

THE MODERATOR

B R E A C T O R M U S E U M A S S O C I A T I O N

October—December

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Fall 2014

From The Control Room

by Maynard Plahuta, BRMA President

September 26, 2014, was a beautiful star-filled evening in which to celebrate the 70th anniversary of B Reactor's start up. And that is exactly what the nearly 250 people did---CELEBRATE---the momentous anniversary of pulling the rods for B's startup. All enjoyed the excellent food and beverage from Richland's famed Atomic Ale Brewpub & Eatery. Features such as the B Reactor Brownie and the Plutonium Porter Beer were highlights. The evening was enhanced by the Mastersingers, who sang 40s-era songs and ending the program with "God Bless America".

Special thanks go to Del Ballard for his excellent BRMA program presentation focusing on the perseverance of BRMA's founding members (Del being one of them) to achieve BRMA's primary goal to have B become a museum with public access---a goal clearly achieved. You did an excellent job Del! I've also heard commendable remarks from various people telling how much they enjoyed chatting with BRMA's docents while they toured B. As usual, you guys did a great job. Michael Matthias, Col. Franklin Matthias' son, was invited but was unable to attend due to prior commitments. However, he sent a wonderful reflective letter with copies provided to all attendees. Turn to P. 3 to read his letter.

The celebration event was a collaborative effort of members from the Hanford History Partnership. Partners include DOE and BRMA along with approximately 10 other local organizations interested in preserving Hanford History. We thank 70th anniversary committee chair Colleen French and other committee members for their dedicated efforts to pull this event off expeditiously. Colleen also did a wonderful job as MC of the program!

Dr. David Klaus from DOE Headquarters gave an

encouraging keynote address in which he supported preservation of DOE's signature facilities. We are encouraged by Congressman Doc Hastings' address in which he stated he was going to do everything in his power to get the Manhattan Project National Historical Park bill passed in Congress.

Lastly, the 70th anniversary committee thanks all the sponsors who donated both cash and services in kind to make this great event possible. Including BRMA there were 12 companies and organizations who contributed.

On behalf of BRMA it was my great pleasure to accept an award for our unending efforts to make B Reactor what it is today. We need to determine where we can best display this award. It is a unique piece of work using old reactor graphite. Come to our next monthly meeting to see this award.

Look for more details and pictures in this edition of *The Moderator*. I thank *The Moderator* Editor Richard Romanelli and our Historian Burt Pierard for putting the story, pictures and details together. Enjoy the pictures taken by BRMA members, especially Communications Director and professional photographer Gary White, and others.

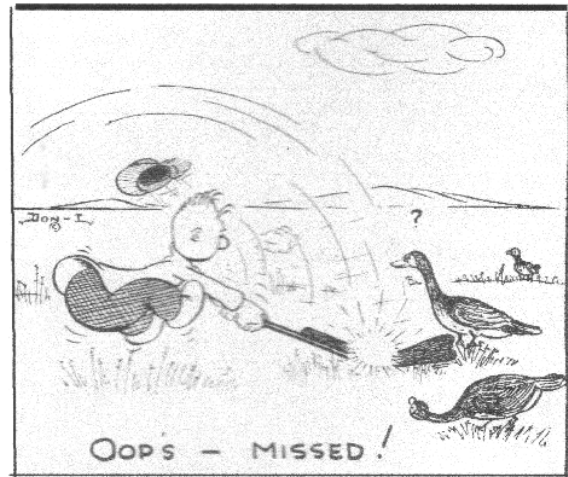
To my current knowledge there has not been major progress on passing congressional legislation to establish the Manhattan National Historical Park. We are aware that staff members have been communicating on how best to achieve its passage through both the House and Senate and then on to the President for signature. Rep. Doc Hastings says this legislation is high on his priority list of things he wishes to accomplish before he retires at the end of this session. At the reactor he said he may have a few "tricks up his sleeve" to get the Park Bill through Congress. Thanks, Doc!

Special 70th Anniversary of B Reactor Startup Edition

OOPS

One of those Gremlin Typos crept into our "Scram" article in the Summer *Moderator*. We credited Bob Whiteside with coming to Hanford in 1848. Since we all know that the Hanford Project was not a pre-Civil War project, the correct date should be 1948. Our apologies, but we were impressed with how many people brought the error to our attention—apparently somebody is reading this stuff.

Dupus Boomer—by Dick Donnell



"Goose Hunter"

Contributed by Connie Estep,

Membership Report

By Burt Pierard, Membership Chair

Our final 2014 membership count was 79 members (2 less than 2013) and one Organization—Los Alamos Historical Society. We Also had 38 Complimentary members.

As of October 1, the **Early 2015 Renewal Period is now OPEN** (any dues we receive are credited to CY2015). To send in your Renewal, the form is below to Clip or Print.

2015 Renewal and New Member Application

Name: _____ Date: _____

Address: _____ City: _____ State: _____ Zip: _____

Phone: (h): (____) _____ (w): (____) _____ MSIN address: _____
(current Hanford employees)

E-mail: _____

- Individual (\$20) or Senior (age 65+) or Student (\$10) and New or Renewal
- Organization (\$25 up to 100 members; please add \$10 for each additional 100 members)

For Organization Membership, Official Representative: _____

Additional tax deductible contribution: \$ _____ Total Enclosed: \$ _____
(Tax ID # 94-3142387) (Please make check out to BRMA)

Thank you; please mail this application with payment to: **B Reactor Museum Association**
PO Box 1531
Richland, WA 99352

Michael Mathias, Unable To Attend B Reactor Anniversary, Sends Letter Circulated To All Attendees

It is a pleasure to provide some comments on this noteworthy day celebrating the origins of the Hanford Project. My father, Franklin T. Matthias, became associated with the Manhattan Project as a result of his assignment with Leslie Groves during the building of the Pentagon in Washington. It was one of those life-changing circumstances for my father personally, and for the nation.

Much has been written and documented elsewhere about the urgency and magnitude of those efforts, at Hanford, Oak Ridge and Los Alamos. We now have the knowledge that those efforts would turn out successfully, that the war would end, that peace would ultimately prevail, and that America's enemies would be vanquished. It is worth remembering that none of these outcomes were known to the pioneers of the nuclear age. They had no precedent that would indicate success was assured.

They took risks, made decisions, and dealt with the consequences of those decisions. There was no guide, no history, no precedent upon which to rely. They used their judgment, made the best decisions they could with the available knowledge and information, and to some degree relied on luck. In the end, these massive efforts prevailed, their intentions became materialized, nuclear fission became controlled and utilized in weapons. They witnessed the beginning of an epoch.

I'm sure that there was very little time available in the course of a day, in those times, to consider these things, their historical significance, the enduring impact their efforts would have on civilization as a whole. No, they lived their lives in the details, encountering challenges, finding solutions, moving on to the next set of problems.

It is for us to reflect, to instill the enduring meaning to those times. It is our responsibility, as our nation has enjoyed the fruits associated with their efforts, to render an appropriate memorialization to their work. Instead of allowing these facilities to slip into history, it is much more appropriate to establish them as national assets, resources for future generations to learn from, to understand, and to move forward. If my father, and many of his colleagues, were here today they would attest to the significance of this achievement, they would speak humbly of their role, they would communicate the sense that they embarked on a great mission, not unlike the great explorers of an earlier age who set out not knowing what they might find, but overcoming fear of the unknown with the commitment to explore.

They would say they knew this was a very dangerous business and that the precautions they took were balanced by the urgency they felt. But to a man, I think they would say, "Do not let these matters be forgotten." In our time, in our way, we can also contribute to the grand events that the Manhattan Project ushered in. We can remember. We can make a commitment that what was built here will remain in the national consciousness, forever a reminder of the will of this nation to endure and of the absolutely American standard and refrain of "Can Do!"

Michael F. Matthias



Visitors complete paperwork prior to boarding tour buses at Richland Federal Building
Photo by Gary White



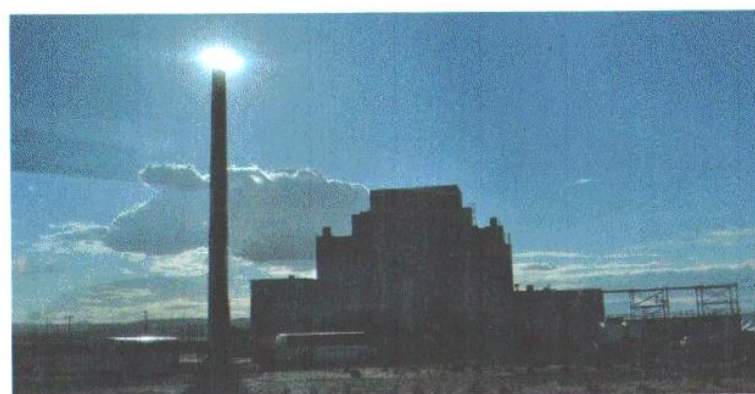
BRMA tour docents and Meistersingers rode out to B Reactor in a shared bus
Photo by Bob Horgos



Visitors arrive at B Reactor
Photo by Gary White



Visitors line up for food selections prepared by Atomic Ale Brewpub
Photo by Gary White



The sun lit up the B Reactor exhaust stack like a giant birthday candle
Photo by Gary White



Temporary pavilions provided shade from the sun and the locations for dispensing food and beverages
Photo by Gary White

A Day Of Celebration At National Historic Landmark

A coalition of DOE and community history leaders put on an impressive 70th Anniversary Celebration of the B Reactor Start-up on September 26, 2014, at the Reactor site.

More than 200 people loaded into 5 buses for a Docent narrated drive-by tour of the Hanford Site on the trip out to B Reactor. Upon arrival, visitors were treated to wine, beer and hors d'oeuvres catered by the Atomic Ale Brewpub, perhaps the first time that alcoholic beverages were legally consumed at Hanford since the taverns at Hanford Camp. The scene outside the Reactor building was set with 40s music playing (and sung by the Mastersingers) and historic images projected on the wall of the building.

Visitors then walked through the Reactor building to hear knowledgeable Hanford workers (mainly BRMA members) explain the operation of B Reactor and the various models and videos.

The formal program was kicked off with a Welcome from Colleen French, for the DOE, and followed with a Keynote Address by David Klaus, Deputy Under Secretary, DOE. Our

own Del Ballard, founding member of BRMA in the late 1980s, gave a moving rundown of BRMA's 20 plus years' battle, through the first breakthrough of getting B Reactor moved to the bottom of the list for "cocooning," BRMA's initiating the National Historic Landmark listing, and finally the National Park Service intervention. Most of the other officials and dignitaries who spoke echoed the accolades for BRMA's role in the preservation. One mentioned that B Reactor was under "a Death Sentence" when BRMA entered the picture.

A number of awards were presented by Colleen French to principal participants in the preservation, the first going to BRMA, accepted by Maynard Plahuta, President. In a surprise move, Del Ballard presented one of the awards to Colleen.

The 3-1/2 hour activity was wrapped up with a stirring rendition of "God Bless America" by the Master Singers (with a picture of the flag projected on the Reactor behind them) and the visitors all filed back to the buses for the ride back to town.



The front face of B Reactor invariably inspires awe in visitors. Several docents (in blue polo shirts) were on hand to explain the reactor's features and answer questions.

Photo by Bob Horgos



BRMA docent Gene Woodruff discusses reactor graphite with visitors
Photo by Bob Horgos

How Mysterious Was The “Mysterious Event”, Really?

By Burt Pierard, BRMA Historian

This article is the third in a continuing *Moderator* Investigative Series to correct the mostly anecdotal Historical Record of the Hanford Engineering Works portion of the Manhattan Project. Almost all the historical accounts (including the video shown at B Reactor) of the first B Reactor startup on Sep. 26, 1944, describe the ensuing shutdown, re-startup, and shutdown again (all on its own, on approximately 15 hour cycles), as baffling to the scientists, a so-called “Mysterious Event.” Not only are these accounts totally unsubstantiated by the facts, in actuality the scientists had predicted the possibility of such an outcome in September 1943, a full year before the startup. But I’m getting ahead of myself.

At this point, a slight digression to briefly examine the fission process will be helpful in understanding the story. Uranium normally and continually emits neutrons travelling at a high velocity. When a neutron is sufficiently slowed by a moderator, graphite in the case of B Reactor, and strikes a U-235 nucleus, it is absorbed and the nucleus becomes unstable. The nucleus then splits into two, somewhat random, elements and releases energy plus 2 or 3 high velocity neutrons (depending on which elements are produced) leading to the chain reaction. The new elements are called fission products or by-products and are highly radioactive (and neutron absorbing to varying extents).

My first hint that there was a different angle to the “baffling story” came from reviewing the 1992 BRMA Oral History VHS tape for Bill McCue, one of the original supervisors of the B Reactor Operators. On the evening of Sep. 27, McCue was on site at B Reactor when the power level started dropping and Control Rod removal was necessary to keep the reactor at full power. After the rods were fully withdrawn, the power level kept dropping until full shutdown. The major scientists and DuPont officials arrived and convened in the office off the Control Room to discuss the problem. McCue waited a short time until his supervisor came through the Control Room and he asked, “What did they decide (meaning what they had decided caused the problem)?” His supervisor replied, “Do you want to know what they’re doing in there? They’re making up a ‘pool’ on when the reactor is going to come back to life.” McCue explained that this indicated agree-

ment that the reactor had been “poisoned” by a neutron-absorbing fission product and the half-life decay time would indicate sufficient decay to allow startup.

The next item I found is essentially a Memorandum of Understanding between the Government, the University of Chicago, and DuPont concerning the Technical Basis for the Plutonium Production Process at Hanford, dated September 1943. This Memorandum was reprinted, in booklet form, by BRMA in the middle 1990s. Of particular interest is the memo’s prediction of radioactive by-products and their possible effects on the reactor operation and the solution. “As pile operations proceed there will be an increasing accumulation of ... radioactive by-products in the uranium in the pile. It is known that the by-products may affect the neutron chain reaction adversely Conceivably, the pile may be ‘poisoned’ by the by-products so rapidly as to delay or prevent ... or perhaps even to preclude the attainment of a Plutonium concentration sufficient for ... recovery. To obviate this, it is necessary to **provide excess reactivity in the pile** (emphasis added).”

The balance of this article is based on Richard Rhodes’ account of the Startup in “The Making Of The Atomic Bomb” and his citation of writings by Princeton theoretician John A. Wheeler. At about the time of the release of the Memorandum, John Wheeler, counselor to DuPont President Crawford Greenwalt on pile physics since DuPont first joined the project, was greatly concerned about fission product poisoning. He observed the pile design that was in progress (the massive wooden shield blocks that formed the front and rear faces of the pile had already been pressed and drilled



Physicist John Wheeler

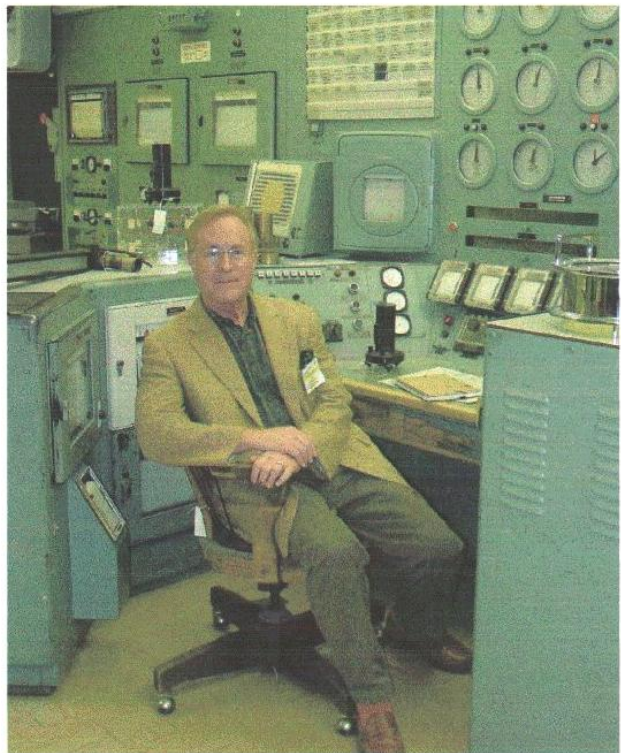
for 1500 tubes in a cylindrical pattern) left the four corners of the cube unused (for economy of design) and might not be adequate to overcome poisoning from known or previously, undetected by-products. He also determined that there was room in the corners of the cube to provide for 504 more tubes on the same 8-inch centers. That would require drilling out the shield blocks and redesigning the soon to be fabricated graphite blocks, which would delay construction and add millions to the cost. Wheeler convinced DuPont to seek approval from Leslie Groves for the re-design. There are many anecdotal accounts of Groves's initial reaction which was predictably negative. When he was presented with the prospect that this issue could completely destroy the whole Hanford Project and who would be blamed, he quickly agreed.

All this background explains Enrico Fermi's initial reaction upon returning to B Reactor on the 27th after the first shutdown. He patiently listened to the engineers speculating about a broken tube or Boron contamination of the water, etc. He felt that the seemingly straight line failure on the charts might be hiding a shallow curve of an exponential decline in reactivity which would mean a fission product, undetected in previous piles, was poisoning the reaction. Thus, the only "mystery" was what fission product was the culprit.

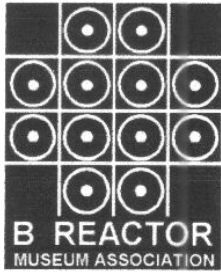
As we have seen, Wheeler was worried about fission product poisons for about a year. When the reactor came back to life on the 28th, ran for about 12 hours and began to decline, Wheeler studied the chart closely. He was convinced that the problem was a compound "mother-daughter" fission product decay. A non-threatening fission product (the mother) decays into a highly poisonous element (the daughter) which in turn decays over time into an inert element. Fermi left and Wheeler worked on the charts through the night. By the morning of the 29th, he had determined that he needed two elements whose half-lives totaled about 15 hours. He then determined that the mother had to be Iodine (6.68 hr.) and the daughter was the previously undetected Xenon (9.13 hr.). Fermi arrived with detailed reactivity data and confirmed his conclusions. As an aside, Fermi then calculated the neutron absorbing cross-section of Xenon and found it to be roughly 150

times the most absorptive nucleus previously known (Cadmium). Later that day, Greenwalt contacted the Argonne Lab in Chicago with the bad news. Walter Zinn, one of the lead designers and constructors for CP-1 and the other test piles at Argonne, was skeptical but he fired up the CP-3 heavy-water test reactor and ran it at full power (100 KW) for 12 hours (it had never been run that long at full power). He found the Xenon effect. Laborious calculations at Hanford over the next three days confirmed it. More reactor reactivity was required (as predicted in the Memorandum of Understanding).

It took about three months to rebuild the front and rear face water piping systems, install the additional 504 process tubes, and load with uranium. According to Harold Heacock, Hanford veteran and Reactor Water Systems authority, DuPont engineers had designed a very conservative water system so new pumps were not required for the 33% increase in tube loading. B Reactor went critical on December 28, 1944.



Richard Rhodes in B Reactor control room, April 2004



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Progress Report From National Parks Conservation Association

In the 1940s, under a veil of secrecy, America led the world into the Atomic Age. *Hanford. Los Alamos. Oak Ridge.* These places still figure prominently in our country's science and technology legacy. Together, these sites tell the story of the building of the first atomic bomb and the extraordinary consequences the Manhattan Project had on twentieth-century history.

Now we have an opportunity to preserve that history and make those stories available for generations to come through a new Manhattan Project National Historical Park. We believe that this national park site will allow visitors to consider the project's many ethical, cultural, and scientific implications. This is not a park to celebrate the creation of atomic weapons, as some detractors fear, but to put into context the impacts, both positive and negative, that resulted from splitting the atom. But time is running short for Congress to act.

Through legislation introduced by Senator Maria Cantwell and cosponsored by Senator Patty Murray, the National Park Service, considered our nation's greatest storyteller, now has the opportunity to preserve places of

importance and interpret and facilitate discussion surrounding the complex stories of the Manhattan Project. If passed, Manhattan Project National Historical Park sites would be designated in Richland (formerly Hanford), Washington; Los Alamos, New Mexico; and Oak Ridge, Tennessee.

The National Park Service would not celebrate the atomic bomb, but interpret the complex history of the Manhattan Project and the ways atomic power and nuclear technology continue to impact our society. A new national park would also share the stories behind the many people involved, including mastermind scientists such as J. Robert Oppenheimer and Maria Goeppert Mayer, as well as the thousands of women who were empowered to join the workforce.

Legislation has already passed in the House of Representatives, and is being considered in the Senate. Positive action there on the Manhattan Project National Historical Park Act would help preserve and share more of America's stories.