Katharine (Kay) Way and her influence on Oak Ridge

(As published in The Oak Ridger's Historically Speaking column on December 5, 2016)

I enjoyed an opportunity recently to sit and talk with Roger Cloutier. As is always the case when we talk, the discussion never stays focused on Roger, he immediately deflects the discussion to someone else regardless of how much I focus on his accomplishments in a brilliant career with Oak Ridge Institute of Nuclear Studies/Oak Ridge Associated Universities.

Roger was the director of ORAU's Professional Training Programs from 1974 – 1992. His career at ORINS/ORAU spanned from 1959 to 1992. During those 32 years, Roger consistently helped others achieve their goals. He is the most effective mentor and enabling manager I know.

In his interview with me, his goal was to get me to see the value that Katharine Way brought to the situation that ultimately created ORINS and eventually the Oak Ridge National Laboratory. I was anxious to learn as I knew nothing about her.

In my research into the early years immediately after the Manhattan Project, I have found that William Pollard was a key individual. He was instrumental in the creation of ORINS and ORNL through creating the consortium of 14 southern universities. He also amassed the political power to cause the Graphite Reactor to become the Oak Ridge National Laboratory and guided the formation of ORINS.

What Roger wanted me to understand and appreciate was that the person with the original idea was indeed, Katharine Way. So, he started talking about her well before she became a key to Pollard's thinking.

He began by showing me a book, "One World Or None" in which Katharine Way was one of two editors. This was a new book for me and one that compiled chapters by authors such as Albert Einstein, Niels Bohr, Arthur Compton, Robert Oppenheimer, Leo Szilard, Harold Urey and Eugene Wigner. Of course, I recognized these authors! So, I immediately gained respect for Katharine Way and was anxious to learn more about her.

While I was learning about Katharine Way from Roger Cloutier, Carolyn Krause was talking with Ruth Gove about Kay Way. Ruth wanted Carolyn to know that Woody Gove knew her well, as did Murray Martin, because they both had worked for her in D.C. and Oak Ridge.

Carolyn also found a reference that Roger had pointed out to me written by Murray Martin, Norwood (Woody) Gove, Ruth Gove and Agda Artna-Cohen about Katharine Way. Using these resources and others, Carolyn did what she does so well and wrote about Kay Way.

Here are the results of Carolyn's research:

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One of the leading female scientists in the Manhattan Project was Katharine (Kay) Way (1903-1995), who spent part of her career at Oak Ridge National Laboratory. One of her most important contributions in Oak Ridge was a suggestion she made right after World War II ended. Her idea sparked the formation of the Oak Ridge Institute of Nuclear Studies (ORINS), now known as Oak Ridge Associated Universities (ORAU).

Way suggested to William Pollard, a former colleague and physics faculty member at the University of Tennessee, that the extensive and unique facilities of ORNL should be made available to the faculty and students of southern universities. Pollard, a nuclear physicist, author and Episcopal priest, embraced the idea and founded the institute. The resulting ORINS/ORAU institution, of which Pollard was elected the

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first executive director (1947-1974), grew to have a major influence on the development of science and technology in the Southeast.

A native of Sewickley, Pa., daughter of a lawyer and homemaker (who died when Way was 12) and graduate of Columbia University with a B.S. degree in physics, Way became John Wheeler's first graduate student in nuclear physics at the University of North Carolina. Wheeler was a Manhattan Project veteran who coined the term "black hole," co-authored standard text on Albert Einstein's general theory of relativity and pioneered the search for a quantum theory of gravity.

At the start of World War II, from 1939 to 1942, Way was an instructor and assistant professor in physics at UT in Knoxville, where she researched neutron sources. After hearing rumors that a war project was underway at the University of Chicago, she called Wheeler there in 1942 and convinced him to get her a position with the Manhattan Project.

At the project's Metallurgical Laboratory in Chicago, she and Alvin Weinberg examined neutron flux data from Nobel Laureate Enrico Fermi's experiments with nuclear reactor designs to determine the possibility of creating a self-sustaining nuclear chain reaction. Their calculations contributed to the construction of Chicago Pile-1, the world's first nuclear reactor to achieve criticality. (The Graphite Reactor at ORNL was the second.)

Way studied reactor constants and identified the fission products that most likely can "poison" nuclear reactors. Some fission products absorb too many neutrons released by uranium fission, poisoning the reactor core enough to stop the nuclear chain reaction – an undesirable effect. Such poisoning caused the sudden shutdown of B Reactor at Hanford in 1944, reducing the amount of plutonium produced for the second atomic bomb. Way visited Hanford, Oak Ridge and Los Alamos.

Way was one of the 70 scientists at the Met Lab who signed the Szilard Petition of July 17, 1945. It was drafted by Leo Szilard, a Hungarian scientist who patented the idea of a nuclear reactor with Fermi and wrote the letter for Einstein's signature that resulted in the Manhattan Project that built the atomic bomb. The petition, which was sent to President Truman and the Secretary of War, was an attempt to avert American use of the atomic bomb against the people of Japan. It was never seen by the top officials before the dropping of the first atomic bomb on Hiroshima.

Concerned about the morality of the use of the atomic bomb against Japan, Way co-edited in 1946 the book of essays "One World or None: A Report to the Public on the Full Meaning of the Atomic Bomb." A New York Times bestseller, the book highlighted concerns about the implications of nuclear weapons expressed by Einstein, Hans Bethe, Niels Bohr, J. Robert Oppenheimer and Szilard.

From 1945 to 1948, Way worked at ORNL, where she continued her research on fission products and became interested in compiling work on nuclear data. She left Oak Ridge to take a position as physicist at the National Bureau of Standards in Washington, D.C.

In 1953, she formed the Nuclear Data Project (NDP), an effort to organize and share vast amounts of nuclear data. Through NDP and the journals "Nuclear Data Sheets" and "Atomic Data and Nuclear Data Tables," she made important contributions that affected how scientists gather, evaluate and disseminate nuclear physics data. Such data, which is valuable for designing nuclear reactors, includes all the measurable properties of some 1500 elemental and isotopic nuclei, including the energy levels and rates of emissions of beta and gamma rays.

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Way was director of the NDP (1953-63) at the National Academy of Sciences–National Research Council in Washington and at ORNL (1964-68). Norwood (Woody) Gove, Murray Martin and the late Agda Artna-Cohen joined NDP in Washington. Weinberg convinced Way to move the NDP to ORNL. So Gove and Martin moved in 1964 to Oak Ridge, where they live with their wives Ruth and Fay respectively.

Asked to describe Way, Gove said, "She was really smart, well-organized, enthusiastic, communicative, socially outgoing, well known as a hostess, politically active and concerned about the dangers of nuclear proliferation."

Martin, Gove, his wife Ruth and Artna-Cohen wrote an article on Kay Way in the 1993 edition of "Women in Chemistry and Physics" (pages 572-580), an important source for this column.

Way is best known for the Way-Wigner formula, which she developed with Eugene Wigner based on their work during the Manhattan Project. A Nobel Laureate, Wigner was research director in 1946-1947 of what became ORNL. Way hosted him in Oak Ridge several times. She co-authored articles in "Physical Review" and "Physics Today" with Wheeler, Wigner and Gove.

The Way-Wigner formula calculates the beta decay rates of fission products. Beta decay is a form of radioactive decay caused by the weak nuclear force, in which a beta particle (electron or positron) and antineutrino are emitted. The source is a neutron in the nucleus that decays into a proton, an electron and an antineutrino.

Way also authored numerous papers on Bohr's liquid drop model of the nucleus (showing the cigarshaped nucleus is unstable) and beta decay. She produced many edited volumes of nuclear and atomic data. From 1968 to 1988, Way served as an adjunct professor of physics at Duke University.

She died on Dec. 9, 1995, at the age of 92. In an obituary in "Physics Today," she was remembered as someone who "expressed herself passionately not only about the analysis of nuclear data, but also about many issues of human fairness and social justice. In such matters, she was an outspoken advocate rather than merely a sympathetic bystander."

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Thanks Carolyn for that excellent insight into another key person in the origin of the Oak Ridge we all know and all too often take for granted. I am pleased to learn the details about Kay Way and share with Historically Speaking readers the story of the person who actually had the original idea for the Oak Ridge National Laboratory!

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A true leader in the field of Physics who originated the idea that resulted in the creation of the Oak **Ridge National Laboratory**