ORSORT: Model for university nuclear engineering courses

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Carolyn Krause brings to light the amazing history of reactor training at the Oak Ridge National Laboratory when she explores the history of the Oak Ridge School of Reactor Technology. What began as a one year training program started by Eugene Wigner eventually evolved into one of the most important specialized educational tools in the nuclear industry. Enjoy learning about yet another Oak Ridge achievement through Carolyn's research:

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The people who came to Oak Ridge to learn about the new field of nuclear engineering were highly intelligent. But these folks from industry, universities, the U.S. Navy and other governmental agencies had the option of adding these letters after their names: D.O.P.E., which stands for Doctor Of Pile Engineering. "Pile" refers to a pile of uranium, fuel for a nuclear reactor such as the Graphite Reactor in Oak Ridge.

In Oak Ridge two nuclear reactor training schools were established well before 1957 when the first American commercial nuclear power plant began producing electricity.

The one-year curriculum at the training schools consisted of mathematics, nuclear physics, reactor theory, reactor technology, health physics and radiochemistry. The curriculum became the "model for the nuclear engineering courses later established in many universities," wrote Alvin Weinberg, former director of Oak Ridge National Laboratory, in his autobiographical "The First Nuclear Era: the Life and Times of a Technological Fixer."

The Clinton Laboratories Training School was open only for a year, in 1946-47. It was affectionately called Clinch College of Nuclear Knowledge (sometimes humorously spelled Klinch Kollege of Knuclear Knowledge).

The most famous visitor to Oak Ridge in 1946 was Captain Hyman G. Rickover, an electrical engineer who later became known as the father of the nuclear navy. He was assigned to Oak Ridge to investigate the possibility of using nuclear energy in naval vessels.

The first training school was reinstituted in 1950 as the Oak Ridge School of Reactor Technology. ORSORT operated until 1965, when governmental funding for the school was ended.

Weinberg recalled a visit to Clinton Labs in 1945 by the Navy's Ross Gunn, who first proposed nuclear propulsion of ships and submarines, and Philip Abelson, who had worked briefly at the thermal diffusion plant next to the K-25 gaseous diffusion plant. "I showed them some of my calculations on the size and general configuration of a pressurized-water reactor," Weinberg wrote. "But the Navy's serious interest in nuclear propulsion really started with Rickover's stay in Oak Ridge."

According to Weinberg, "Captain Rickover arrived with his half-dozen naval lieutenants and lieutenant commanders about six months before the school officially started. Harry Soodak and Edward Campbell gave informal lectures for Rickover's people, and Rickover himself attended these lectures."

In his book "The Rickover Effect: How One Man Made A Difference," Theodore Rockwell, a former ORNL engineer and a classmate of Rickover in Oak Ridge, wrote about Rickover's problems with learning the material taught by a physicist.

"Rickover kept asking simple, basic questions, making himself look pretty stupid and getting a lot of knowing chuckles from the wiseacres." He was offered tutoring and he accepted the offer. A tutoring class was set up and Rockwell decided to attend it.

"When I got to the tutoring class a little late, I was surprised to see not only the captain but a dozen or more of his classmates, including some of the chucklers, all busily taking notes. Noting my startled look, the captain said, 'I guess I'm not the only dummy in the class. Just the only one with the guts to admit it.'"

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The establishment of the Clinton Labs Training School met one of the three goals of Eugene Wigner (later a Nobel Laureate), research director of Clinton Labs in 1946-47. He asked one of his Ph.D. students, Frederick Seitz, to move to Oak Ridge and organize and direct the training school. (Seitz later became president of the National Academy of Sciences and then president of Rockefeller University.)

According to Weinberg, the first class had 30 full-time students, mostly from industry. The faculty included members of Wigner's theoretical group – Harry Soodak, Gale Young, Kay Way and Weinberg.

ORSORT got started in 1950 after Rickover contacted Weinberg, research director of ORNL. Rickover wanted to establish a "national asset" that would train a sufficient number of qualified nuclear engineers to meet the needs of industry and the government. Weinberg, Rickover and their staffs worked out a one-year curriculum. In addition to courses, the students conducted lab experiments and formed teams that worked with a faculty adviser to design new reactors.

Dick Cheverton, a retired ORNL nuclear engineer, led an ORSORT team that designed the High Flux Isotope Reactor. It still operates today, helping make ORNL a preeminent neutron-scattering research center.

One of the nuclear navy's leading figures who attended ORSORT was James Watkins, former chief of naval operations and Secretary of Energy. Another attendee was Milton Shaw of Knoxville; he later headed reactor research at the Atomic Energy Commission and disagreed with Weinberg on breeder reactor development. President Jimmy Carter, who worked on nuclear submarines in the 1950s, has said that, next to his father, the man he admired the most was Rickover.

ORSORT turned out about 100 graduates a year. The total number of ORSORT graduates was 976, including international students who were permitted to attend starting in 1959. They were sponsored by the governments of Australia, India, Israel, Japan, Netherlands, Pakistan, Philippines and South Africa.

According to Rockwell, "By 1958, 35 students had been sent from Naval Reactors, and other organizations working with NR had sent nearly 600 additional trainees." These other organizations included reactor vendors Combustion Engineering, General Electric and Westinghouse; private and naval shipyards; manufacturers and electric utilities. Other students came from Bureau of Ships groups outside NR and other governmental organizations.

Many ORSORT graduates, Rockwell wrote, "went on to become leaders in the burgeoning nuclear power industry. Rickover had delivered on his promise to create new nuclear engineers."

Admiral Rickover later joined many others in having reservations about nuclear energy. But many Americans are grateful that nuclear submarines that keep our nation safe have not had any reactor accidents so far and that nuclear power plants produce almost 20 percent of the nation's electricity.

For those who particularly admire the Admiral, here's his philosophy: "Knowing is easy; it is the doing that is difficult. The critical issue is not what we know but what we do with what we know. The great end of life is not knowledge, but action."

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Well, Rickover's philosophy is certainly on target. Action is the key to success in anything we do. Carolyn has shown us another one of the MAJOR contributions ORNL has made to the nuclear industry. Thank you Carolyn!

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Alvin Weinberg, a key leader of ORSORT

Admiral Hyman Rickover in 1955