The First Nuclear Bomb

At 5:29 in the morning on July 16th, 1945, the sun began to rise over the horizon of the New Mexican desert a bit earlier than expected. After a moment it disappeared, only to return later. Those confused by the flash were probably even more puzzled when they felt the shockwave that followed. In fact, the intense light seen across the desert wasn't the sun. It was the final product of a massive top secret government program, code-named the Manhattan Project. After almost 2 billion dollars and 3 years of intense research, the atom was split and caused a chain reaction, releasing the energy equivalent to nearly 20,000 tons of TNT. The blast produced a mushroom cloud 7 ½ miles high and could be heard 200 miles away. As scientists observed the detonation from over 5 miles away, they knew that their work would change the world forever (Huntington 19).

In fact, the nuclear bomb has had a tremendous impact on everyday life. Shortly after it was successfully tested, the United States used it against Japan. After World War II, the bomb sparked the arms race between the United States and Soviet Union, a large part of the Cold War. During this time, the world lived in fear of a nuclear war that could make the planet uninhabitable. Even after the Cold War, nations continue to develop and stockpile nuclear weapons, and some of the more volatile third world countries are suspected of trying to acquire nuclear material. The world has certainly faced a new fear ever since the bomb was created, but it has also benefited. Research related to the bomb led to scientific developments that were key to nuclear energy production and the medical field. Another benefit often overlooked is that the bomb ended the fight against Japan and brought a close to World War II.

Although the bombing was a horrific display of destruction, it is important to consider the circumstances surrounding the bombing, and why the nuclear bomb was developed in the first place.

The Manhattan project began shortly after the start of World War II. Scientists Albert Einstein and Leo Szilard wrote a letter to President Roosevelt, warning that breakthroughs in atomic research could soon lead to the development of an incredibly powerful new weapon. Fearing that Nazi scientists were developing the bomb, Einstein and Szilard urged Roosevelt to begin nuclear weapons research in the United States. Roosevelt responded by creating the Advisory Committee on Uranium. This committee had a limited budget and didn't make any significant breakthroughs. In 1941, British scientists shared an important breakthrough in nuclear research with the United States. The scientists had calculated the critical mass of uranium, or the amount of uranium needed to create a bomb. This new information sparked an overhaul of the nuclear research program, and in October of 1941, the Manhattan project began. Headed by Major General Leslie Groves of the Army Corps of Engineers, the project rapidly expanded, creating a large network of researchers working at universities and uranium enrichment facilities. At its peak, the program employed over 150,000 people. The greatest challenge to scientists was obtaining enough of the proper uranium isotope for the bomb. Uranium ore only contains 0.7% of the needed isotope, and a majority of the 2 billion dollars spent on the project went towards the enrichment of uranium. By 1945, several new uranium extraction processes had been developed, and there was enough nuclear material to build a bomb (Kraft 26).

The first nuclear bomb, nicknamed "the gadget," was detonated at the Trinity test site of the White Sands Missile Range in New Mexico. Scientists didn't quite know what to expect, and some even feared that the bomb would ignite the atmosphere and destroy the entire planet. When the bomb was successfully tested, President Truman was notified. Germany had surrendered only 9 weeks earlier, and the Allies pushed Japanese forces back to their mainland. The Japanese showed no signs of giving up and rejected the Potsdam Declaration, which called for their surrender. Before initiating a land invasion, slated to begin on November 1st, President Truman decided to employ the newly developed bomb against the Japanese.

The cities chosen for a nuclear strike were carefully considered. The targets had military significance, yet remained nearly unscathed. By this time, many Japanese cities, including Tokyo, were subjected to devastating napalm strikes. In order to demonstrate the full destructive power of the bomb, the United States chose targets that had not been touched by these bombing campaigns (Olwell 103). Hiroshima was the first target. On August 6th, 1945, the B-29 Superfortress bomber named the Enola Gay dropped its payload over Hiroshima. The bomb, named the "little boy," detonated over the city, killing at least 75,000 people and destroying 70 percent of the city. A few days later, on August 9th, another nuclear bomb was dropped on Nagasaki, killing at least 39,000 people. These bombings forced the Japanese to surrender on August 14th, 1945 (Huntington 20).

The use of nuclear weapons allowed the United States to avoid a full scale land invasion of Japan. The Allies estimated that they could lose over a million lives, with Japanese forces and civilians suffering an even greater loss of life. To put this into perspective, the United States had

lost around 500,000 soldiers up to this point in World War II, which means that the invasion would have tripled the number killed. By forcing the Japanese to surrender with the nuclear bomb, many lives on both sides were spared, and much of Japan was left intact. Some argue that the use of the bomb was unnecessary, and that Japanese surrender was imminent when the Soviet Union entered the war against Japan (Grimsley 72). Even if the Japanese had surrendered before November, many more civilians may have been killed in the Allied bombing campaigns. It's hard to tell how long the war would have gone on if nuclear weapons hadn't been used, but based upon the Pacific Campaign against the Japanese, the conflict would have been bloody and drawn out.

The decision to use the nuclear bomb against Japan affects the world today, although some of the results may be less obvious. Today, Japan is the world's third largest economy. The United States imports many goods from Japan, such as electronics and automobiles. In fact, it's impossible to drive down the highway without seeing vehicles made by Toyota, Honda, Nissan, or Mitsubishi. If a land invasion of Japan had taken place, Japan may have been damaged beyond repair, unable to recover from the loss of life and destruction of infrastructure. It is likely that the nation would not be the large economic power that it is today. There are also the Allied lives that were saved to consider. Every one of the million estimated Allied forces that were estimated to die in an invasion of Japan ended up returning home alive. These were young men and women who went on to start families, build businesses, and contribute to society in many ways. It is impossible to tell where the United States would be today if these people had been killed, but it would undoubtedly be very different.

After World War II ended, the resources organized under the Manhattan project were transferred to the United States Atomic Energy Committee. This committee worked to transfer nuclear research over to the civilian sector and find peaceful ways to harness nuclear energy. One of the most important post war uses of nuclear material was in the medical field. According to medical writer Albert Q. Maisel, there were "two uses of atomic energy – as tracer detectives and as interbody medical bullets." (Creager 665). Experts knew that radioactive materials could cause tissue damage and cancer, and they took note of the effects of radiation sickness on the survivors of the bombings in Japan. Using this knowledge, they developed a procedure to use radiation to kill cancer cells, and radiation therapy was used as early as 1946 to treat thyroid cancer. Further research into radiation therapy led to the development of the bone marrow transplant, and this led to the discovery of stem cells, which are present in bone marrow. Radioactive materials developed by the Manhattan project were also used as biomedical tracers. By injecting a small amount of radioactive material into a subject, scientists could track the location of a small group of atoms and observe exactly how biological processes took place. This important research tool was used to help diagnose diseases and cancers. In 1946, when many of the breakthroughs hadn't been made yet, health physicist Robley Evans said that "The sober truth is that through medical advances alone, atomic energy has already saved more lives than were snuffed out at Hiroshima and Nagasaki." (Creager 651). These advances in nuclear medicine continue to benefit society to this day, and they would not have been possible without the development of the nuclear bomb. The same facilities that produced nuclear material for the bomb also produced the isotopes used in medical research, and

provided them at a low cost. Without the Manhattan project, it would have been much too costly for medical researchers to produce their own nuclear material.

The Atomic Energy Committee also conducted research on other peaceful uses of nuclear material. The same research facilities that had built the bomb used their findings to create a stable fission reaction that could be sustained for a long period of time. By 1951, a nuclear reactor was used to create electricity. Today, nuclear power is a large source of electricity. According to the Nuclear Energy Institute, 14% of the world's electricity came from nuclear power in 2009. There are 442 reactors running worldwide. In the United States, nuclear energy accounts for 20% of the electricity produced (*Nuclear Statistics*). Nuclear energy also provides the propulsion system of many vessels in the United States Navy. The Navy only needs to refuel reactors every 20 years, so this gives carriers and submarines a nearly endless range and mission capability. This also makes nuclear power ideal for use in space, and several long range probes use small nuclear cells to power their onboard systems. There are many benefits to nuclear power, including the long time between refuels and the environmental impact. In fact, nuclear energy produces no emissions. With fossil fuel prices climbing and natural resources limited, nuclear energy offers a cost effective and environmentally friendly alternative. Without the research conducted during the Manhattan project, nuclear energy might not be the important source of energy that it is today.

The nuclear bomb has had many positive effects, including the end of World War II, the creation of electricity using nuclear power, and the development of new medical technology. Many associate images of a mushroom cloud or a blown out city with nuclear weapons, but

they probably don't consider how nuclear weapons might be affecting every day life in a positive way. Anyone who has a grandfather who served in the Pacific Campaign of World War II, knows someone who is still alive because of cancer treatment, or buys electricity from a grid with nuclear power has the Manhattan Project and the nuclear bomb to thank. Nuclear weapons will always be a controversial subject and tricky foreign policy issue, but the research done to create the bomb will continue to benefit society as well. Nuclear medicine will continue to save lives and give cancer patients hope, and nuclear energy will become more prominent as fossil fuels run out. The scientists working on the bomb knew they created a powerful new weapon that would cause great destruction, but they may not have known how important their research would be when used for peaceful purposes.

Works Cited

Creager, Angela N. H. "Nuclear Energy in the Service of Biomedicine: The U.S. Atomic Energy Commission's Radioisotope Program, 1946-1950." *Journal of the History of Biology* 39.4 (2006): 649-684. Print.

Grimsley, Mark. "…the Manhattan Project had Failed?" *World War II* 23.2 (2008): 71-72. Print.

Huntington, Tom. "Dawn Over Trinity." *America's Civil War* 14.2 (2001): 18-21. *Academic Search Premier.* Web. 22 March 2011.

Kraft, Alison. "Atomic Medicine." *History Today* 59.11 (2009): 26-33. Print.

Nuclear Statistics. Nuclear Energy Institute. 1 Apr. 2011. Web. 10 April 2011.

Olwell, Russell. "Manhattan Project." *Americans at War* 2005: 101-104. *Gale Virtual Reference Library.* Web. 22 March 2011.