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## **NUCLEAR WEAPONS AND THE RESPONSIBILITY OF SCIENTISTS**

By David Krieger

Nuclear weapons are unique among weapons systems – they are capable of destroying civilization and possibly the human species. Nuclear weapons kill massively and indiscriminately. They are powerful. They are also illegal, immoral and cowardly. They are long-distance killing machines, instruments of annihilation. They place the human future in jeopardy. In spite of all of this, or perhaps because of it, these weapons seem to bestow prestige upon their creators and possessors.

Nuclear weapons were first created by scientists and engineers working in the US nuclear weapons program, the Manhattan Project, during World War II. The project began simply and, ironically, with a letter to President Roosevelt from a great man of peace and humanitarian, Albert Einstein, who also happened to be the greatest and most celebrated scientist of his time. Later, after the use of the US nuclear weapons at Hiroshima and Nagasaki, Einstein would lament having written the letter to Roosevelt.

By examining the subsequent responses of three leading scientists whose earlier work had involved them in significant ways with the creation of nuclear weapons, I will show how they set an example for scientists today. I will seek to answer these questions: Do the scientists who created nuclear weapons have special responsibility for these weapons? Do scientists today continue to have responsibility for nuclear weapons?

### **Albert Einstein**

Albert Einstein is one of great men of the 20<sup>th</sup> century, and one of the men I most admire. His penetrating intellect changed our view of the world. His understanding of the relationship between mass and energy, as contained in his famous formula  $E=mc^2$ , gave the original theoretical insight into the power of mass converted to energy. Einstein, however, for all his theoretical brilliance, did not foresee the potential power that might be released by the atom and give rise to nuclear weapons.

By 1939 Einstein was living in the United States, a refugee from Hitler's Germany, and had a position at Princeton's Institute for Advanced Study. A fellow physicist and friend, Leo Szilard, a Hungarian refugee from Nazi Germany, became concerned that the Germans would develop an atomic weapon and use it to defeat the Allied powers fighting against Hitler. Szilard came to Einstein, explained his fear, and asked Einstein to sign a letter explaining the danger to President Franklin Roosevelt. The letter that Einstein sent said that "uranium may turn into a new and important source of energy in the immediate future," and that, while not certain, "extremely powerful bombs of a new type may be constructed." The letter called upon the President Roosevelt to have his administration maintain contact with "a group of physicists working on chain

reactions in America.” The letter led Roosevelt to take the first steps toward what would become the Manhattan Project, a very large US government program to create atomic weapons. President Roosevelt set up an Advisory Committee on Uranium, headed by Lyman J. Briggs, to evaluate where the US stood with regard to uranium research and to recommend what role the US government should play.

Einstein never worked on the Manhattan Project to make the atomic bomb, and was deeply disturbed and saddened when the bombs were used on Japan. He was reported to have said later, “If only I had known, I would have become a watch maker.” Einstein would join and lend his name to many organizations working to control and eliminate nuclear weapons during the final ten years of his life after the bombs were used. He was also outspoken in his condemnation of atomic weapons. He fought against the development of the hydrogen bomb.

In 1946, Einstein joined a group of atomic scientists that formed the Emergency Committee of Atomic Scientists. Einstein and his fellow trustees of the Emergency Committee released a statement at the end of a conference held in Princeton in November 1946 that included the following “facts...accepted by all scientists”:

1. Atomic bombs can now be made cheaply and in large number. They will become more destructive.
2. There is no military defense against the atomic bomb and none is to be expected.
3. Other nations can rediscover our secret processes by themselves.
4. Preparedness against atomic war is futile, and if attempted will ruin the structure of our social order.
5. If war breaks out, atomic bombs will be used and they will surely destroy our civilization.
6. There is no solution to this problem except international control of atomic energy and, ultimately, the elimination of war.

These six points remain as valid today as they were in 1946.

The final public document that Einstein signed, just days before his death, was the Russell-Einstein Manifesto. It is an eloquent call to scientists to act for the good of humanity. The document began, “In the tragic situation that confronts humanity, we feel that scientists should assemble in conference to appraise the perils that have arisen as a result of the development of weapons of mass destruction, and to discuss a resolution in the spirit of the appended draft.”

The Russell-Einstein Manifesto is one of the most powerful anti-nuclear and anti-war statements ever written. It expresses the fear of massive destruction made possible by nuclear weapons that could bring an end to the human species. It states: “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?” Einstein and Russell were joined by nine other prominent scientists in calling upon people everywhere, and

particularly scientists, to take a simple but critical step: “Remember your humanity, and forget the rest.”

One of Einstein’s most prescient warnings to humanity was this: “The splitting of the atom has changed everything save our modes of thinking, and thus we drift toward unparalleled catastrophe.” More than five decades after Einstein’s death, his warning remains largely unheeded.

## **Leo Szilard**

Leo Szilard was one of the most remarkable men of the 20<sup>th</sup> century. He first conceived of the possibility of an atomic chain reaction that could result in atomic bombs while standing at a stoplight in London in 1933. One of the people Szilard credits with influencing his discovery was British novelist H.G. Wells, who talked about atomic bombs in his 1913 science fiction book, *The World Set Free*.

Six years later, it was Szilard who encouraged Einstein to warn President Roosevelt about the possibility of a German atomic bomb. Once the Manhattan Project was underway, Szilard would work with Enrico Fermi at the University of Chicago on creating a controlled chain reaction. The two men succeeded in conducting the first controlled and sustained chain reaction in their laboratory under the bleachers at the University of Chicago on December 2, 1942. In doing so, they left no doubt that the creation of an atomic weapon would be possible.

By early 1945, it seemed clear to Szilard that Germany would not succeed in creating an atomic bomb, but that America would. Szilard became concerned that the US would choose to use its new weapon as an instrument of war rather than as a means of deterring the German use of an atomic weapon. Szilard made frantic attempts to stop the US from using the bomb that he had been so instrumental in creating. He went back to Einstein in an attempt to arrange a meeting with President Roosevelt. Einstein wrote another letter to Roosevelt on Szilard’s behalf. The President’s wife, Eleanor, wrote back agreeing to meet with Szilard in her Manhattan apartment. Szilard received the letter with great excitement, but his excitement was dashed when later in the day the news was announced that President Roosevelt had died. It was April 12, 1945.

Next Szilard tried to arrange a meeting with the new President, Harry Truman. Truman arranged for Szilard to meet with Jimmy Byrnes, a Senate mentor of Truman’s who would soon be named his Secretary of State. Szilard, along with scientists Walter Bartky and Harold Urey, traveled to Spartanburg, South Carolina to meet with Byrnes. The meeting went badly. Szilard expressed concern about a nuclear arms race with the Soviet Union. Byrnes seemed to be more concerned with the possibility of using the new weapon as a demonstration of military might to make the Soviets more manageable. Szilard made an unfavorable impression on Byrnes. Szilard later wrote, “I was rarely as depressed as when we left Byrnes’ house and walked to the station.”

Szilard next worked energetically on the Social and Political Committee of the Met Lab scientists working on the bomb at the University of Chicago. The Committee was headed by Nobel Laureate physicist James Franck. The Committee report concluded that the bomb should be demonstrated to Japan before being used against Japanese civilians. The Scientific Committee of the Manhattan Project's Interim Committee – composed of Arthur Holly Compton, Enrico Fermi, Ernest O. Lawrence and Robert Oppenheimer – rejected the report, recommending against a demonstration and for military use of the bomb.

Finally, Szilard drafted a petition to the President of the United States. The petition, dated July 17, 1945, began, “Discoveries of which the people of the United States are not aware may affect the welfare of this nation in the near future....” The petition argued against attacking Japanese civilians on moral and practical grounds. It argued that “a nation which sets a 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.” The petition was held by General Leslie Groves, the head of the Manhattan Project, and did not reach Secretary of Defense Stimson or President Truman until after their return from Potsdam and after Hiroshima had been destroyed by the first attack with a nuclear weapon.

After the war, Szilard was a leader among atomic scientists in working to alert the public to nuclear dangers. He was a founder of the Council for a Livable World. He remained active in opposing nuclear weapons until his death.

### **Joseph Rotblat**

Joseph Rotblat was one of the great men of the 20th century. He was a Polish émigré, who went to London in 1939 to work with Nobel Laureate physicist James Chadwick. Rotblat became concerned about a German atomic weapon, which led him to work on the British atomic bomb project and later in the US Manhattan Project. He believed that an Allied atomic bomb was necessary to deter the Germans from using an atomic bomb. By late 1944, however, Rotblat had concluded that the Germans would not succeed in creating an atomic weapon. He had been shocked to hear from General Groves one evening that the purpose of the US bomb had always been directed against the Soviets, then US allies in the war. As an act of conscience, Rotblat left the Manhattan Project in December 1944 and returned to London. The following August his worst fears were realized when the US used their newly created weapons at Hiroshima and Nagasaki.

Rotblat would dedicate the rest of his life to working for a nuclear weapons free world. He helped in the creation of the 1955 Russell-Einstein Manifesto, and was its youngest signer. Two years later, he helped organize the first meeting of the Pugwash Conferences on Science and World Affairs, bringing together scientists from East and West. He would serve as a leader of the Pugwash movement for the rest of his long life, always as a voice of conscience and reason and a strong and uncompromising advocate of nuclear weapons abolition. He was the living embodiment of the Russell-Einstein Manifesto, calling for nuclear weapons abolition and the abolition of war.

In 1995, Joseph Rotblat received the Nobel Peace Prize. He appealed in his Nobel Lecture in part to his fellow scientists. In doing so, he referred approvingly to the statement made earlier that year by former Manhattan Project scientist Hans Bethe on the 50<sup>th</sup> anniversary of the Hiroshima bombing, and he quoted Bethe's statement in full:

*As the Director of the Theoretical Division at Los Alamos, I participated at the most senior level in the World War II Manhattan Project that produced the first atomic weapons.*

*Now, at age 88, I am one of the few remaining such senior persons alive. Looking back at the half century since that time, I feel the most intense relief that these weapons have not been used since World War II, mixed with the horror that tens of thousands of such weapons have been built since that time - one hundred times more than any of us at Los Alamos could ever had imagined.*

*Today we are rightly in an era of disarmament and dismantlement of nuclear weapons. But in some countries nuclear weapons development still continues. Whether and when the various Nations of the World can agree to stop this is uncertain. But individual scientists can still influence this process by withholding their skills.*

*Accordingly, I call on all scientists in all countries to cease and desist from work creating, developing, improving and manufacturing further nuclear weapons - and, for that matter, other weapons of potential mass destruction such as chemical and biological weapons.*

Rotblat concluded his remarks to scientists with the following appeal: "At a time when science plays such a powerful role in the life of society, when the destiny of the whole of mankind may hinge on the results of scientific research, it is incumbent on all scientists to be fully conscious of that role, and conduct themselves accordingly. I appeal to my fellow scientists to remember their responsibility to humanity."

In the final words of his Nobel Lecture, he spoke as an elder statesman of humanity: "The quest for a war-free world has a basic purpose: survival. But if in the process we learn how to achieve it by love rather than fear, by kindness rather than by compulsion; if in the process we learn to combine the essential with the enjoyable, the expedient with the benevolent, the practical with the beautiful, this will be an extra incentive to embark on this great task. Above all, remember your humanity."

## **Conclusions**

I have discussed the manner in which three important scientists reacted to nuclear weapons. Of course, there have been many other scientists – including Linus Pauling,

Eugene Rabinowitch and Andrei Sakharov – who have also joined in publicly seeking to free the world from the dangers of nuclear arms. But there have also been many other scientists who have supported the nuclear arms race and continue to work on designing and improving nuclear weapons.

Einstein, Szilard and Rotblat believed that nuclear weapons threaten the future of humanity and must be brought under international control and abolished. They sought to eliminate not only nuclear weapons, but war as a human institution. They all contributed to the creation of nuclear weapons, influenced by the threat of a potential Nazi atomic weapon, but they all regretted their part and sought to change the course of history. They believed that scientists had an important role to play in educating the general population about nuclear threats and encouraging the public and political leaders to support effective nuclear disarmament.

These men have become historical figures, but they lived real and courageous lives. They were all men of conscience, who understood that nuclear weapons cast a dark shadow across the human future. They stood not with the power establishments of their day, but with humanity. They are important role models for young scientists and engineers. Their lives and their words convey a crucial message for the scientists of today: Contribute your talents constructively to humanity, but withhold them from making and improving armaments, in particular nuclear arms.

The atomic scientists were influential in initiating many institutions that continue to work for a nuclear weapons free world. These include *Bulletin of the Atomic Scientists*, Council for a Livable World, Pugwash Conferences on Science and World Affairs, the Federation of American Scientists. To these can be added newer organizations committed to science for social responsibility such as Science for Peace in the UK and the International Network of Engineers and Scientists for Global Responsibility.

As the scientists directly connected with the World War II US Manhattan Project and the British MAUD Committee have passed on, new responsibilities have fallen to a younger generation of scientists. It remains to be seen, though, whether this new generation of scientists will have the passion and persistence to carry on effectively in fighting for a world free of nuclear weapons. It is a positive sign that one of the world's most renowned physicists, Stephen Hawking, has stated, "As scientists we understand the dangers of nuclear weapons and their devastating effects...as citizens of the world we have a duty to alert the public to the unnecessary risks that we live with every day and to the perils we foresee if governments and societies do not take action to render nuclear weapons obsolete."

Today the University of California manages and provides oversight to the main US nuclear weapons laboratories at Los Alamos and Livermore. These laboratories have designed every nuclear weapon in the US arsenal. They have recently designed a new nuclear weapon, called the Reliable Replacement Warhead, which the US government would like to develop to replace all existing weapons in the US nuclear arsenal. To this

enterprise, the University of California lends its prestige and legitimacy. Leaders of the University proudly proclaim that they are performing a national service, and seem to give little thought to the dangerous nuclear nightmare they are perpetuating.

Scientists everywhere should join together, in the spirit of the Russell-Einstein Manifesto, to speak out and demand that Universities, such as the University of California, stop supporting the design, development, testing and manufacture of any weapon of mass destruction, most of all nuclear weapons. They should bring collective pressure to bear upon those scientists who choose to participate in such work. In short, they should follow in the footsteps of Einstein, Szilard and Rotblat, and accept personal and professional responsibility for ending the nuclear weapons threat to humanity.

As Nagasaki Mayor Tomihisa Taue pointed out in his 2007 Nagasaki Peace Declaration, “[A] major force for nuclear abolition would be for scientists and engineers to refuse to cooperate in nuclear weapons development.” To achieve this end, it will be necessary to apply peer pressure within the scientific community to strip away any semblance of prestige and legitimacy that remains connected to the creation of weapons capable of destroying humanity.

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