Events leading to the Manhattan Project

This is the third in a series of articles on the unique history of Y-12.

A series of significant events across the world were precursors to the Manhattan Project and Y-12. The basic building blocks and mechanisms of atomic energy were discovered over the first 40 years of the twentieth century.

The basic knowledge of physics was greatly expanded around the turn of the century when scientists began to understand the nature of atoms. French physicist Pierre Curie and his Polish wife Marie in 1898 demonstrated that the uranium ore pitchblende emitted radioactivity that they named radium.

In 1911, Ernest Rutherford described the basic structure of an atom as having the majority of its mass contained in a very small nucleus at its core, made up of protons, surrounded by a web of moving electrons. It was not until 1932 that James Chadwick added the knowledge that the nucleus also contained neutrons. Also in 1932, John Cockcroft and Ernest Walton "split the atom" for the first time.

In 1934, Italian physicist Enrico Fermi reported that radioactivity could be produced when bombarding uranium with neutrons. In that same year, French physicists Irene and Frederic Joliot-Curie noted that radioactivity could be induced in stable elements by bombarding them with alpha particles.

German Chemists Otto Hahn and Fritz Strassmann, in the first week of January 1939, announced to the world that the nucleus of the uranium atom could be caused to split or fission when bombarded with neutrons, proving that Fermi had actually witnessed nuclear fission. This major leap in understanding was quickly assimilated by scientists in every major country in the world. They realized that something of major importance was being discovered.

Lise Meitner and Otto Robert Frisch were first to theoretically claim that huge amounts of energy would be released in the process of fission. Hungarian Leo Szilard also found through his experiments that neutrons were given off during fission, thus being the first to realize that a chain reaction was possible. This caused Szilard to comprehend the fact that a bomb with potentially huge instantaneous energy release could be built using the fission technique.

It was within this atmosphere of discovery and insight that the Nazi army marched into first Czechoslovakia in 1938, and then Poland in 1939. During the months that World War II was starting, scientists on both sides of the conflict were very much aware of that fission could be used as a weapon, but no one was sure how it could be done. An amazing thing happened; physicists across the world stopped publishing papers on fission as they knew the potential such knowledge had for their enemies.

Many scientists were fleeing from the upheaval in their various European countries. The United States became the beneficiary of increased scientific knowledge as many of these scientists came to live and work here. Leo Szilard was among that number. He knew the importance of the work he was attempting and increasingly feared that Nazi Germany would be the first to perfect the means to explode an atomic bomb using fission of uranium.

Two exiled German scientists living in England in February 1940, Otto Frisch and Rudolf Peierls, stated that an atomic bomb could be built and detonated using just a few kilograms of uranium-235, the lighter rare isotope of uranium, using only fast neutrons. This eliminated the need for a moderator material to slow down the neutrons and was a leap in knowledge that moved the world closer to an atomic bomb. England began to seriously consider the creation of industrial capabilities to build such a bomb.

The MAUD Committee was formed in April 1940. The name “MAUD” was a code name given the committee and taken from a phrase contained in a message from Niels Bohr, “Miss Maud Rey at Kent.” This committee produced a report that declared that producing a fission bomb was practical. James Chadwick, a member of the British MAUD Committee, later wrote that at that time he "realized that a nuclear bomb was not only possible, it was inevitable.”

All the while, actions being taken by the Germans convinced others that they still had the lead in developing a fission weapon. One convincing action was noted when the French attempted to purchase heavy water, an excellent moderator for uranium fission, from Norway in 1940. Germany had already offered to purchase the entire Norwegian supply of heavy water.

Fortunately, just before Germany invaded Norway in April 1940, the French told the Norwegian government that the heavy water could be valuable to Germany’s efforts to create a fission weapon. Norway then gave the entire stock of heavy water to a French Secret Service agent who smuggled it through England to France.

Throughout 1940 and 1941, the British, being at war and realizing the importance of an atomic bomb, continued to pressure the United States to investigate the possibility of using uranium to produce a bomb. Ernest O. Lawrence, a scientist working with calutrons – named for **Cal**ifornia **U**niversity cyclo**trons** – a basic physic mass separation machine, also urged Vannevar Bush to pursue the idea. Bush enlisted the cooperation of Arthur Compton and jointly they produced a report in May of 1941 regarding the potential that uranium fission might hold. Nothing much was said in this report regarding a bomb.

In July of 1941 the MAUD Committee (so code named because of mistaken interpretation of a message sent by Nehls Bohr regarding a “Maud Rey”) produced its final two reports and shared them with the United States. However, Lyman Briggs, director of the United States Uranium Committee had placed the reports in a safe and had not shared them with anyone. This disappointed Marcus Oliphant, a member of the MAUD Committee, who came to Washington to urge consideration. Britain was convinced that an atomic bomb was necessary to win the war and the United States, having maintained a posture that kept out of the war, did not yet see the urgency.

However, the continued practice of open sharing of information between the United States and England eventually resulted in the United States actually taking the lead on the project, thus ultimately creating the Manhattan Project with England’s knowledge and agreement. This was spelled out in the Quebec Agreement and the British efforts were ultimately rolled into the Manhattan Project with many of the British scientists coming to work in the United States.

On November 27, 1941, Vannevar Bush had sent President Roosevelt a recommendation that a uranium bomb was feasible. Radical change began to occur in the United States, spurred on by the December 7, 1941 attack on Pearl Harbor. On January 19, 1942, President Roosevelt replied with this brief handwritten note, “V. B. OK -- returned -- I think you had best keep this in your own safe FDR.” A major step had been taken that would change the world forever with a one sentence handwritten note placed on the recommendation!