Grady Whitman: A Satisfying Career at ORNL

(As published in *The Oak Ridger's Historically Speaking* column on May 6, 2013)

Carolyn Krause brings us the third and final column in the series featuring Grady Whitman. In earlier columns, she has helped us to better appreciate Grady's early career in the Special Engineer Detachment and his work on Y-12's calutrons. Here she focuses on his later career in the Oak Ridge National Laboratory.

Carolyn has used Grady's oral history as found in the Center for Oak Ridge Oral History, a great resource for our history. If you would like to contribute to our historical archive of oral histories, please contact the Oak Ridge Public Library to have an interview scheduled.

Now for Carolyn's third and final Grady Whitman column.

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Many researchers at Oak Ridge National Laboratory have worked on promising government-sponsored reactor projects that the government defunded a few years later. Grady Whitman had that experience, but near the end of his career he headed a program with lasting effects.

After the calutron program for uranium enrichment was ended because the war was over and the Oak Ridge Gaseous Diffusion Plant was more efficient, Whitman worked for Chris Keim in the Stable Isotopes Program from 1947 to 1954 at the Y-12 Plant. Then he moved to Oak Ridge National Laboratory to work on the Aircraft Nuclear Propulsion project.

"The Navy had a nuclear submarine and the Air Force just needed to have a nuclear-powered aircraft," Whitman said. "We built an aircraft reactor experiment that we ran for a week."

"We used the first uranium-bearing molten salt to make a liquid fuel. The reactor was moderated by beryllium oxide. The fuel ran at high temperatures and transferred its heat to a liquid metal coolant that in turn transferred its heat to air for running a jet engine."

The nuclear airplane concept was cancelled in 1961. Once intercontinental ballistic missiles were made ready to launch, the tactical advantage of nuclear-powered aircraft was diminished.

In addition, the possibility that an airplane powered by a nuclear reactor could crash and release radioactivity troubled many. Shielding was a problem; it had to be thick enough to protect the crew from the reactor's neutron radiation but not so heavy that the plane couldn't fly.

The ANP program gave birth to a whole array of research programs at the Lab.

Examples included the Molten Salt Reactor, a new class of materials, improved welding technologies, and the first of ORNL's computers that achieved world-record speed for a time.

In 1956, Congress reacted to British advances early in the decade by directing the Atomic Energy Commission to gain first-hand experience with gas-cooled, graphite-moderated reactors. The AEC turned to ORNL, which formed a task force charged with comparing the feasibility and costs of gas-cooled and water-cooled reactors.

Encouraged by the initial findings, the AEC asked ORNL to design fuel elements for the Experimental Gas-Cooled Reactor (EGCR) and authorized the Tennessee Valley Authority to build and operate the EGCR on an ORNL site on Melton Hill Lake. By early 1958 the laboratory had completed a conceptual design for a helium-cooled, graphite-moderated reactor with a fuel core of uranium oxide clad in stainless steel.

According to Whitman, ORNL representatives had to appear before the Advisory Committee on Reactor Safeguards to get a license. Some members of ACRS had to recuse themselves because of their involvement in the EGCR design. But at the 13th review meeting in Hanford, Wash., ACRS gave ORNL approval to load the fuel.

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The problem was that Milton Shaw, then in charge of the Atomic Energy Commission's reactor business, had a reputation for crossing swords with a number of people. "When he crossed swords with you, you knew you'd been crossed," Whitman said.

He claimed that Shaw said something like this: "Well, I know you've done a good job, and you're ready to go critical. But, we're going to shut it down. We've got other fish to fry. We can't afford the expenditure of any more funds on this concept. I don't think a gas-cooled reactor can compete with water reactors economically."

So, Whitman said, "We disbanded the EGCR project." He noted that Alvin Weinberg, who had been ORNL director since 1955, did not dispute Shaw's decision, probably because Weinberg had a stronger bent for liquid-fueled and pressurized-water reactors than for gas-cooled reactors.

Whitman got to know Shaw even better when the latter headed the AEC's Heavy-Section Steel Program for investigating the effects of radiation on the strength and fracture resistance of reactor vessels.

"U.S. companies were building huge reactor vessels made of heavy-section steel for light-water reactors, both pressurized and boiling," Whitman said. "We really didn't know that much about the behavior of the irradiated steels."

So, ORNL's Bill Manly wrote a letter to the ACRS suggesting that the AEC establish a program for extensively studying low-alloy steels. Whitman said that he was proudest of his work as a manager of ORNL's Heavy Section Steel Program.

At ORNL's Bulk Shielding Reactor steel specimens were irradiated with neutrons. Researchers studied the samples' fracture properties, or ability to resist cracking under different conditions.

One discovery at ORNL was that adding copper to steel during welding prevented the steel from corroding and improved its conductivity and strength. However, under neutron bombardment, copper enhanced the embrittlement of the reactor vessel's wall, lowering its resistance to fracture.

"We were the first in the world to determine the fracture properties of low-alloy steel," Whitman said. "And, our data are still in the pressure vessel codes," which give rules on how much radiation damage can be safely allowed in steel reactor vessels.

ORNL is still recognized as the leading U.S. national lab for determining the life of reactor vessels. Its work has provided the Nuclear Regulatory Commission with valuable scientific data and computer codes to help the agency decide which 40-year-old nuclear power plants can operate another 20 years.

ORNL research has led to the renewal of operating licenses for a number of the 103 nuclear power plants that provide one-fifth of U.S. electricity. The program Whitman once led continues to have enduring effects on energy producers, distributors, and consumers.

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Thanks Carolyn, for another excellent article.

Another aspect of Grady Whitman's extraordinary career in Oak Ridge was his volunteerism. Katy Brown sings his praises as a volunteer at the Oak Ridge Convention and Visitors Bureau. The ORNL Reporter in Volume No. 54, December 2003 has the following information on Grady:

"Volunteer Grady Whitman came to Oak Ridge in 1944 as part of the Special Engineering Detachment. He offers a unique perspective because he can reflect on what it was like to work on several programs while at two of the three facilities. He was at Y-12 from 1944 to 1946 and then moved to ORNL's Stable Isotopes Division in 1947."

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"'I have found participation as a tour guide to be a very rewarding activity,' says Grady. 'I am able to share memories on the early days of the Manhattan Project—in particular, the startup and operation of the Y-12 Plant. I can also relate some of the events unique to living in a secret community. My role as a public tour ambassador has encouraged me to keep abreast of current research, so I can continue to present a more complete picture of the many exciting activities taking place in Oak Ridge today,' he adds."

Grady Whitman cropped from a photograph taken at a history get together for volunteers at the Oak Ridge National Laboratory and the American Museum of Science and Energy on December 4, 2003.