly Compton, Paul Dirac, Werner Heisenberg, Albert Michelson, Robert Millikan, Edward Teller, Linus Pauling, Paul Langmuir, Arnold Sommerfeld and so on. The mathematics department had been started by the very famous Carl Friederick Gauss. These physicists all published their findings in two leading journals - Nature, the journal of the Royal Society of the UK, and the German journal, Naturwissenshaften.

The stage was now set for the final elucidation of atomic structure. Earlier in 1898, J.J. Thomson, who had discovered the electron as a third basic sub-atomic particle, postulated that atoms themselves were not ?indivisible? but composed of sub-atomic particles. By 1904 he theorized that the atom consisted of electrons in orbits around some ?sphere? of positive electrification. A second theory, by the Japanese physicist, H. Nagaoka, was close to the ultimate solution. He proposed a structure similar to the planet Saturn and its moons. By 1912, Rutherford theorized that the central core was composed of a concentrated positively charged region which he named the ?nucleus?.

While it is not possible to acknowledge the individual contribution of every individual scientist to the unlocking of the secrets of atomic energy, one discovery

is worthy of note because of its critical role in the final building of an atomic bomb. In 1932. James Chadwick discovered the neutron, a sub-atomic particle with no charge, which is part of the nucleus of atoms, together with positively charged particles, protons. The neutron was to become a bullet which could be aimed at the nucleus of atoms to unleash the power hidden inside. Because the nuclei of atoms contain protons which are positively charged, they repel attempts to fire protons at them. But when the neutron bullet is fired at the unstable isotope of uranium, it produces an enormous explosion of energy.

Following the discovery of the neutron by Chadwick in 1932, Heisenberg came forward with the modern view of atomic structure, modified and improved by E. Majorana of Italy, in 1933. Contributions by Bohr and Sommerfeld led to the final elucidation of atomic structure as an ultra-micro miniature solar system, with the nucleus consisting of protons and neutrons as the ?sun?, and planetary electrons revolving in elliptical orbits around it. The number of protons in the nucleus is called the atomic number of the atom, Z. The atomic mass, A, is the mass of the sum of protons plus neutrons. Thus the number of neutrons becomes A-Z. And all the elements in the world are differentiated from each other by these numbers. Finally, some elements have more than one form of atomic structure. These are called isotopes. They are identical in the number of protons and electrons but have different numbers of neutrons. Therefore they differ somewhat in atomic mass.

By 1933, all the pieces of the puzzle of atomic structure had been put together to form a coherent picture. Also, Becquerel?s work had drawn the attention to that fateful atom, uranium. It was to become the focus of more than mere scientific curiosity. In its natural occurrence in the earth?s crust and, to a lesser degree, in the oceans, uranium consists of two isotopes, uranium 238 and uranium 235; in 1000 kilograms of natural uranium there are 993 kilograms of U-238 and 7 kilograms of U-235. It was the U-235 that turned out to have a property that changed the world. It became the stimulus for H.G. Well?s imagination and Leo Szilard?s curiosity and persistence. However, Rutherford was to say, ?One timely word of warning was issued to those who look for sources of power in atomic transmutations - such expectations are moonshine.? This was in a speech Rutherford made to the British Association on September 11, 1933, Leo Szilard

read about it in the London Times the next day and disagreed but did not know what the word ?moonshine? meant.6

It was at this point in the history of the atomic bomb that Szilard, the brilliant Hungarian physicist who had obtained his Ph.D. in Berlin and was considered a genius, entered the scene and became the lead actor. His genius allowed him to see the applications of scientific discoveries early in their development. While living in London, Szilard read Wells?s book, The World Set Free, the first chapter of which predicted a discovery of ?a new source? of radioactive energy. In the mid-1930?s Szilard became actively involved in promoting research on this ?new source of energy?. He surmised that if an element could be discovered that had a nucleus that could be split by neutrons and at the same time emitted neutrons, then a ?chain reaction,? a term he took from chemistry, might sustain this process. In 1934 he even applied for a patent for his process, which he assigned to the British Admiralty since he had already foreseen the military possibilities of such a device. At the same time, he did not want his patent to become public.

Pieces of the larger puzzle were being simultaneously discovered in several countries including Nazi Germany. By 1938, the focus on an atom bomb was intensified through revelations by key experiments. Uranium continued to be the focus of interest as the links in the chain of discovery proceeded. Fermi, in Rome, conducted experiments bombarding uranium with neutrons, but he failed to identify the process known as fission which Szilard had imagined possible. Then on December 22, 1938, two German researchers in Berlin, Otto Hahn and Fritz Strassman, reported on a decisive experiment in the journal, *Naturwissenshaften.* *7* The experiment indicated that an isotope of uranium, U-235, had undergone fission, its nucleus had split when bombarded by neutrons, at the same time emitting neutrons that could cause further fission, although they also failed to understand the significance of this event. It is a criticism of the history of science that Ida Noddack, a Czech scientist, is not always credited with being among the first to understand the significance of Hahn-Strassman experiments.8

An associate of Hahn and Strassman, Lise Meitner, an Austrian Jew, also saw its significance. She had calculated that the sum of the masses of the fission products was less than the original mass of the uranium and therefore some of this mass had been converted to energy. She was about to become a target of Germany?s racial laws and she had to be smuggled out of Germany. She communicated her findings to her nephew, Otto Frisch, who worked with Bohr in Copenhagen. Bohr not only saw the significance, but felt compelled to warn the West. Bohr arranged an interview with Churchill to inform him of the likelihood of a race to build atomic weapons. Churchill listened to the scientist for half an hour in silence. But at the end of that time he suddenly stood up and broke off the audience, before Bohr had finished. The Prime Minister is then said to have turned to Lord Cherwell and asked, with a shake of the head, ?What is he really talking about? Politics or physics??9 What Churchill and his science advisor, Lord Cherwell, failed to understand is that Bohr was talking about both science and politics.

The relatively tranquil world of nuclear physics, at least in terms of political impacts, was short-lived when Adolph Hitler came to power in Germany in 1933. The collision with politics created a shock wave that reverberated in history. It ultimately led to a race to unlock the incredible force of nuclear power between Hitler?s Germany and the scientists of the West. But the Germans made a false start and were disqualified early in the race. A fascist agitator, Johannes Stark, instigated a general attack on nuclear research as ?Jewish physics.? In May, 1933, seven key nuclear physicists resigned from Georgia Augusta University, among them the eminent James Franck. This was the beginning of a flood of immigration of great talent from Germany. Even Heisenberg was later attacked by the Black Shirts (Die Schwarze Korps) as a ?white Jew.? As the racist policies of Hitler became clearer every day, a general emigration of Jewish scientists took place, not merely from Germany, but from Italy and most of Europe, West and East. While some of the scientists first went to Britain, most ended up in America. Key players in the theatre of nuclear physics to migrate were Teller and Szilard from Hungary, Fermi from Rome, Von Halban and Leo Kawarski from France, Bohr from Copenhagen and, of course, Albert Einstein. They and many others contributed their work and experience to the eventual project to build a bomb. The age of innocence for nuclear physicists was to end.

Then in 1939, both Szilard and Fermi performed experiments with uranium confirming the possibility of a chain reaction. However, they could not convince the U.S. military of the significance of their discovery. Another physicist, Walter Zinn, at Columbia, had also confirmed the chain reaction. It was at this time that Szilard decided to approach all the key physicists in the relevant fields, urging them to cease publication on their further findings. He particularly tried to convince Joliot, in Paris, a leader in the field, not to publish the key discoveries. But the debate was cut short when Joliot and his French co-workers published an article describing uranium fission in the leading British journal, Nature.10 There were also many other scientists, such as Teller and even Fermi, who did not agree with Szilard?s request for a moratorium on publishing. By 1940, it was clear that Szilard and Fermi understood the basics of creating a chain reaction utilizing the U-235 isotope of natural uranium. This is one of two natural fissionable elements in the world, the other being plutonium-239. Szilard also thought that the fission occurred when U-235 was bombarded with ?slow neutrons.? This turned out to be incorrect. He realized you needed a starter for this process, a neutron generator. He also thought, incorrectly, that you needed a ?moderator?, a substance to slow down the acceleration of ejected neutrons from the fission process. He even conceived of the possibility of using ?fast neutrons? to split the U-238 fraction of natural uranium and felt that research should be conducted on this possibility.

Szilard focused his efforts on the search for an element that might produce a chain reaction. In fact, in London, he even visited Chaim Weizmann, a renowned chemist, later the first president of Israel. Weizmann was receptive and together with another famous chemist, Michael Polanyi, tried to get a grant for Szilard to do his experiment. Getting grants proved fruitless and Szilard emigrated to the United States. As the knowledge gradually emerged about the feasibility of building a bomb, scientists began to ask more searching questions about the implications. Szilard spearheaded the effort to get the U.S. government to recognize the potential for making an atomic bomb and the danger that Germany could win the race for the bomb. It is interesting and understandable that scientists like Szilard and Einstein, as well as others who understood the true nature of fascism in Germany, felt compelled to prevent Germany from being the first to build the bomb, given its ultra-racist policy. However, the majority of scientists, perhaps motivated by a Faustian drive to discover and compete, adopted a position of neutrality, defending the purity of scientific discovery in a sociopolitical vacuum.

Szilard felt it was necessary at this time to seek an audience with President Franklin Delano Roosevelt. He decided to approach Albert Einstein, a scientist with the stature to facilitate such a meeting. Both men shared the fear that Nazi Germany might be the first in the race to build an atom bomb. As Szilard said, ?You don?t have to be much cleverer, you just have to be one day earlier.? The letters exchanged between Szilard and the key players in the bomb project have been collected to provide a valuable background to the events leading to the deadly decision. His daughter, Gertrude Weiss Szilard, helped edit the correspondence.11

Einstein failed to obtain a direct audience with Roosevelt. He decided to enlist the intervention of other famous people such as Charles Lindberg, but finally chose Alexander Sachs of Lehman Brothers who knew Roosevelt personally. On March 7, 1940, Einstein wrote Sachs explaining the ?German Uranium Project? that involved the eminent physicist, Von Weiszacker, the son of the German Secretary of State, who was working on uranium with a group of scientists at the Kaiser Wilhelm Institute. And on March 15, 1940, Sachs transmitted this information to General Edwin H. Watson, secretary to Roosevelt.

Then in 1941, a key event, the attack by Japan on Pearl Harbor, galvanized the U.S. response to an atom bomb. At the same time, Szilard and Einstein went from the position of agitating for the development of the bomb to arguing against its use as a military weapon in the war with Japan. In the last stages of this drama, Szilard in particular argued for a ?demonstration? of its potential by dropping it on an uninhabited island rather than its military use and, above all, for international control of this terrible weapon.

There is a vast gap between an experiment, albeit successful, and the actual design of a workable innovation. In a critical mass, for every neutron lost a second neutron must be generated. In the actual bomb design, two neutrons were generated for each one lost. Both U-235 and Pu-239 bombs need to be surrounded by a material that reflects neutrons. The explosive engineering was accomplished by George Kristiakowski. Scientists devised a tubular cannon with

two separated masses of uranium, each sub-critical, so that when they are brought together by firing a chemical explosive they achieve criticality. This was the form of the atom bomb used on Hiroshima. At the same time, Glenn Seaborg, a U.S. scientist who had discovered plutonium -239, suggested it was even easier to create fission. In this case, the bomb was a spherical mass of Pu-239, just barely sub-critical. By surrounding it with conventional explosives designed to explode inwards, to implode, the slightly increased density would cause the plutonium to go critical. This was the bomb first tested at Alamogordo, New Mexico, on July 16, 1945, and dropped on Nagasaki on August 9, 1945.

As a result of letters from Einstein, Szilard and Sachs, Roosevelt became aware of the threat inherent in the potential of atomic weapons in enemy hands. There was the momentous exchange on that fateful day of October 11, 1939, when Roosevelt said, ?Alex, what you are after is to see the Nazis don?t blow us up.? ?Precisely,? said Sachs.12 Roosevelt summoned his military aide, General Watson, and thus was launched the Manhattan Project to build the bomb. The date was October 11, 1939. Soon after, Roosevelt appointed a ?uranium committee? to meet with the concerned scientists such as Szilard, Teller, Wigner and others, to discuss the issue. The committee became stuck in the mud of bureaucratic procedure and for a year and a half failed to take the action recommended by the scientists to fund the experiments. At the time, governments were not accustomed to funding major R & D projects. However, events led the U.S. to create a special military organization to proceed with the research, prompted, to a large degree, by increased involvement in World War II. By the spring of 1941, a discovery by Rudolf Peierls confirmed Szilard?s ?guess? that the U-235 isotope of uranium would permit the development of a small bomb began to interest the military. There was also considerable interest in a bomb based on Pu-239 that promised to be even more efficient in neutron utilization. This prompted the U.S. to create a new committee, Section S-1 of the Office of Scientific Research and Development, to coordinate all military useful scientific developments. S-1 recommended a dedicated effort to separate the U-235 isotope from uranium.

The Manhattan Project got underway on September, 1942, with Brigadier General Leslie Richard Groves as its head, which placed it directly under the military. Given the individuality and idiosyncrasies, as well as the politics of the international scientists assembled, this was a prescription for conflict. And

conflicts did arise between the scientists and the military over central policy issues. The conflict between the scientists and the military could have been predicted, since scientists are used to working in an open environment and the military is basically a closed, secretive establishment. General Groves appointed a brilliant American physicist, Robert Oppenheimer, to head the scientific and technological program. Oppenheimer turned out to be the Hamlet of nuclear physics.

Oppenheimer chose the village of Los Alamos, New Mexico, where he had attended a private boy?s school, as the site for the major laboratories of the Manhattan Project. A huge team of international scientists was assembled and brought there. They included the top physicists from Europe, Britain and the U.S., with a strong contingent of the refugee group such as Szilard, Wigner, Teller, Bohr, Franck and Samuel Goudsmitt. Major auxiliary functions were assigned to the University of Chicago. Szilard and Groves were natural adversaries. In fact, Groves first tried to get rid of Szilard in 1941 and actually drafted a memo for Secretary of War, Henry L. Stimson, to have Szilard interned, which Stimson ignored. Groves?s fear was not that Szilard could not keep secrets but that he would distract the other scientists with his constant agitation over the intended use of the bomb.13

The atmosphere at Los Alamos not only reflected a deep division between the natural openness of the scientific mind and the closed military mentality, but also one between those scientists exclusively concerned with the technical aspects and those who were also concerned with the consequences. The latter group included Szilard, Franck, Bohr, Wigner (who had the courage to resign), Philip Morrison and Eugene Rabinowitch, while Teller was the leading representative of the former group. Moreover, Groves has been identified as anti-Semitic; Sachs referred to him as ?very ambitious, intelligent and a fascist.?14 Oppenheimer straddled the fence between the two groups, between means and ends, thus precipitating his tragedy.

Military security was maintained meticulously with intelligence services watching

and listening to everything, including the personal lives of the scientists and all their communications. The head of military security was Colonel Boris Pash, a man with a neurotic passion to look for and expect to find Communist infiltration. Pash suspected Oppenheimer was a security risk and was opposed to his appointment. He had documented Oppenheimer?s left-wing contacts, both organizationally and personally, and discovered that Oppenheimer was having an affair with Jean Tatlock, a woman with well-established left-wing associations. On the other hand, Groves believed in Oppenheimer?s critical leadership role and continued to support him. In the course of events, Pash became convinced that Oppenheimer had been approached by a spy. Military security began to interrogate Oppenheimer, insisting that he reveal his ?contact.? Finally, for some unaccountable reason, Oppenheimer named a close friend, Haakon Chevalier, a lecturer in romance languages at the University of California. This was a complete lie. Chevalier was fired and driven into exile by Oppenheimer?s irresponsible charges. It is tragic that a man of Oppenheimer?s talents and stature should have finally chosen power over integrity, though not surprising. It was as much a betrayal of self as of other. Nevertheless, under the protection of Groves, and because Oppenheimer had named his ?contact,? he remained the director of the project.

The development leading to the actual production of atom bombs did not go smoothly. The conflicts between the refugee scientists and the combined bureaucracy of the U.S. science establishment and the extreme security of the military all proved distracting. By the end of 1942, however, a major success was achieved. A secret laboratory had been built underneath the west stands of Stagg Field at the University of Chicago. Under the directorship of Fermi, the first successful ?atomic pile? went critical on December 2, 1942. This was a predecessor of civil nuclear reactors in which the energy of fission is absorbed by heat exchangers and converted to electricity through steam generators.

As the bomb project proceeded, an understandable shift took place. The very scientists who had initially prompted the U.S. to develop atom bombs now became the critics of its intended military use. For one thing it had become clear by the end of 1944 that the German Uranium Project was a dud, so this threat had disappeared. Moreover, the war began to go well for the Allies and the Soviets, as

the Germans began to sustain serious losses into 1945. At the same time, the agitation of some of the scientists concerning the use of the bomb increased. On July 3, 1944 Bohr wrote an eloquent letter to Roosevelt urging the need for international control of nuclear weapons. Szilard, using the good offices of Einstein, wrote to Roosevelt in much the same vein. The essence of the enclosure from Szilard was that:

the use of the first atomic bombs against Japan would inevitably spur a post-war nuclear arms race;

it was inevitable that the Soviets would have the bomb within six years;

there would be a special danger from small hidden bombs placed on U.S. territory;

the future development of rockets could place U.S. cities in hazard;

ultimately enough bombs on both sides could threaten billions;

nuclear war could be started by a bomb employed as a ?preventative measure?;

the possibility exists of a weapons-based fissioning U-238, with a yield equivalent to ten million tons of TNT;

there is a need to develop a system of international controls of critical materials, such as uranium, with safeguards against violation;

Russia should be persuaded at the beginning, together with Britain and the U.S., that no further development should take place;

a system to deter other states from developing this bomb should be developed.

Considering the entire sequence of subsequent events - the nuclear arms race, the Cold War and the largely frustrating attempts to put the nuclear genie back in the bottle - Szilard?s foresight was nothing short of incredible. Tragically, this last communication, dated March 25, 1945 was never read by Roosevelt, who died on April 12 in Warm Springs, Georgia. The letter was submitted unopened by James Byrnes - a superhawk Republican in Southern Democrat clothing - to the new president, Harry S. Truman. Szilard sent a note to Truman on May 25, 1945. In a personal meeting that Szilard had with Byrnes, now Truman?s Secretary of State, Byrnes clearly tied the use of the bomb to deterring the ?Ruskies?. At this point the bomb project was approaching completion with great rapidity. Szilard and others had been participating in a discussion on its use. In a draft petition, Szilard concluded with the following statement petitioning the President ?to rule that the United States shall not, in the present phase of the war, resort to the use of the atomic bombs?. Eighteen scientists had the courage to sign this draft. Szilard was particularly concerned that it not be used on the Japanese. Together with a small group of some ten scientists, Szilard eventually circulated a petition at the University of Chicago labs which secured a total of sixty-eight signatures which he attempted to submit to President Truman but was prevented by General Groves.

In 1945, Franck, the German refugee physicist, together with seven of his colleagues, including Szilard and Rabinowitch, was entrusted with developing a policy position on the deployment of the atomic bomb. Essentially, the Franck Report recommended a ?demonstration? rather than a military use.15

Rabinowitch, the founder of *The Bulletin of the Atomic Scientists,* was co-drafter of this report. The recommendation of the report was close to Szilard?s position on deployment. It was quickly ?classified? on the grounds that it was contrary to the policy of the Truman government. It is interesting that Einstein and Morrison firmly believed that Roosevelt would not have used the atom bomb against a military target, something history cannot substantiate.16 It is clear that the decision to bomb Japan was prompted by both racial and revenge motives.17 And there was anti-Semitism apparent in the references to Jewish scientists as ?of Jewish extraction.?18 Unfortunately, Truman was captive to the Pentagon and the generals had already made the decision to use the bomb against Japan. Moreover, Truman shared the prevailing view that linked the bomb to the politics of containment of the Soviet Union. Given the success of the Soviet forces in entering Berlin and their formal agreement to join the war against Japan, the U.S. was concerned to halt any further Soviet expansion of influence.

One amusing story in an otherwise tragic tale had to do with the allied search for he Germany uranium project headquarters. As Allied forces swept across France, Colonel Pash and the Dutch physicist Goudsmitt followed to take part in this search. One of their techniques was to test river, stream and lake waters to see if there were signs of radioactivity which could be a signal of nuclear research. Goudsmitt was easygoing and affable, but he was bored with the search and with Pash?s obsessive personality. He sent a cable to America which in part read, ?water negative, but great activity with the wine?. What he meant was that he was able to engage in some wine-tasting as they passed through an occasional vineyard. What he didn?t know was that all his correspondence was read by military intelligence. The next thing he knew, Pash had ordered a careful search of every possible vineyard. Ironically, when they finally located the office of the German Uranium Project - and a poor thing it was - they found it occupied by Heisenberg, author of the Uncertainty Principle. On his desk was to use it, we had adopted an ethical standard common to the barbarians of the Dark Ages?.32

In summary, the real reasons for using the bomb were a mix of the following components:

It was the second step in the containment of the Soviet Union. (The first was the Chamberlain-Hitler deal and the ?phony war? period.)

It was in part driven by the allure and seduction of scientists in the pursuit of discovery and invention.

It was a classic example of the alleged neutrality of their work on the part of some scientists, and a reflection of the technological mind-set.

It was in part an act of revenge against the Japanese and possibly in some part an act of racism.

The group in the Pentagon responsible for the Pacific theatre was experimenting with a new toy of enormous military potential; for them, it was ?just an experiment?, an unjustified one.

There is little question that the U.S. violated existing international humanitarian law, particularly the 1925 Geneva Protocol, when it used atomic weapons on Hiroshima and Nagasaki, as it did when it used poison gas, the defoliant Agent Orange, in Vietnam.

The major argument by those who have justified the bombing of Japan is that it has prevented atom bombs from being used again. But, in fact, the bomb has been ?used? many times if one considers that threatening to drop it is one sort of use. Truman issued a direct threat against the Soviets in March, 1946, when Soviet troops entered Iran. ?We?re going to drop it on you?, was what he conveyed to Ambassador Andrei Gromyko.33 The threat was used many times in

Korea in 1953, in Berlin in 1961, in Cuba in 1962 and by Nixon against Vietnam. In 1980, the Carter Doctrine involved the threat of using nuclear weapons against the Soviets in the Middle East theatre. In fact, there were secret Pentagon policy studies which added an operational parameter to such threats.34 The World Court made a judgment which stated that ?the use or threat of use? of nuclear weapons was contrary to international humanitarian law. This condemnation of the U.S. in no way condones Japan?s criminal and unprovoked attack on Pearl Harbor in 1941 or its military history of cruelty and violence. But nothing Japan did justified the greater crimes of Hiroshima and Nagasaki.

A Short Retrospective

While a few scientists, like Teller, were consistent in supporting the bombings before and after, the majority appeared to suffer some remorse and even guilt. Some offered explanations of their role that were themselves revealing. Some were totally absorbed by the technical problems, their solution and their ultimate success. Still other scientists had early doubts which changed later to regret. The rationale for their initial and later assessments could make an entire course on the sociology of science, and its norms of behaviour, values and ethics. Reading between the lines of the various statements concerning the dropping of the bomb, there is evidence of a common psychological response of people who have committed horrific crimes. There is denial and disassociation. The former is rationalization and the latter shutting out the context.

In 1947, some fifteen years after Franck left Germany and after the ?success? of the Manhattan Project on which he worked, he made a remarkable statement of great insight concerning science and politics: ?It is a custom in science - and perhaps a principle - to select from the infinite reservoir of unsolved problems only those simple ones the solution of which seems possible in terms of available knowledge and skills. We are trained to subject our results to the most severe criticism. Adherence to those two principles results in our knowing very little, but on the other hand being very certain that we know this little...We scientists seem to be unable to apply these principles to the immensely complex problems of the

political world and its social order. In general we are cautious and therefore tolerant and disinclined to accept total solutions. Our very objectivity prevents us from taking a strong stand in political differences, in which the right is never on one side. So we took the easiest way out and hid in our ivory tower. We felt that neither the good nor the evil applications were our responsibility.?35

Both Heisenberg and Von Weizsacker also made insightful statements when they talked to Fermi. Jungk reports on their meeting at the home of Goudsmitt, their former colleague, at G?ttingen and the subject turned to the part that a critical experiment, done at the Kaiser Wilhelm Institute in Berlin in 1938, had played in developing the atomic bomb. Heisenberg said: ?In the summer of 1939, twelve people might still have been able, by coming to mutual agreement, to prevent the construction of atomic bombs?. He himself, and Fermi, who were undoubtedly included among the twelve, ought then to have taken the initiative. But they let the opportunity go by. Their powers of political and moral imagination failed them at that moment as disastrously as did their loyalty to the international tradition of science. They never succeeded in achieving thought and action appropriate to the future consequences of their invention. Nor had they, in that critical situation, enough confidence in the legacies bequeathed by the past of their profession.36

?The fact that we physicists formed one family was not enough?, Weizsacker remarked after the war. ?Perhaps we ought to have been an International Order with disciplinary power over its members. But is such a thing really at all practicable in view of the nature of modern science?37 Von Weizsacker?s proposal was precisely what some scientists had attempted to accomplish. But the truth is that as long as we have political states in conflict with no higher form of governance, this is a dream difficult to turn into reality.

The Post-War Nuclear Fallout

In 1946, following the lead of Dean Acheson and David Lilienthal, Bernard Baruch

presented a plan for the international control of nuclear weapons to the United Nations. The Baruch Plan had considerable merit based, as it was, on the global control of uranium, together with an international agency for enforcement.38 However this plan fell victim to the emerging ?cold war? and a year later the Soviets rejected it. While the Baruch Plan had concentrated on uranium mining, five days afterwards Soviet Foreign Minister Andrei Gromyko presented the Soviet plan which was based on a pledge by all countries not to produce nuclear weapons and to destroy all existing weapons and initiate an inspection and verification process. There was a rider, and this was that each of the five members of the Security Council with veto power could veto these inspections and punishments. Obviously, neither plan could be acceptable both to the U.S. and the Soviet Union.

After a successful campaign by scientists to keep nuclear matters out of the hands of the military, the U.S. Congress passed an act in 1946 to create a civilian body, the Atomic Energy Commission (AEC) to oversee nuclear power and, even more specifically, to carry out President Eisenhower?s ?Atoms for Peace? program, and to promote and regulate atomic energy - two incompatible functions. The real mission was to protect ?atomic secrets? and provide civilian control over nuclear weapons, yet another incompatible pair of functions. The record of the AEC, like its counterpart, the International Atomic Energy Agency (IAEA) has been one of continuous cover-up, deliberate distortions and outright deception, supported by a program of concerted propaganda.39 David Lilienthal, head of the Tennessee Valley Authority was the first chairperson, while Lewis Strauss, a former Wall Street investment banker, became the second. Seaborg, co-discoverer of plutonium and a Nobel Laureate, was the third and, given his practically religious devotion to the advancement of nuclear power, he became the ultimate technological optimist and, at the same time, the person who always upheld the hypothesis that nuclear power was clean, safe, necessary and limitless. These men worked to establish a large nuclear reactor program quickly to get the private sector involved - to reap the ?benefits?, without quite bearing the costs. They even supported so-called ?peaceful nuclear explosions?.

On the military side, the post-1945 period saw the beginning of a new debate among scientists and within government on the question of whether to build a

fusion or superbomb, as it was called. In part, the debate was prompted by the explosion of the first Soviet atomic bomb in Siberia on August 29, 1949 (Joe I), only four years after the American bomb. Most of the scientists were not surprised. Szilard, for example, had predicted that the Soviets would produce a bomb within six years. The politicians, on the other hand, were certain that the Soviets could accomplish this only with the help of spies.

New journals of scientific associations emerged after Hiroshima and Nagasaki, such as the Journal of the American Federation of Atomic Scientists. *The Bulletin of the Atomic Scientists*
, celebrated for the Doomsday Clock on its cover, was born in 1946. To this day it is the best source of information on nuclear matters, as it was in the early period. It was largely through the opposition of the nuclear physicists that the May-Johnson Bill, which would have retained military authority over nuclear matters, was defeated. In a way, this was also the first stage in the protest movement of both scientists and citizens against both civil and military nuclear power. And it was at this time that I first became involved in anti-nuclear activities. It also led to such initiatives as the International Pugwash Conference founded by the the Canadian industrialist, Cyrus Eaton, with whom I later developed a relationship after a publisher approached me to write his biography.

Linus Pauling, the most persistent and powerful anti-nuclear voice in the world and the then president of the American Chemical Society, wrote in response to the Russian bomb: ?I believe that the event should, however, serve to point out the necessity of taking immediate action to avert the atomic catastrophe that the world is facing, I believe that it should be a warning to the people of the world and a potent incentive to the nations of the world to resume negotiations, through the United Nations Organization, for the establishment of an effective system of international control of atomic energy?40

Meanwhile, those in charge of the military program, still under the jurisdiction of AEC and a Joint Committee on Atomic Energy (JCAE), a congressional overseer body, pressed for further development and stockpiling of atomic weapons while wrestling over the decision to produce a ?superbomb? which was based on fusion

rather than fission. It was actually the General Advisory Committee (GAC) of the AEC that mediated the issue of whether to build the superbomb. Oppenheimer was its chairman. By 1949 the GAC was still opposed to the superbomb. Remarkably, there were those in Truman?s cabinet, such as Dean Acheson, Secretary of State, who was also disgusted with ?the whole rotten business?, yet felt that it was necessary to develop a superbomb. Enough evil had been brought into human life, it was argued by men of highest standing in science, education and government, through development of atomic weapons without adding the super-horror of thermonuclear ones. ?If the United States, with its vast resources, proved that such an explosion was possible, others would be bound to press on to find the way for themselves. If no one knew that a way existed, research would be less stimulated. Those who shared this view were, I believed, not so much moved by the power of its logic (which I was never able to perceive - neither the maintenance of ignorance nor the reliance on perpetual goodwill seemed to me a tenable policy) as by an immense distaste for what one of them, the purity of whose motives could not be doubted, described as ?the whole rotten business.?41

Supported by the Secretary of Defense, Lewis Johnson, Truman made the decision to proceed with the superbomb in January, 1950. The major advocate was Teller, a cold warrior scientist and the darling of right-wing Republicans in Congress. His record on arms control is consistently negative. From his Lawrence Livermore Laboratory he had been an unwavering proponent of the uses of nuclear technology in war. He fought against the nuclear test moratorium and deserves the major blame for the failure of the 1963 Nuclear Test Ban Treaty to prohibit underground tests. In time, he became a confidante of Ronald Reagan and a strong supporter of the Star Wars technology. He is also responsible for the inclusion of the so-called peaceful uses of nuclear power in the nuclear Non-Proliferation Treaty (NPT) of 1968.

Meanwhile, in August, 1950, the U.S. exploded their first genuine superbomb, code-named Mike, on Enewetok Atoll in the Marshall Islands. Its yield was equivalent to ten million tons of TNT or ten megatons, a thousand times greater than the bomb that was dropped on Hiroshima which killed 100,000 people. Then in August, 1953, the Soviets exploded their first superbomb which was only

partially a fusion device. Their first genuine superbomb, Joe II was exploded in 1955.

In the U.S. very few people in Congress had opposed Truman?s decision to proceed with the superbomb. In 1950, Teller made a statement revealing his belief in scientific detachment: ?The scientist is not responsible for the laws of nature. It is his job to find out how these laws operate. It is the scientist?s job to find the ways in which these laws can serve the human will. However, it is not the scientist?s job to determine whether a hydrogen bomb should be constructed, whether it should be used or how it should be used. This responsibility rests with the American people and with their chosen representatives?,42 i.e. the alleged neutrality of science.a picture of himself with an arm around the shoulder of none other than Samuel Goudsmitt, taken at G?ttingen. One can imagine the response of Pash, given his suspicious nature.19

A landmark event occurred on July 16, 1945 with the successful detonation of a plutonium device in the remote desert hamlet of Alamogordo, New Mexico. The military code named it ?Trinity?, a linguistic artifice to cover over the offensive reality. Oppenheimer, the poet-scientist, was gazing in wonder at the incredible fireball and ominous mushroom cloud and recalled the words from the Bhagavad Gita, a sacred epic of the Hindi:

If the radiance of a thousand suns

were to burst into the sky,

that would be like

the splendor of the Mighty One.20

And then he also remembered another line, a phrase of the exalted Sri Krishna: ?I am become Death, shatterer of worlds?.21 But Oppenheimer was only a man, one into whose hands fate had placed an instrument so powerful that it could shatter worlds. He was a true child of Frankenstein, later to suffer remorse and guilt. He remarked, ?In some crude sense, which no vulgarity, no humour, no overstatement can quite extinguish, the physicists have known sin and this is a knowledge which they cannot lose?. He also said, ?We thought of the legend of Prometheus and of that deep sense of guilt in a man?s new powers that reflect his recognition of evil, and his long knowledge of it.22

On June 30, 1945, the U.S. naval ship, the Indianapolis, carried the two bombs to the island of Tinian in preparation for assembly and loading on bombing aircraft. Of four target cities in Japan, Hiroshima and Nagasaki were selected to be attacked with a uranium and a plutonium bomb respectively. They were given the cozy Disney-like names, ?Little Boy? and ?Fat Man?. It was a cruel irony that the Indianapolis, on its return from Tinian, was sunk by the Japanese in shark-infested waters and 316 of the crew were eaten alive. In a strange way, this was a symbolic mutual carnage.23

On August 6, 1945, at 8:15 a.m., the U.S. Air Force bomber, the Enola Gay, with Paul Tibbets as pilot - Enola Gay was the name of Tibbets?s mother - and George Weatherby as navigator, dropped Little Boy on Hiroshima. The official military assessment was that over sixty percent of the entire city of Hiroshima was wiped off the map. Of the thirty designated military targets, only four were really specifically military. Among the thirty were distinctly non-military industrial targets such as textile mills.

The number of deaths after the first few days was in the order of 100,000, a figure kept secret by official sources. The dead had been incinerated, vapourized and

fragmented to dust. From the beginning, the U.S. military and government deliberately minimized the immediate to long-term range of radioactive damage. This tradition of down-grading radiation insults has continued to this day, practiced by the civil nuclear power authorities with a vengeance. Robert Jay Lifton, an American psychiatrist, visited Hiroshima and interviewed many of the survivors (?hibakusha?). The following account is a dramatic description of the horror in the immediate aftermath of the bombing: ?The appearance of people was...well, they all had skin blackened by burns. They had no hair because their hair was burned, and at a glance you couldn?t tell whether you were looking at them from in front or in back. They held their arms bent like this...and their skin...not only their hands, but on their faces and bodies too - hung down. If there had only been one or two such people perhaps I would not have had such a strong impression. But wherever I walked I met these people. Many of them died along the road - I can still picture them in my mind - like walking ghosts. They didn?t look like people of this world. They had a special way of walking - very slowly...I myself was one of them.?24

Lifton quotes a young sociologist: ?Everything I saw made a deep impression - a park nearby covered with dead bodies waiting to be cremated...very badly injured people evacuated in my direction...The most impressive thing I saw was some girls, very young girls, not only with their clothes torn off but with their skin peeled off as well...My immediate thought was that this was like the hell I had always read about.? Lifton adds: ?Survivors began to notice in themselves and others a strange form of illness. It consisted of nausea, vomiting and loss of appetite; diarrhea with large amounts of blood in the stools; fever and weakness; purple spots on various parts of the body from bleeding into the skin....inflammation and ulceration of the mouth, throat and gums,...bleeding from the mouth, gums, throat, rectum and urinary tract,....loss of hair from the scalp and other parts of the body,...extremely low white blood cell counts when those were taken...and in many cases a progressive course until death.?25

Following the bombing of Hiroshima there was a rush to commit a further atrocity. On August 7, the news reached Tokyo headquarters that the U.S. forces were planning a further assault, Japanese high command consulted a nuclear physicist, Yoshio Nishima, who, upon hearing that a single plane was carrying out the

attack, strongly suspected that it contained an atomic device. On August 8, he set out in a small plane with radiation detectors. Unfortunately, bad weather forced him to return to Tokyo. He did not reach Hiroshima until August 9 and immediately knew that an atomic bombing had taken place.26 Also, on August 8, the USSR declared war on Japan which may have influenced the final decision to drop a second bomb. On August 9, 1945 a single bomber named Bock?s Car after the pilot Charles Bock, dropped an atom bomb on the helpless and unprepared city of Nagasaki - in the context of Hiroshima, an act of genocide. The terrible result was another 100.000 people who died for no acceptable reason. Even if there were any way to justify bombing Hiroshima, there was absolutely no justification for the attack on Nagasaki. On August 14, 1945 Japan surrendered, but with the condition that Emperor Hirohito remain at the head of the government. Despite this, Truman insisted on calling it an ?unconditional surrender?-a gratuitous label - because retaining the emperor was in fact U.S. policy.

The majority of the people killed, wounded, maimed and tortured were non-combatants, civilian men and women and many children. In the two days following the bombing of Hiroshima, it was reported that the deaths from the radiation, the invisible poison, reached the tens of thousands and deaths from the murderous delayed effects continued to exact an increasing toll. The longer-term survivors, the ?hibakusha? of which there were some 350,000 in Japan, never quite escaped the horror of being reminded of the event by radiation sicknesses of all kinds, some terminal, to this day. The best estimates of the death toll in Hiroshima was 197,045, while Nagasaki suffered 74,000 dead. However, there have been deaths every year from the delayed effects of radiation poisoning.

Admiral William Leahy, Truman?s Chief of Staff, placed the weapon in the category of a poison gas. ? ?Bomb? is the wrong word to use for it, it is not an explosive. It is a poisonous thing that kills people by its deadly radioactivity?.27 The U.S. military, under the command of General Douglas MacArthur, used every means to suppress information about the effects of radiation. The Japanese press were censored, reporters were forced to leave Japan, and a general policy of playing down the radiation effects of the bomb was ordered.

There is no question that, even then in 1945, the bombings of Hiroshima and Nagasaki were in clear violation of both the Hague and Geneva conventions. These conventions prohibit the use of poisonous gas and limit the use of force to what is proportional to the task, and to weapons which discriminate between combatants and non-combatants and between military and non-military targets. In fact, all the mass bombings of cities by all sides in World War II also contravened these conventions. The so-called ?dehousing? raids by the allies in Germany?s and Japan?s cities killed roughly 500,000 civilians in each of these countries. As with the bombing of Hiroshima and Nagasaki, we must bear in mind that this sort of conventional bombing was also a clear violation of both the Hague and the Geneva Conventions.

One innocent victim of the Hiroshima bombing was Sadako Sassaki, who was two years old when the bomb was dropped. She was exposed to high levels of radiation and ten years later she became ill with leukemia. In the hospital Sadako folded paper cranes to symbolize her wish for world peace and to regain health. Japanese legend has it that if one folds a thousand paper cranes, one?s wish will come true. Sadako died with 646 cranes folded and the task was finished by her classmates. Before she died, Sadako wrote: ?I will write peace on your wings and you will fly all over the world?.28 The folded crane has become a world-wide symbol of peace.

It is hard to believe that to this day the U.S. has consistently maintained that nuclear weapons are not weapons of mass destruction. This was the U.S. position at the 1996 International Court of Justice hearings on the use or threat of use of nuclear weapons. The U.S. does not even admit that nuclear weapons are also chemical weapons, dismissing radiation damage as ?collateral?. Yet a special commission of President Clinton studying terrorism in the U.S. classified nuclear as weapons of mass destruction. It is an even crueler irony that among the major Federal charges levied against Timothy McVeigh in the bombing of a federal courthouse in Oklahoma City - which the media repeatedly assured the world was the greatest terrorist act in the history of the U.S. - was the ?use of a weapon of mass destruction?. That conventional explosive killed 158 people. Is it not odious to compare this to the bomb that fell on Hiroshima which killed over 100,000?

It is difficult to accept that the use of the atomic bombs against Japan was necessary from a military point of view. The rationale that the bombings would save American lives is based on the assumption that the U.S. would have had to mount a land invasion of Japan. This assumption is false - and possibly a deliberate ploy to cover up other motives - as we now know that the U.S. had cracked the Japanese communications code and intercepted messages clearly indicating that the Japanese knew that they had already lost the war. The country was blockaded and utterly vulnerable to U.S. bombing with conventional weapons. There is clear evidence that the Japanese, under direct orders of the emperor, made a serious gesture to end the war with the U.S. using the good offices of the Soviet Union. There is simply overwhelming evidence that the U.S. had intercepted several messages in the last two weeks of July, 1945, to Japan?s Ambassador Sato in Moscow, which clearly indicated Japan?s willingness to ?secure peace at any price?. Moreover, a number of U.S. government representatives spelled out the same message clearly, including Rear Admiral Eliot Morison, Admiral Leahy, Admiral Chester W. Nimitz, Under-Secretary for the Navy Ralph A. Bard and General Carl A. Spatz,Commander of the Strategic Air Force. All agreed that Japan was defeated and that the dropping of the bomb was unnecessary.29

In fact, by the time of the Potsdam Conference in July, after the successful ?Trinity? test, Allen Dulles, Office of Strategic Services, knew that the retention of the emperor was the only condition of the Japanese terms of surrender. Many of the major American military commanders opposed the decision to drop the bombs. Supreme Commander of the Allied Forces in Europe, General Dwight D. Eisenhower, broached the subject with Secretary of War Stimson: ?I voiced to him my misgivings, first on the basis of my belief that Japan was already defeated and that dropping the bomb was completely unnecessary and, secondly, because I thought our country should avoid shocking world opinion by the use of a weapon that I thought was no longer mandatory as a measure to save American lives....Japan was, at that very moment, seeking some way to surrender with a minimum loss of ?face?....It wasn?t necessary to hit them with that awful thing.?30

In fact, General Omar Bradley said Eisenhower directly challenged Truman at a meeting on July 20, 1945. The U.S. Strategic Bombing Survey concluded:

?Certainly, prior to December 31, 1945 and in all probability prior to November 1, 1945, Japan would have surrendered even if the atomic bombs had not been dropped, even if Russia had not entered the war, and even if no invasion had been planned or contemplated?.31 Leahy was a five-star admiral and the senior military officer of the U.S. as well as chief of staff to presidents Franklin D. Roosevelt and Truman. His denunciation of the atomic bombing was unequivocal: ?It is my opinion that the use of this barbarous weapon at Hiroshima and Nagasaki was of no material assistance in our war against Japan...My own feeling is that in being the first

Einstein continued to consistently oppose nuclear weapons and the terrible possibility of a major nuclear war. Together with Bertrand Russell, he issued a manifesto in 1955, which gave birth to the Pugwash Movement. In part, they declared: ?We have to learn to think in a new way. We have to learn to ask ourselves not what steps can be taken to give military victory to whatever group we prefer, for there no longer are such steps; the question we have to ask ourselves is what steps can be taken to prevent a military contest of which the issue must be disastrous to all parties...It is feared that if many H-bombs are used there will be universal death - sudden only for a minority, but for the majority a slow torture of disease and disintegration....Here, then, is the problem which we present to you, stark and dreadful and inescapable; Shall we put an end to the human race; or shall mankind renounce war??43 Possibly the most comprehensive book on Einstein was written by Ronald W. Clark.44 A second book, *A Biography of the World?s Most Famous Equation,* by David Bodanis, is highly recommended45

While we will never know for certain what President Roosevelt?s ultimate decision would be regarding the atomic bombing of Japan, we do know more about Truman. In an article in a book of papers produced by the Bulletin of the Atomic Scientists, the author discovered new evidence about Truman?s decision, some forty years after the event. Firstly it is very clear that both Truman and Churchill saw the bombing of Japan as taking the initiative in the coming confrontation with the Soviet Union. In fact, Truman went so far as to call the Japanese savages, ruthless, merciless and fanatic? as well as ?beasts? although he had moments of remorse.46

Notes

Clement Leibovitz, *The Chamberlain-Hitler Deal* (Edmonton, Alberta: Les Editions Duval, Inc., 1993)

Ibid., 37

Ibid., 86-87

Ibid., 81,100

Otto Nathan and Heinz Noedan, *Einstein in Peace* (New York: Simon and Schuster,

Richard Rhodes, *The Making of the Atom Bomb* (Simon and Schuster, 1986), 313-14

Ibid., 256-63. The paper was mailed to *Naturwissenshaften* on 22 December,1938

Ida Noddack, Angew, *Chemie*, 47:1934, 653

Robert Jungk, *Brighter Than a Thousand Stars,* (Hammondsworth: Penguin, 1960), 17

Halban H. Von, F. Joliot and Leo Kawarski, *Nature* 143: 1939, 470-472

S.R. Weart and G.W. Szilard, Leo Szilard: ?His Version of Facts? (Cambridge, MA: MIT Press, 1980)

Rhodes, *The Making of the Atom Bomb,*

Ibid., 502, 503, 506, 507

Robert Jay Lifton and Eric Markusen, The Genocidal Mentality: Nuclear Holocaust and Nuclear Threat
(New York: Basic Books, 1990), 165

Jungk, Brighter Than a Thousand Suns, *348; Rhodes,* The Making of the Atom Bomb, *765*

Robert Jay Lifton and Greg Mitchell, Hiroshima in America*:* A Half Century of Denial *(New York: Avon Books, 1996), 22*

Rhodes, The Making of the Atom Bomb*, 506-07*

Ibid, 507

Jungk, Brighter than a Thousand Suns*, 168-70*

Ibid, 201

Rhodes, The Making of the Atom Bomb*, 676*

J.Robert Oppenheimer, ?Physics in the Contemporary World?, The Bulletin of the Atomic Scientists,
March, 1998, 66

Jungk, Brighter Than a Thousand Suns*, 158-164*

Robert Jay Lifton, Death in Life, *(New York: Random House), 1967, 27*

Ibid., 29, 57

Jungk, Brighter Than a Thousand Suns*, 201*

William D. Leahy, I Was There, *(New York: Whittsley House, 1979), 441*

Nuclear Age Peace Foundation, Working Peace Bulletin*, Summer 1995, 1*

Barry M. Blackman and Stephen S. Kaplan, ?Force Without War? (Washington, D.C.: Brookings Institute, 1978), 238, 256; Jungk, Brighter Than a Thousand Suns, *207; Daniel Ellsberg,* Call to Mutiny
,
The Deadly Connection
, Joseph Gerson, ed. (Philadelphia: New Society Publishers, 1986), 35-59

Lifton and Mitchell, Hiroshima in America*, 213*

The U.S. Strategic Bombing Survey, U.S. News*, 5 July 1996*

Barton Bernstein, ?Ike and Hiroshima: Did He Oppose It?? Journal o*f* Strategic Studies *, 10 September 1987, 387*

Daniel Ellsberg, ?Introduction: Call to Mutiny, Protest and Survive*, E.P. Thompson and D. Smith, eds., (London: Monthly Review Press, 1982), i*

Ibid., xi; Gil Alperovitz, ?Historical Cleansing?, quoted in Peace Times*, July 1993, 4-5*

Jungk, Brighter Than a Thousand Suns*, 34*

Ibid., 81

Ibid., 85

Lifton and Markusen, The Genocidal Mentality, *115*

Daniel Ford, The Cult of the Atom: The Secret Papers of the Atomic Energy Commission *(New York: Simon and Schuster, 1982)*

Lifton and Mitchell, Hiroshima in America*, 84; Lifton and Markusen, The Genocidal Mentality, 115; Rhodes,* The Making of the Atom Bomb,
765

Dean Acheson quoted in Herbert F. York, The Advisors*:* Oppenheimer, Teller and the Superbomb *(Palo Alto, CA: Stanford University Press, 1989), 67*

Edward Teller, ?Back to the Laboratories?, The Bulletin of the Atomic Scientists, *February 1950, 71*

Delivered at a press conference in London, 9 July, 1955

Ronald W. Clark, Einstein: The Life and Times *(New York: Avon Books, 1999) 210-250. This reference is one of the most complete and authoritative books on Einstein*

David Bodanis, A Biography of the World?s Most Famous Equation: E=mC2 *(New York: Berkley Publishing, 200*

Robert L. Messer, ?New Evidence on Truman?s Decision?, Len Ackland and Steven McGuire, editors: ?Assessing the Nuclear Age? (Chicago: The Bulletin of the Atomic Scientists
, 1986) 43-52