## More Eugene Wigner stories; Response to a Feynman claim

(As published in The Oak Ridger's Historically Speaking column on August 29, 2016)

Carolyn Krause has collected a couple more stories about Eugene Wigner, plus a response by Y-12 to allegations by Richard Feynman in a book that included a story on his experience at Y-12 during World War II.

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Mary Ann Davidson, widow of Jack Davidson, a longtime member of the Oak Ridge National Laboratory's Instrumentation and Controls Division, told me about Jack's encounter with Wigner one day.

Once Eugene Wigner had trouble opening his briefcase while visiting ORNL. He was referred to Jack Davidson in the old Instrumentation and Controls Division. Jack managed to open it for him. As was his custom, Wigner asked Jack about his research. Jack, who later won an R&D-100 award, said he was building a camera that will imitate a fly's eye; in other words, it will capture light coming from a variety of directions. The topic of television and TV cameras came up. Wigner said he wondered how TV works. So Davidson explained the concept to him.

Charles Jones told me this story about Eugene Wigner when he visited ORNL in the 1980s. Jones, who was technical director of the Holifield Heavy Ion Research Facility, said he invited Wigner to accompany him to the top of the HHIRF tower, and Wigner happily accepted the offer.

At the top Wigner looked down at all the ORNL buildings, most of which had been constructed after he was the lab's research director in 1946-47. Jones then pointed to the Bull Run Steam Plant. "That's about ten miles away – about as far as we can see from here today." Wigner pointed at the sun, some 93 million miles away. "That's not right," he said to Jones. "We can see a lot farther than that."

In a previous two-part Historically Speaking series on Richard Feynman (1918-88), who later won a Nobel Prize for physics, the view of three distinguished scientists at the Los Alamos laboratory in 1994 was that the Oak Ridge Y-12 electromagnetic separation plant was in danger.

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It started when a plant superintendent with Tennessee Eastman Corporation in Oak Ridge sent a letter to Los Alamos with this question: Should Oak Ridge have advanced fire-fighting equipment and special chemicals because "no provisions have been made in the 9207 Area for stopping reactions resulting from the bringing together by accident of an unsafe quantity of material"?

Robert Oppenheimer, scientific director of the Manhattan Project and director of the Los Alamos lab, sent Emilio Segrè and then Feynman to Oak Ridge to inspect the Y-12 Plant, which was producing uranium fuel for the atomic bomb being developed at Los Alamos. Feynman was also asked to educate the Y-12 managers on the best ways to prevent a nuclear explosion in Oak Ridge.

Segrè had been astonished by the Army's "compartmentalization of information" that kept secret the findings Oak Ridge managers needed to know to ensure plant safety. He had seen workers wheeling around bottles of a greenish, water-based solution of uranium nitrate.

According to "Genius: The Life and Science of Richard Feynman," by James Gleick, the Oak Ridge officials "lacked knowledge that had become second nature to the experts at Los Alamos: that the presence of hydrogen, as in water, slowed neutrons to dangerously effective speeds and so reduced the amount of uranium-235 needed to sustain a reaction."

As an expert in making critical-mass calculations at Los Alamos, Feynman worried about the possibility in Oak Ridge of reactions that could release dangerous, potentially fatal amounts of radioactivity and heat at near-explosive speed, as the atomic bomb was being designed to do.

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Feynman discovered that uranium nitrate solution enriched in U-235 was stored in multiple drums. He showed that the drums were placed in potentially unsafe arrangements in dozens of rooms in several buildings.

According to Gleick, Feynman "met with engineers to study blueprints for plants under construction. He realized that the plant was headed toward a catastrophe. The nightmare was that two batches, individually safe, might accidentally be combined.

"Eventually, meeting with senior Army officers and company managers, he laid out a detailed program for ensuring safety. He also invented a practical method . . . that would let engineers make a conservative approximation, on the spot, of the safe levels of bomb material stored in various geometrical layouts. A few people, long afterward, thought he had saved lives."

At an Oak Ridge Institute for Continued Learning class, Arvin Quist handed me a report he had written that challenges the Los Alamos story about Oak Ridge. The report is Volume 1 of the K-25/Martin Marietta report "Security Classification of Information." It's entitled "Introduction, History, and Adverse Impacts," and it was published in September 1989.

According to Quist: "General Groves insisted on strict compartmentalization of knowledge --the 'need to know' requirement...Compartmentalization may also have been used to keep the scientists' attention focused on their particular task and not become interested, at the expense of their primary responsibilities, in other intriguing scientific questions not directly related to their tasks."

Thus, information exchanges between the Los Alamos laboratory and the Y-12 Plant were regulated. "Also because of compartmentalization," Quist wrote, "a nuclear criticality incident 'allegedly' almost occurred at the Y-12 plant in Oak Ridge."

A footnote of two paragraphs explains the use of "allegedly" in the previous sentence. The first paragraph is based on Harold Urey's testimony in a 1945 hearing (Nov. 27-30, Dec. 3) before the U.S. Senate's Special Committee on Atomic Energy. The following footnote refers to "a Los Alamos scientist," who was known to be Feynman:

"The Y-12 Plant made the final enrichment of U-235 to obtain weapons-grade uranium. Part of the process involved handling aqueous solutions of high-enriched uranium. The Y-12 Plant personnel were made aware of nuclear criticality problems with those solutions only because 'compartmentalization' with that knowledge broke when a Los Alamos scientist happened to visit the Y-12 Plant prior to generation of those high-enriched uranium solutions."

The second paragraph in this footnote is based on a private communication from Y-12's John M. Googin in July 1988. It reads:

"The word 'allegedly' is used because it is not clear that there was a real danger. The Y-12 Plant personnel were aware of the possibility of criticality in their process and had designed the equipment accordingly. The Los Alamos scientist suggested a larger safety factor, which was implemented, although as later measurements showed, the original equipment would have been safe from a criticality standpoint."

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Thanks Carolyn for yet another intriguing example of how history often documents only part of the story. The "rest of the story" is often learned much later. As for me, if Dr. John M. Googin said it, I believe it!

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We have named the research library in the Y-12 History Center at the New Hope Center the "John M. Googin Library" in his honor. He was the "Scientist of Y-12" and is highly respected by all who knew him.



Jack B. Davidson, who worked at the Oak Ridge National Laboratory Instrumentation and Controls



Charles M. Jones, retired technical director of the Holifield Heavy Ion Research Facility at the Oak Ridge National Laboratory

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Dr. John M. Googin, who was the renowned Scientist of Y-12