More on the term "Fission"

Imagine my delight when I received an email from Murray Rosenthal regarding one of my recent articles about Y-12 history. Murray had helped me with the history of the Oak Ridge Institute for Continued Learning when I was writing that story for my *Historically Speaking* column. He is also the author of *An Account of Oak Ridge National Laboratory's Thirteen Nuclear Reactors,* published in August 2009 and revised in March 2010.

So, to get an email from Murray was exciting. I knew he would provide some interesting information, and he certainly did. His insight into the origin of the term "fission" expanded greatly on the mere mention I had made of it in the Y-12 history column he commented upon.

Thanks to Murray and the leads he gave me, I can now provide a much more complete and definitive historical account of how this most significant term came into common use. It is a story with a twist, and it has a strong Oak Ridge connection. Thanks also to Elias Greenbaum, Ph.D., ORNL Corporate Fellow and UT-Battelle Distinguished Inventor. Murray suggested I talk to Eli. With his help and the input from Murray a more complete story of the origin of the term "fission" resulted.

It seems that Bill Arnold is the key to the term. William Arnold (December 6, 1904 - October 26, 2001) was renowned as a Biologist in the Oak Ridge National Laboratory's Biology Division, according to Eli Geenbaum. Eli said Arnold "became famous as an undergraduate at 'Cal Tech' [California Institute of Technology] in 1932."

Here is what I found in Wikipedia, "Professor Robert Emerson and an undergraduate student, William Arnold, used a repetitive flash technique to precisely measure small quantities of oxygen evolved by chlorophyll in the algae Chlorella. Their experiment proved the existence of a photosynthetic unit."

Paul Frame, of Oak Ridge Associated Universities, in his *Tales from the Atomic Age,* published in the Health Physics Society's Newsletter, stated, "His search began as a result of a mysterious letter in 1938 from Otto Hahn to Lisa Meitner, Frisch's aunt. Hahn asked Meitner if she could offer some fantastic explanation for the apparent production of barium in the uranium he had bombarded with neutrons.

"'Would it be possible' Hahn asked, 'that uranium 239 bursts into a Ba and a Ma [Tc]?"(Stuewer 1985). By employing the liquid drop model of the nucleus developed by Gamow and Bohr, Meitner and Frisch demonstrated that a splitting of the uranium nucleus to produce barium was theoretically feasible.'"

"Furthermore, they calculated that the products of this splitting would have exceptionally high kinetic energies. But their fantastic explanation seemed far too fantastic for some at the Institute. So, to satisfy himself as well as the doubters, Frisch decided to experiment (Frisch 1979).

"Down he went into the well (Friday, 13th, January 1939) - to measure the energy of the particles emitted by uranium as it was exposed to neutrons. By positioning the uranium next to a proportional chamber, exposing the uranium to neutrons, and viewing the pulses from the chamber with an oscilloscope, Frisch performed a visual pulse height analysis!

"Word quickly spread throughout the Institute about the unusual events in the well, and one of those who decided to see for himself was the biologist William Arnold (Arnold 1996; Ermanc 1989). At first, all Arnold saw on the oscilloscope screen was a series of small pulses produced by uranium's alpha particles. But then, at Frisch's suggestion, he picked up one of the neutron sources by the handle and put it next to the uranium. The world changed! Huge pulses began appearing - pulses far larger than anything produced by the alpha particles - pulses produced by the fragments of the splitting uranium nuclei!

“Later that day, Frisch tracked Arnold down and said something to the effect ‘You’re supposed to be some kind of biologist. What is the term you use to describe dividing bacteria?’ Arnold replied, ‘Binary fission.’ Frisch then asked if the word ‘fission’ would suffice and Arnold agreed that it would.

Much of the last two paragraphs is also found quoted in the Oak Ridge Associated Universities website at: https://www.orau.org/PTP/articlesstories/names.htm under the definition for the word “fission.” Again, Paul Frame is the author of this information titled, “WHY DID THEY CALL IT THAT? – The Origin of Selected Radiological and Nuclear Terms.”

Such notoriety gained from the naming of a new scientific term is rare indeed and often associated with people after they are long gone from the scene. The naming of the term “fission” was most unusual.

Murray also arranged to introduce me to Elias Greenbaum, who still works at the Oak Ridge National Laboratory and who was a contemporary of William Arnold. Eli’s contribution to the Bill Arnold story will be in the next installment.