

Secret City, Part 2

(As published in The Oak Ridger's Historically Speaking column the week of May 20, 2024)

Anna Caryl Guffey continues her series on Oak Ridge.

A series of earth changing events had taken place in the 1930's which led to the Szilard/Einstein letter to Roosevelt:

In 1932, the atom had been split for the first time, thereby proving Einstein's 1907 Theory of Relativity, $E=mc^2$ or Energy equals mass times the speed of light squared.

In 1933, Hungarian physicist Leo Szilard had realized the possibility of the nuclear chain reaction.

In 1934, the first nuclear fission was achieved at the University of Chicago's Metallurgical Lab by Enrico Fermi of Italy. Working with Fermi in Chicago was Christian County native and physicist, Dr. Benjamin Bradshaw.

And in January 1939, Robert Oppenheimer realized the military possibilities of nuclear fission. Oppenheimer would later become the director of the Manhattan Project's secret weapons laboratory at Los Alamos, New Mexico, or Site Y, where the atomic bomb was designed.

In the summer of 1939, six months after the discovery of uranium fission, in December 1938 by chemists Otto Hahn and Fritz Strassmann and physicists Lise Meitner and Otto Robert Frisch, American newspapers and magazines openly discussed the prospect of atomic energy. However, no official U.S. atomic energy project existed.

Leo Szilard was profoundly disturbed by the lack of American action. If atomic bombs were possible, and he believed they were, Nazi Germany might gain an unbeatable lead in developing them. It was especially troubling to Szilard that Germany had stopped the sale of uranium ore from occupied Czechoslovakia.

Eugene P. Wigner, a Hungarian physicist and future Nobelist, who had come to the United States after he was fired from his university teaching job in Berlin because his mother was Jewish, had received a warning from a German friend who was working on the German atomic effort.

Although German, Wigner's friend was against Hitler, he sent a message to Wigner. The message read: "Hurry up. We (Germany) are on the track."

It was then that Leo Szilard and Eugene Wigner went to see their friend Albert Einstein to explain the state of international research on uranium and the evidence that the German's were building a bomb. As a life-long pacifist, Einstein opposed the making of weapons, but he could not allow the Nazis sole possession of such destructive power.

Therefore, on August 2, 1939, Einstein signed a letter, written by Szilard, to President Roosevelt informing him of the German's work toward an atomic bomb and encouraging the President to support American research and development in nuclear reaction.

Less than one month later, on September 1, 1939, Germany invaded Poland and World War II began. Shortly thereafter, President Roosevelt appointed a "Uranium Committee," but approved only \$6,000 to buy graphite and uranium for the experiments that Szilard proposed.

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On December 6, 1941, one day before the Japanese bombed Pearl Harbor, President Roosevelt approved funding for the development of an atomic weapon. Thus, was born the Manhattan Project whose sole mission was the research and development of an atomic bomb.

Almost immediately the search began for a location where the Manhattan Project could produce the enriched uranium necessary for the new atomic bomb. The site would have to be thousands of acres in size to accommodate the four massive plants that would convert Uranium ore into Uranium-235, and the people who would build and run the plants.

The part of uranium that is finally refined from the uranium ore is 99.3% U-238 and only .7% U-235. To make the task even more difficult, the U-235 and U-238 are isotopes, nearly identical in their chemical makeup. No ordinary chemical extraction method could separate them; only very complex mechanical methods would work.

The Manhattan Project would need four plants or laboratories, which would use three different methods of uranium enrichment and one method to prove that plutonium could be produced in a uranium reactor. The first plant to be built, Y-12, implemented a process involving magnetic separation of the two isotopes. Y-12 was the home of the Calutrons – **CAL**ifornia **U**niversity of Cyclo**TRON**s.. (This would be the plant where Miss Brown would work in the chemistry lab analyzing Oralloy using a Beam-a-Lite Balance).

Y-12 was the only electromagnetic separation plant in the world at the time.

The plant and its magnets were massive, and, because of the war, the copper needed to build the magnets was not available, so the Project used silver, 14,700 tons of silver, borrowed from the US Treasury with a value of \$300 million dollars. (over \$5 Billion today)

The second enrichment plant the Project needed would use the principle of gaseous diffusion. This plant would be named K-25 and when completed would be the largest building in the world, covering 44 acres.

The last facility to be constructed at Oak Ridge was S-50, which was built right beside the power plant at the K-25 site and would use a liquid thermal diffusion method of uranium enrichment. It served to start the process and feed material first to the Y-12 Beta Calutrons and when K-25 came online the feed material went from S-50 to K-25 and to the Y-12 Beta Calutrons.

While Y-12 (with feed material from S-50 and K-25) would produce the uranium-235, Oralloy, also known as "25" as fuel for one version of the atomic bomb, Little Boy, the second plant constructed, X-10, would produce a second type of fuel called "49," Element 94, Plutonium. X-10 was a pilot plant for full scale Plutonium production. The Plutonium produced at X-10 would then be transported to Los Alamos for laboratory experiments. Another facility located at Manhattan Project's Site W in Hanford, Washington, would produce the plutonium needed for The Gadget and Fat Man.

In September 1942, then Col. Leslie Groves, a 1918 West Point Graduate who had been project manager for the construction of the Pentagon, was named to lead the secret Manhattan Project. Groves ordered agents from his Army Corps of Engineers to secure 60,000 acres of remote East Tennessee ridges and valleys.

People whose families had lived on the land in East Tennessee for generations were given little explanation for the government's sudden intrusion. One day they were farmers. The next day they were nomads, looking for a place to live. In a matter of weeks, some 1,000 families of 3,000 individuals in small communities in Roane and Anderson Counties were driven out of their homes and off their farms.

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Agents pounded on doors and, citing the War Powers Act, informed owners that the government was taking their land and their buildings. They had 30 days to evacuate. The price, an average of \$48 an acre, was not negotiable.

The remote East Tennessee location was selected for the Manhattan Project for several reasons: the availability of water and electricity from TVA's recently completed Norris Dam, the proximity of railroads and highways, the ample water supply from the Clinch River, the location's relative seclusion (Knoxville, population 111,000, was the biggest town in more than 100 miles) - and, of course, the cheap labor and cheap land.

The project's location was established within a 17-mile-long and 7-mile-wide series of ridges and valleys which was bordered on the east, south and west by the Clinch River and on the north by Black Oak Ridge. The valleys were linear and was bisected by several ridges. The valleys between these bisecting ridges were the sites for Oak Ridge's three uranium enrichment plants and one graphite reactor. The ridges provided natural protection against disasters between the four plants so they wouldn't blow up "like firecrackers on a string."

Some say that the location was a political decision influenced by U.S. Sen. K. D. McKellar, a Tennessee Democrat who chaired the Senate Appropriations Committee. Senator McKellar is said to have replied to Roosevelt's request to quietly approve a large amount of money for a secret war effort with: "Yes, it can be done, and Mr. President, just where in Tennessee are we going to locate that thing?"

The construction blitz that followed the land acquisition was astonishing. There, in what was once a sleepy little pocket of the rural South, 35,000 construction workers virtually attacked the landscape overnight. In just 30 months, a town and three uranium enrichment plant sites and the X-10 Graphite Reactor were constructed, and Oak Ridge emerged as the fifth largest city in Tennessee, with a population topping 75,000.

By 1944, Oak Ridge had the ninth largest bus system in the nation and was using more electricity than New York City or about seven percent of the electricity produced by TVA.

In the search for manpower and brains, government recruiters, like the one who had gone to Murray State College, worked almost nonstop, combing virtually every state and several countries. Workers were hired from shipyards and laboratories and steel mills - electricians, welders, teachers, carpenters. Most plant workers had high school diplomas, and thousands had college degrees. The recruiters raided university faculties for Ph.D.'s and graduate students. They called on industry for engineers and physicists.

At one time, there was a greater concentration of Ph.D.'s in Oak Ridge, TN, Los Alamos, NM, and Hanford, WA, than anywhere else on earth. And hardly anyone was over 40 years of age. The average in Oak Ridge was just 27!

The earliest workers lived in Army trailers and hutments, when they were available, and rooms, attics and garages rented from nearby farmers when they were not. To appease scientists and their wives, the Army built 3,000 "permanent" houses called cemestos. They were built with prefabricated fiberboard that was coated with a cement-asbestos mixture.

The town grew so fast that, sometimes in the morning, a house would be standing where there was only an excavated lot the night before. At the height of construction, a house went up every 30 minutes.

The Cemestos houses were well-built, two- and three-bedroom homes with coal furnaces, fireplaces, hardwood floors and porches and furnished with new electric appliances that were virtually unattainable during the war.

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Prefabs - the ugly, boxy, one-door flattops that were transported to lots on flatbed trucks and built on wooden stilts - were considered the second-best housing. They, too, were equipped with refrigerators and ranges and with beds, built-in cabinets, bookcases, and warm-morning coal stoves.

Coal was delivered free to everyone. Electricity and water were free. Trash pickup was free. City buses and work buses were free. Most streets were mud and gravel, and there were 163 miles of boardwalks, made of scrap wood.

The Army trailers, about 7,000 of them crammed into two locations, were mostly for construction personnel. They had no running water; some had no electricity. Oil stoves were used for heat and cooking. Kitchen sinks drained into open barrels, which were emptied when the daily sewage truck arrived.

Thank you, Anna Caryl, the series continues with the final of three parts next with more insights into Oak Ridge and some of the details Anna Caryl determined she thought were important elements in the Oak Ridge story.



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Anna Caryl's mother, Frances Brown Baker

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Y-12 in 1945