

A calutron girl's reminiscences: from excitement to misgivings

(As published in The Oak Ridger's Historically Speaking column the week of June 8, 2020)

In August 2020, the world will experience the 75th anniversary of the dropping of the first atomic bombs. Even today this decision remains controversial. There are those who interpret history without considering the then existing environment in which the historical events took place and attempt to reconcile historical actions in light of current culture.

This is a mistake, in my opinion. However, because it is so prevalent, I think it will be good for Oak Ridgers to be fully aware of this tendency as we approach the 75th anniversary of the dropping of the atomic bombs, in which Oak Ridge played such an important role.

We Oak Ridgers can be better prepared for the anniversary by realizing the broad spectrum of opinion and avoiding becoming defensive when current thinking influences past history. We can better support our actual history when all facts are known, and when the distortion of history happens, we are then better prepared for it.

The atomic bombs were credited with bringing an end to World War II, the most destructive war in human history, with over 60 million people killed. The comparison to conventional bombing is that in an instant the two atomic bombs completely destroyed Hiroshima on August 6, 1945, and Nagasaki on August 9, 1945.

While the firebombing of Tokyo, in one night – March 9-10, 1945, killed as many or more people than a single atomic bomb, approximately 280 airplanes were used and over 1,600 tons of incendiary bombs dropped. The surrender of Japan was influenced from the impact of this comparison, in my opinion.

The effects of the explosive forces of the two atomic bombs, greater than anything ever seen before, and radiation associated with the atomic bombings resulted in the deaths of an estimated 90,000–146,000 people in Hiroshima, and 39,000–80,000 people in Nagasaki. Roughly half of the deaths in each city occurred on the first day.

Carolyn Krause has written a series of four articles on the local reactions of three Oak Ridgers (two deceased) to the controversial decision to drop the first—and only— two atomic bombs on cities, as well as an article on the debate about the bombs that goes on even today. While each of us have an opinion regarding the decision to drop the atomic bombs and many, myself included, hold the position that using the atomic bombs actually resulted in reducing the number of deaths from that awful killing war, not all share that perception.

The first article is about Ruth Sisson Huddleston, a 19-year-old cubicle operator, known today as a calutron girl, who unknowingly helped produce the fuel for the first atomic bomb ever created. Ruth is one of the few remaining Calutron Girls and she helps me when I ask her to speak to groups, be interviewed on TV or participate in helping people better understand the wide range of emotions she experienced while working at Y-12 as a part of the Clinton Engineer Works of the Manhattan Project.

Ruth is being included in a book on World War II being written by Chris Wallace of FOX News and will be featured in a documentary film being shown on June 14, 2020, on the FOX News Network. I am proud of her and pleased to have helped in some small way to get her the recognition she so rightfully deserves.

Enjoy Carolyn's review of Ruth Huddleston's role and reaction to the dropping of Little Boy.

In 1944, Ruth Sisson, 19, and her father, William Sisson, left their mountain home daily for their government jobs "down" in Black Oak Ridge. They mounted an open wooden trailer with two long benches and a potbelly wood-burning stove in the center. It was pulled by a small truck. The Army called

A calutron girl's reminiscences: from excitement to misgivings

(As published in The Oak Ridger's Historically Speaking column the week of June 8, 2020)

it a bus, but they called it a cattle car because it was jammed with workers for the Manhattan Project. The bus stopped at the Oliver Springs gate, where a guard came aboard with a flashlight to check whether every rider had a badge.

Ruth and her father lived in Windrock, Tennessee, a coal mining town nestled in the foothills of the Cumberland Mountains. Ruth had graduated from high school, attended summer school at the University of Tennessee and then taught fourth through eighth grade for a year at a wage of \$78 a month. "I had boys in the eighth grade who were older than me," she told an Oak Ridge audience in 2019. "Then I decided I wasn't going to teach anymore until I got certified to teach."

To add to her earnings so she could eventually afford to attend more classes at UT, she moved to Clinton and got a job at Magnet Mill, a hosiery mill there. Her job was to pair stockings and socks of the same length. She had a boyfriend named Lawrence Huddleston whom she had met in Hoskins Drug Store, where he worked. The store was near Magnet Mill. Then, he was drafted and sent to fight with the U.S. Army forces in Germany.

At Magnet Mill, Ruth heard other girls talk about the jobs opening up at Clinton Engineer Works in Black Oak Ridge as part of a secret effort to end the war. "Ruth, why don't you go with us and apply for a job?" one girl asked.

So, after Ruth learned the C.E.W. workers make good money, she convinced her father to join her in applying for jobs in Oak Ridge. At the time William Sisson owned and operated a sawmill for the Windrock Coal Company. Both were hired by C.E.W. to work on the same shift. He took a job working with sheet metal and she was hired as a cubicle operator in a large windowless building at the secret Y-12 plant.

In interviews by Oak Ridge Historian Ray Smith, Matt Dozier (for Direct Current Short Circuit, an Energy.gov podcast) and Don Hunnicutt (for the Center for Oak Ridge Oral History at the Oak Ridge Public Library), Ruth Huddleston, who was 93 years old when she told her story, talked about her excitement, misgivings and feelings of betrayal when she learned the purpose of her job at the end of the war.

She had worked as a "calutron girl" from August 1944 until September 1945. It's a story she kept to herself for decades until a few years ago when her granddaughter received an assignment to write about the early history of Oak Ridge, and Ruth declared, "Oh, I can help you with that!"

"I had to have a clearance," she told an Oak Ridge audience in 2019. "I was trained in a building at Y-12. We were told that whatever we saw or heard, we didn't tell anybody anything. If somebody asks you, 'What do you do over there,' you could say, 'Well, I don't do much of anything.' You didn't tell them anything about Oak Ridge. If they caught you talking about your job or asking too many questions, you didn't stay very long. They got rid of you for some reason. We kept our mouths shut like we were supposed to do and we did our work."

At Y-12, where Tennessee Eastman employed a high of 22,482 people, many of the workers were teenaged girls who served the war effort as cubicle operators in three shifts—7 a.m. to 3 p.m., 3 to 11 p.m. and 11 p.m. to 7 a.m. Their jobs were to sit on tall, hard wooden stools and adjust handles, knobs and switches while monitoring meters to ensure that the pointer stayed in a narrow range on the dial.

"When it drifted too far to the left, it was your job to get it back to where they told you to keep it," she explained. "If it got too far to the right, you did the same thing. And if something happened that you couldn't get it back to where it was supposed to be, we had a fellow who would come and help us. And if he couldn't get it back, they closed it down. They took something out of it." That something was uranium

A calutron girl's reminiscences: from excitement to misgivings

(As published in The Oak Ridger's Historically Speaking column the week of June 8, 2020)

tetrachloride, which contained two uranium isotopes that the calutron was designed to separate to produce atomic bomb fuel.

Tennessee Eastman hired female calutron operators because young men were not available. Most had been drafted to fight in the war. Ernest Lawrence, inventor of the calutron and a Californian, argued that his scientists and engineers could produce more enriched uranium than Eastman's "hillbilly girls." In a contest, the calutron girls proved they could outproduce their technical competitors. Perhaps they had a better touch when adjusting the dials than the scientists who were constantly fiddling with the knobs as they tried to figure out the causes of the dials' minor fluctuations.

The purpose of the 1,152 calutrons, including the machine Ruth operated in Building 9204-1 at Y-12, was to separate the charged atoms (ions) of fissionable uranium-235 from the uranium-238 ions in the beam current that the calutron operators unknowingly were controlling. In 1,000 pounds of natural uranium, only seven pounds is U-235, the bomb's fuel.

Each calutron consisted of a vacuum chamber sandwiched between two magnets made from silver wire (because the nation's copper was diverted to other wartime needs). The cubicle operators couldn't wear bobby pins in their hair. The reason: the strong magnetic fields would yank them out.

Because the U-235 and the U-238 ions have different masses, the magnetic fields caused them to separate, to deflect at different angles and become trapped in different collectors. Ray Smith compares U-235 to a ping pong ball and U-238 to a golf ball. If both are attached to two long rubber bands and swung at the same time in an arc, the balls will end up at different points at the top of the arc because of centrifugal force. The same thing happens to uranium 235 and 238 as the U-238 is three neutrons heavier than the U-235.

In just over two years, the Y-12 calutrons produced only about 140 pounds, or less than a gallon, of U-235. "That was enough to make the first atomic bomb," Smith said.

On August 6, 1945, after the first bomb was dropped on Hiroshima, Ruth and thousands of other calutron operators were "told that the bomb had been dropped and that we had a part in it," she said. "I was really happy at the time and excited. My boyfriend was over in Germany. And I thought, well, this will get him back. He won't have to fight in Japan."

But her initial elation quickly faded. "It really, really bothered me because I had a part in killing all those people. I told myself there has always been war, and death goes with war. We didn't know we were working on such a terrible weapon. But then I thought, they had to keep it secret, to keep the Germans from getting the bomb first.

"Then I thought if the bomb hadn't been dropped, then probably more people would have been killed. I finally accepted the fact that my future husband might not be back and all the other Americans over there fighting—they had family and other loved ones—they wouldn't have come back either. But even today, if I think too much about it, it bothers me."

I know you appreciate the feelings of Ruth Huddleston when she learned she had been a part of producing the Little Boy atomic bomb dropped on Hiroshima. Such mixed emotions were unavoidable and I am sure many others shared her experience and mixed feelings.

Next, Carolyn will bring us the story of a famous Oak Ridger, K. Z. Morgan, known as the Father of Health Physics. In his book, *The Angry Genie*, he wrote that dropping the A-bomb on cities was a terrible

A calutron girl's reminiscences: from excitement to misgivings

(As published in The Oak Ridger's Historically Speaking column the week of June 8, 2020)

mistake. He was among the scientists who desired a demonstration explosion rather than actual bombing of a city.



Ruth Huddleston