Eugene Wigner: R&D director of Clinton Labs in Oak Ridge for a year

(As published in The Oak Ridger's Historically Speaking column on June 6, 2016)

First my apologies to readers for including the wrong photograph of Charles Thomas last week. The Charles Thomas pictured with the article is still very much alive and called to say tell us he appreciated seeing his photo but he was sure we intended another Charles Thomas. As I hope you noticed, The Oak Ridger was kind enough to publish a correction and also express our regret…but they only published the photo I sent. The photo being in color should have been a clue to me, huh.

Now enjoy this Historically Speaking series as Carolyn Krause continues her research into the directors of the Oak Ridge National Laboratory, or in this case the Clinton Laboratories in 1946.

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Eugene Wigner thought of himself as a teacher and scholar rather than a natural administrator when he was hired for one year (1946-47) to serve as research and development director of Clinton Laboratories in Oak Ridge. He was more interested in solving research problems, guiding researchers in achieving solutions, and hiring the right people than in attending committee meetings and managing laboratory personnel.

Wigner, best known as winner of a Nobel Prize for physics in 1963, was a chemical engineer and physicist from Budapest, Hungary. He designed the Hanford reactors that produced plutonium for the Manhattan Project bomb that helped end World War II.

Charles Thomas, vice president of Monsanto and project director of Clinton Labs in 1946-47, persuaded Wigner to take a year's leave of absence from Princeton University and assume the new position of R&D director of Clinton Labs. Wigner agreed to take the role only if someone else handled most administrative details. So Thomas established a dual directorship and named James Lum, his colleague at Monsanto, as a co-director.

In "The Recollections of Eugene P. Wigner," as told to Andrew Szanton, Wigner said, "Charlie Thomas told me that Clinton Laboratories badly needed me to lead its uranium power development project." Wigner gave two reasons why he decided to take the Clinton Labs job.

"Gale Young and Alvin Weinberg, my top assistants at the Metallurgical Laboratory in Chicago, were heading to Clinton, and I agreed to go myself partly for the pleasure of working with those two remarkable men. But I went to Oak Ridge for a more fundamental reason: I wondered what I could learn from a new laboratory. What novel ideas could I bring to it? And most important, could I help make the fruits of nuclear science available for peaceful ends?"

Early in his tenure, Wigner outlined his weekly routine, according to the ORNL Review (Vols 3&4, 1992). On Mondays, he would remain in his office with an open door to hear staff advice and grievances. On "Holy" Tuesdays, he would vanish, pursuing his own research to "keep my knowledge alive." The remainder of the week he would attend to duties, circulating through the research labs to discuss scientific and administrative problems. "We'll have long arguments," he told the staff, "and I fully expect to be wrong in most of them—that is, from Wednesday to Friday."

Under Wigner's leadership, Clinton Labs morphed from a wartime pilot plant into an expanding national lab that pioneered such nuclear technologies as reactor design, radioisotope production and chemical separations. Wigner also started the precursor of nuclear engineering programs at universities and hired Alexander Hollaender, who established the world-class Biology Division.

Clinton Labs researchers designed the Materials Testing Reactor (MTR), the precursor of all modern light-water reactors. Wigner suggested two modifications of the original MTR design that were implemented.

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The MTR was intended to be a research reactor fueled by enriched uranium, cooled with light water, and moderated with heavy water (to slow down the neutrons emitted by fission so that the fuel could absorb more free neutrons and, in turn, release even more).

According to Jeffery Lewins, author of "Advances in Nuclear Science and Technology," Wigner argued that "most of the moderating power was provided by the light water coolant," so the heavy water was unnecessary. As a result, the fuel elements could be stacked more compactly, increasing the flux – the number of neutrons striking a specific area each second. The MTR had a higher flux than the Hanford reactors.

Wigner's second contribution to the MTR was the curved plate fuel element. Compared with the parallel flat plates in the original design, which could expand enough to block the flow of coolant, "the curved plate is stiffer and its thermal expansion more predictable," Lewins wrote. "This suggestion was incorporated into the design of MTR fuel, and has been used in many other pool-type reactors."

The MTR, which was built in Idaho, operated from 1952 to 1970. Its uses included testing how materials performed in intense radiation environments.

The other project, supported by physical chemist Farrington Daniels (1889-1972) who had been director of the Met Lab at war's end, was to design a High Temperature Gas cooled Reactor as the first step in investigating the feasibility of generating electricity using a nuclear reactor. This project, which chemical engineers from Monsanto worked on, was less successful.

In 1946 Wigner led a ceremony celebrating the first of thousands of radioisotope shipments that left the Graphite Reactor through the early 1960s. This event initiated a program of tremendous value to the medical, biological, agricultural, and industrial sciences. And researchers worked on improving the separation of plutonium and fission products from spent uranium fuel, pioneering nuclear fuel reprocessing technology.

In his 1994 book "The First Nuclear Era: The Life and Times of a Technological Fixer," former ORNL Director Alvin Weinberg recalled another achievement during Wigner's tenure as R&D director. It was the establishment of the Oak Ridge School of Reactor Technology (ORSORT), "which would teach the elements of the technology to a new generation of industrial and naval engineers." ORSORT, affectionately called the Clinch College of Nuclear Knowledge, "was the model for the nuclear engineering courses later established in many universities," Weinberg wrote.

Wigner recruited his first doctoral student, Frederick Seitz, to organize and direct ORSORT. (Seitz later became president of the National Academy of Sciences and then of Rockefeller University.) The ORSORT faculty included Gale Young, Kay Way and Weinberg, who lectured on reactor theory and provided notes for a book that he and Wigner coauthored and published in 1958. The book, Weinberg wrote, "has had enormous influence on the teaching of reactor theory."

In October 1946, Wigner recruited Alexander Hollaender, a founder of radiation biology, to form and head a Biology Division. At the U.S. Public Health Service, Hollaender had induced mutations using ultraviolet light and X rays and first discovered (in 1939) that nucleic acids are the building blocks of genes. Hollaender hired Bill and Liane Russell, whose discoveries greatly advanced the field of mammalian genetics.

Wigner was troubled that the Army continued its wartime security policies at Oak Ridge, Hanford and Los Alamos, making it difficult for the three labs to exchange scientific data. Colonel Walter Leber insisted that Wigner follow Leber's interpretations of new safety regulations, thus delaying Wigner's proposed tests of beryllium as a reflector of neutrons back into the reactor core. "Only after review at the highest level were

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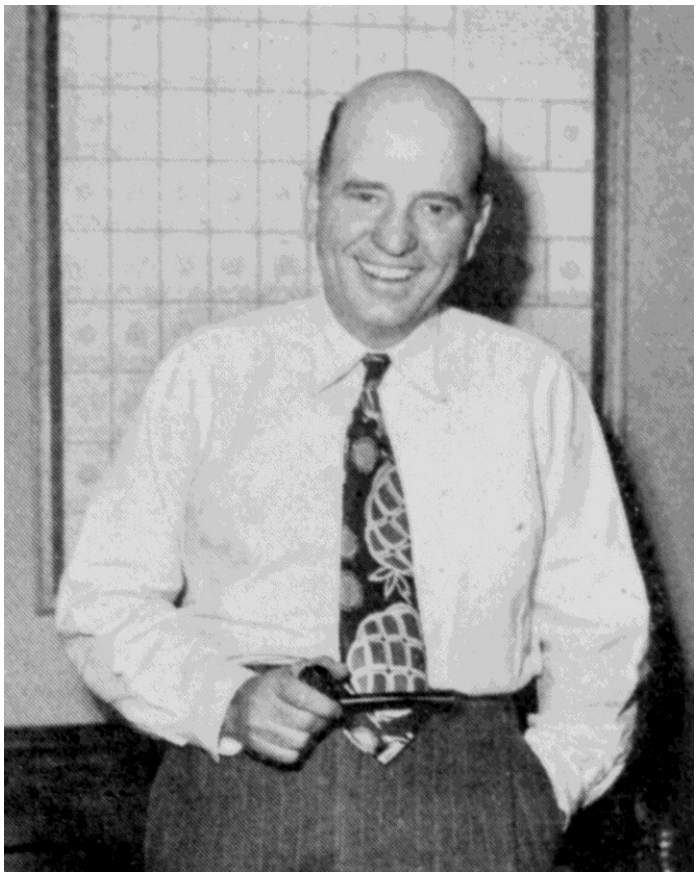
the experiments allowed to continue," the ORNL Review stated. "Such delays discouraged Wigner and in time caused him to return to university life."

In his "Recollections," Wigner wrote: "I hated the bureaucracy at Clinton Labs. They called me a leader, and I offered personal ideas on many aspects of nuclear research. I did as well as I could do. But I am afraid that I made a poor boss. . .

"In the laboratories of large institutions, people get too used to each other. Human thought, which is wonderfully personal, becomes institutionalized. The sense of fresh adventure evaporates. The equipment is quite impressive, but the devotion is gone. Such settings stifle innovation and make me feel useless and sad." However, Wigner recalled that he had had a "moment of honor" at Clinton Labs when "we gave a one-millicurie unit of carbon-14 to a St. Louis hospital for the treatment of human cancer."

NEXT: More on Eugene Wigner from Oak Ridge sources



The correct photo of Charles Thomas of Monsanto

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Eugene Wigner and Alvin Weinberg

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DOE Photo – in August 1945, the Laboratory's research director, Eugene Wigner, handed the first shipment of a reactor-produced radioisotope, a container of Carbon-14, to A. U. Cowdry, director of the Barnard Free Skin and Cancer Hospital of St. Louis, Missouri