## Rosenthal managed non-nuclear energy and fusion research

(As published in The Oak Ridger's Historically Speaking column on September 20, 2017)

Second installment in a three-part series of *Historically Speaking* by Carolyn Krause featuring Murray Rosenthal. More insights into one of our local Oak Ridge scientists.

The Molten Salt Reactor Experiment was ready for startup with uranium-233 fuel in 1968. Murray Rosenthal, molten salt program director, kept Alvin Weinberg, director of Oak Ridge National Laboratory, informed on the reactor's progress, and Weinberg invited Glenn Seaborg, Chairman of the Atomic Energy Commission at the time, to come to Oak Ridge and start up the MSRE.

Seaborg had won the Nobel Prize in chemistry because he and his team had discovered several new transuranium elements, including plutonium and uranium-233. Seaborg accepted the invitation, and as he sat at the controls and started up the MSRE, photographers snapped pictures.

"I had assumed that the crew had actually started it up the night before and knew it would work," Rosenthal told ORNL's Steve Stow in an oral history interview. "But, they hadn't, so when Glenn started it up, it jerked around a lot. The power went up and bounced around, and everybody got very excited."

"Well, uranium-233 is somewhat different from U-235. To start up a reactor on U-233, you have to reset the controls. So, in truth, Seaborg really started up the world's first uranium-233 reactor, with some heart palpitations on his part and the rest of us." Nowadays, every component of the reactor would have been checked out 20 times before a dignitary visited it, Rosenthal observed.

During Seaborg's term as AEC chairman in the 1960s, Rosenthal spent a year in Washington as technical assistant to the man in charge of all AEC reactor programs. "Seaborg's speechwriter called on me at times for help. He brought me a draft of one talk that included comments about thorium, and it had some statements that I said were wrong. The speechwriter argued with me and finally said, 'Dr. Seaborg says you're wrong.' I thought I was debating with the speechwriter, but the next day I got a call from Seaborg himself (who I didn't know then), and we had a heated argument."

"Neither of us yielded, and I doubt that the speech was revised. I'm convinced to this day that I was right, and he wasn't. But the molten salt reactor wouldn't really have had a justification if he hadn't figured out how to produce uranium-233."

Rosenthal remained the program manager for MSRE until about 1973 when the program died even though the reactor was performing well technically. "But the AEC had its bets on the fast breeder reactor, which produces plutonium from uranium-235. They tolerated us, but we were kind of an annoyance to them."

"And finally, in 1973, they decided we were too much of an annoyance. The Molten Salt Program actually got revived for a couple of years, and Gene McNeese led it, but it was pretty much gone and died again." (There is a "Weinberg Foundation" that seeks today to revive the Molten Salt Reactor. <u>http://www.efn-uk.org/l-street/nuc-lib/thorium-reports/index\_files/Weinberg-review.pdf</u> – Ray)

In the late 1960s and early 1970s, Weinberg steered the lab toward investigations of applications of nuclear power and non-nuclear sources of energy. David Rose, an MIT professor, was asked to lead ORNL's planning office. A creative, energetic man, he recruited researchers to do various studies. Rose put Jack Gibbons in charge of an environmental program that struggled to attract funds from the National Science Foundation.

Then the state of Tennessee was gerrymandered, and the lab ended up in the district of a very powerful congressman named Joe Evins, the second ranking member on the House

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Appropriations Committee; he had power that nobody in the Congress has today. His first gift to Oak Ridge was the American Museum of Science and Energy (which will be moved a couple blocks in 2018).

When Richard Atkinson, head of the National Science Foundation, appeared before Evins' committee for the first time, Joe said, 'In my district is this lab in Oak Ridge. Do you have any programs going on there?' And, according to Atkinson, he replied, 'No, Mr. Chairman, but I'm a'fixin' to!'" The AEC and NSF worked out an arrangement so ORNL could receive some NSF funding.

As a result, Gibbons' program received generous funding from the NSF. That started the energy conservation program that Roger Carlsmith led for years. Pete Craven, Bill Fulkerson, and many others were involved in this large program.

President Nixon asked Dixie Lee Ray, chair of the AEC, to prepare a report on the nation's energy problems in the wake of the Arab oil embargo, which caused gasoline shortages and long lines of vehicles in the U.S. Rosenthal and Jere Nichols spent a lot of time that summer in Washington helping with the report, and they were joined at times by Carlsmith, Chuck Coutant, and others.

The ORNL cadre in Washington helped write "The Nation's Energy Future," which recommended that the nation try to achieve energy independence by 1980. Rosenthal said the group knew the U.S. would not become much less dependent on foreign oil by that time because the carmakers kept manufacturing and selling inefficient, gas-guzzling vehicles. "It was just a political document," he added.

When Rosenthal returned, ORNL Director Herman Postma sought advice on consolidating various research programs. Rosenthal proposed the creation of the Energy Division. The new division was headed first by Sam Beall and then by Bill Fulkerson after Beall retired.

"We created the Fossil Energy Program, which was led by Jere Nichols, and later, Gene McNeese," Rosenthal said. "These programs really changed the direction of ORNL from a nuclear reactor laboratory to the broad energy laboratory it is today. It opened up many opportunities for us."

In 1974, Postma appointed Rosenthal associate laboratory director for advanced energy systems at ORNL, with responsibility for the Energy and Fusion Energy divisions and the Fusion, Fossil Energy, Energy Conservation and Renewable Energy programs.

After the AEC was disbanded in 1974, the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission were established. ERDA and other agencies were incorporated into the Department of Energy in 1977.

"ERDA allowed ORNL to become reshaped into what it is today," Rosenthal said. "We were asked to decide which energy options would pay off. We chose energy conservation as a target for research. That was the best decision we ever made." Carlsmith, who headed the program for years, won the Carnot Award, a very high honor.

"I knew nothing in the world about fusion," Rosenthal told Stow. "I got part of my education in the Navy. But I never had a physics course. I had to go learn about physics and fusion. I ended up acting as program manager for fusion with all the responsibilities. It turned out to be one of the most exciting things I ever did."

In the 1970s entrepreneurial employees in the energy field at ORNL became involved in subcontracting—that is, hiring other organizations to do certain research for DOE that ORNL

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couldn't do.

"We managed the subcontracted work for DOE," Rosenthal said. "It really was a change, and we worried about the impact on us. We insisted that in any programmatic work we subcontracted out, we'd take a certain percentage of the budget for work in-house. We learned about real-world problems as we became increasingly involved with industry."

"For example, we convinced industrial employees that they could develop more efficient compressors for refrigerators and freezers. We couldn't do that because we didn't know the business, but they did."

"However, we knew the technical aspects. We had motivation. So, our partnership with industry turned out to be very valuable. Refrigerators and freezers in use today are much more efficient largely because of work that came out of our program." (Yet another example of scientific advancement at ORNL that impacts our everyday life...but I dare say few readers even realized it! - Ray)

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Thanks Carolyn! Next, the final installment in this series will show how Murray Rosenthal helped select a new ORNL director and then became a deputy director.



In this 1968 photo, Glenn Seaborg, chairman of the U.S. Atomic Energy Commission, starts up the Molten Salt Reactor Experiment at ORNL. The MSRE ran on fuel consisting of uranium-233, an isotope that Seaborg and his team discovered after exposing thorium-232 to neutrons.

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In this 1978 photo, Murray Rosenthal shows "The Nation's Energy Future" book he worked on to ORNL Director Herman Postma.