The
MODERATOR
B REACTOR MUSEUM ASSOCIATION

Winter Quarter 1992-93

Message from the President

This message, my first as the new president of BRMA, provides an opportunity to greet all who are interested in preserving the historic B Reactor and its legacy. Greetings, in particular, to new readers at our sister sites, where the 50th anniversary of the first scale-up of the Chicago pile to a functioning reactor also has special meaning. The goal of the B Reactor Museum Association (BRMA) is to make available to posterity the fascinating story of B Reactor's conception, construction and operation and its role in shaping the world during the past 50 years.

In assuming the presidency at the start of this historic year, I inherit a wealth of ideas from past president Don Sandberg and other members of the organization, ideas that form the foundation for coordinating BRMA's goals with the other celebrations of the Hanford Site 50th Anniversary. Don continues to provide assistance, energy, and enthusiasm as BRMA becomes a driving force behind several celebration activities.

The first of these activities is the presentation to the Department of Energy of the American Nuclear Society's Nuclear Historic Landmark award for B Reactor. This event is described by Wanda Munn elsewhere in this newsletter. BRMA is currently active in finding guides for the bus tours, enlisting former B Reactor insiders for the in-reactor presentations and creating displays.

Another project, in cooperation with the City of Richland, may be an Interpretive Center that will include material related to the B Reactor era and encompassing much of the history of the Hanford Site. This is envisioned as part of the "Living Legacy Project" of the City of Richland. Monuments by acclaimed northwest sculptor Jim Acord will be featured in both the Living Legacy and the ANS Nuclear Landmark presentation.

Few of us have more than one opportunity in a lifetime to support a unique project of this magnitude; for this reason, if you would like to participate or have comments or suggestions for either these or possible other BRMA projects, please call 967-3924!

Your financial support is especially encouraged. Please send your checks to the B Reactor Museum Association at P.O. Box 1531, Richland, WA 99352.

Our meetings are held on the second Monday of each month, usually at the Richland Public Library at 4:45 p.m. Membership is available at $20 per year, but you do not have to be a member to attend.

Please join us for an exciting and challenging year!

- *Fran Berting, President*

Making History and Preserving It at B Reactor

This is the second part of a two-part article. The first installment explained why B Reactor is scientifically and historically important; this piece tells the story of how it came to be.

In 1939, it became apparent that atomic fission had great civilian and military potential. On December 2, 1942, Enrico Fermi had demonstrated, using a small experimental reactor, that plutonium could be created by a controlled, self-sustaining nuclear reaction. In January 1943, before the completion of a pilot air-cooled graphite reactor at Oak Ridge, Tennessee, the Hanford area was chosen as the site for reactors and chemical separation facilities needed to produce enough plutonium for military weapons. E. I. du Pont de Nemours was the major contractor for the detailed design and construction of these facilities. Based on Fermi's experimental design, plans for large-scale reactors were quickly developed, and work on the B Reactor commenced at Hanford in the summer of 1943. Some 95,000 workers were recruited from defense contractors throughout the nation.

The reactor building, consisting of 390 tons of structural steel, 17,400 cubic yards of concrete, 50,000 concrete blocks, and 71,000 concrete bricks, was completed in six months. The reactor pile, measuring 37 x 46 x 41 feet high, consists of an interior cube of graphite blocks sitting on a 23-foot-deep solid concrete base surrounded by laminated walls of steel and masonite. A cast iron thermal shield encapsulates the laminated walls, and these, in turn, are enclosed in a 3- to 5-foot-thick concrete exterior. Construction tolerances of the pile ranged from +/- 0.005 inches to +0.003 and -0.000 inches.

The original design included 1,500 horizontal aluminum tubes, approximately 1-1/2 inches in diameter, for fuel assemblies. An additional 208 horizontal holes were drilled into the graphite core to accommodate cooling water pipes. Also installed were 38 vertical holes for safety rods, of which only 27 were used, and nine horizontal holes for water-cooled control rods.

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On Tuesday evening, September 4, 1944, just 13 months after construction began, all 1,500 fuel tubes had been loaded. A few minutes past midnight on September 5, 1944, the world's first full-scale plutonium producing reactor reached criticality. By 2:00 a.m. that morning, a level of power was reached that was higher than any previous chain reaction had achieved. According to Richard Rhodes (*The Making of the Atomic Bomb*), the next hour was uneventful. Then, engineers began urgently whispering to each other as it was noted that reactivity was declining and control rod adjustments needed to be made. Even with the control rods completely withdrawn, power could not be maintained and by Wednesday evening the pile was "dead."

According to Rhodes' account, John Wheeler, an associate of Fermi, had been concerned with fission poisoning for months. He had correctly suspected that a non-neutron absorbing mother fission product of some hours' half-life could decay to a daughter product that would absorb neutrons. As the mother product decays to the daughter product and the volume of the daughter product increases, neutron absorption increases until the power curve of the pile declines to zero. Then as the daughter product decays, too little of the product is left to inhibit a chain reaction and the pile begins to become operational again. This is exactly what had occurred at B Reactor.

That evening, Wheeler quickly calculated the half-lives of numerous products that would cause such a problem. Eventually, he determined that iodine-135, with a half-life of 6.68 hours, was the mother product. In turn, iodine-135 decayed to xenon-135, with a half-life of 9.13 hours. Wheeler also noted that xenon-135 had a cross section of absorption 150 times greater than most absorptive nuclei previously known. This isotope acted as an additional unwanted control rod. To override its effects, more reactivity was needed. To produce more reactivity would require more fuel rods.

If the B Reactor and its sister, D Reactor, had been built to their original specifications, both would have had to be completely rebuilt. Wheeler, however, had convinced du Pont that the four corners of the original circular fuel rod configuration could accommodate another 504 fuel rods; 126 in each corner. The addition of these rods, even though they were not connected to a water supply, delayed construction and cost millions of additional dollars. In retrospect, Wheeler's perseverance paid off.

On December 28, 1944, with 2,004 fuel rods loaded, B Reactor again reached operational goals. Nine days earlier, D Reactor, which had not yet been completed when B Reactor originally went on-line, had also reached criticality after going operational with 2,004 loaded fuel rods. Plutonium production in quantity had finally begun. The product produced by the B Reactor, along with its sister reactor at Hanford, was detonated at the Trinity Site, New Mexico, ushering in the atomic age.

(For further information, see Richard Rhodes, *The Making of the Atomic Bomb*, Simon and Schuster, New York, 1986; and S. L. Sanger with Robert W. Mull, *Hanford and the Bomb: An Oral History of World War II*, Living History Press, Seattle, 1989.)

- *Charles Pasternak*

Hanford's 50th Anniversary Shifts into High Gear

Throughout most of 1993 and 1994, the Hanford community will be celebrating a series of milestones marking 50 years since the remarkable events at the Hanford Works that changed the world forever. Two of the kickoff events are coming up VERY soon, so mark your calendars and encourage your colleagues and neighbors to join the action.

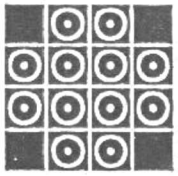
February 4 through 27

Yes, In My Back Yard?

YIMBY is a multi-media, interdisciplinary exhibition that will explore contemporary myths and realities of Hanford. In addition to the display, which will include the works of 15 visual and video artists, there will also be participation by 15 nuclear technical, advocacy, regulatory, and activist groups. It is the first event of a three-year art program, Nuclear Fieldwork, which will include a regional resource exhibition, artists' Tri-City residencies and forums, and a national (tentatively international) touring exhibition.

This truly unique exhibit will be on display at the Allied Arts Gallery. Allied Arts Gallery is located at 89 Lee Blvd in Richland.

For more information or to volunteer assistance, phone the curator, Helen Slade, at (206)443-2273.



Saturday, March 13

That's the date when national American Nuclear Society President David Rossin will be presenting the **Nuclear Historic Landmark** award plaque for the **B Reactor** to the U.S, Department of Energy. The day will include a ceremony at John Dam Plaza beginning at noon, with brief comments from several people you will really want to meet and greet. Buses will then take you out to the B Reactor, where the plaque will be officially presented, and tours of the facility will be available. You won't want to miss this event!

For more information, to help with logistics, or to volunteer as one of the required badged escorts aboard the buses, call Wanda Munn at 376-4953.

B Reactor Museum Association

Renewal and New Member Application

I want to help preserve the history of B Reactor. Below is my application with payment for annual membership in the B Reactor Museum Association.

❑ New ❑ Renewal

Name: _____ Date: _____

Address: _____ Zip: _____ MSIN: _____

Phone, (H): (___) _____ (W): (___) _____

❑ Individual ($20) ❑ Senior/Student ($10) ❑ Group ($25+$10 for every 100 members over 100)

Official Group Representative: _____

Tax deductible contribution: $ _____ (ID #94-3142387)

(Please make checks payable to BRMA)

The "Three Faces of Richland": A Hanford 50th Anniversary Project

In Richland a case of community amnesia is developing. The collective memory of what has happened here and of the turn-of-the-century town that once existed has been rapidly disappearing. That we are even starting to forget the government town of the 1940s is evident when people ask, "What was the Manhattan Project?" or "Who Is Colonel Matthias?"

The "Three Faces of Richland" project is doing more than recalling our history - it is recovering our fragmented heritage through research and the collecting of old photographs, artifacts, and memorabilia. Eric Taylor, a top northwest museum exhibit designer, is helping us turn the results of this project into a blockbuster show to be featured at Allied Arts Gallery, June 6 through July 31, 1993. The project, including the development of this exhibit, has been funded by a major grant from the Washington Commission for the Humanities and donations from our community.

Richland has a unique history with world significance and a stunning setting on the Columbia River. It is a town that is the result of tumultuous events - it didn't grow and evolve in a natural way. What happened here, our community heritage, has changed the world. The historical elements of a town act as an accumulator of its energy, with the past alive as a part of the present in the life of a city. The history draws people in and the Three Faces of Richland project is "discovering" and documenting a dynamic and vital Richland. The key result of this project is the "Three Faces" exhibit of Richland's history.

- The first FACE includes Native Americans, explorers, missionaries, and the early cattle and horse ranchers in this area up to 1905.
- The second FACE highlights the people who came to the original town of Richland between 1905 and 1943 because of irrigated land promotion.
- The third FACE shows the abrupt change that forced the old town and Columbia River farmers to be displaced by the "atomic boomers" and a Manhattan Project company town–all cloaked in the secrecy of its mission to end World War II. Also shown is the change from this government town to the "City of Richland" in 1958.

The exhibit is designed for travel to other sites. Ultimately, it is hoped that this will become a central feature in the "Lasting Legacy" facility now being planned by the City of Richland.

In addition to this significant exhibit at the Allied Arts gallery, there will be a series of lectures and programs by regional scholars on various facets of the project. The first of these is on May 6 (at the Battelle Auditorium at 7:30 pm) when Dr. Henry Matthews, Professor of Architecture at Washington State University, will speak on G.A. Pehrson, the architect of government Richland and the government houses.

The Three Faces of Richland project is sponsored by the East Benton County Historical Society and Allied Arts Association. To get involved or for more information, contact the project coordinator, Sandy Rathbun, at (509)946-0811.

- Sandy Rathbun

The B Reactor Museum Association
P.O. Box 1531
Richland, Washington
99352

Supporting the
50th Anniversary
Commemoration of the
Manhattan Project
1943-1993

Reactor Facts

Next time you despair at the length of your shopping list or the total at the cash register, keep in mind what it must have been like for the buyers at the Hanford Site during the Manhattan Project! The information to the right was included in the Completion Report for the Hanford Engineer Works; listed are the approximate quantities of furnishings for the barracks at the construction camp.

- Greg Greger

Article	Amount
Ash Trays	34,206
Blankets	139,063
Box Springs	5,747
Chairs (straight-back)	37,689
Chest of Drawers	19,519
Cots (metal)	40,036
Davenports	610
Electric Irons	510
Innerspring Mattresses	5,890
Ironing Boards	572
Ironing Board Pads and Covers	702
Mattresses	44,503
Mattress Pads	2,587
Mirrors	6,702
Pillows	51,485
Pillow Cases	242,394
Sheets	356,317
Special Wardrobe Lockers (hutments)	10,150
Writing Tables	14,706
Wash Boards	379
Wooden Beds	6,219

The Termination Winds

The work proceeded slowly, dogged by recruiting problems. The nation at war had moved beyond full employment to severe labor shortages and men and women willing to camp out on godforsaken scrubland far from any major city were hard to find. Frequent sandstorms plagued the area, writes Leona Woods, now Leona Marshall after marrying fellow physicist John Marshall of Fermi's staff. "Local storms were caused by tearing up the desert floor for roads, and construction sites were suffocating. Wind-blown sand covered faces, hair, and hands and got into eyes and teeth.... After each storm, the number of people quitting might be as much as twice the average. When the storms were at their worst, buses and other traffic came to a stop until the roads were visible through the grey-black clouds of dust." Stoics who stayed on called the dust "termination powder."

- Richard Rhodes, The Making of the Atomic Bomb

The people were met at the train, fed and put up temporarily and sent out to Hanford by bus. A lot of them would get off the bus, stand around for a while, see a dust storm coming and get on the next bus back to Pasco. They never even stayed overnight, a lot of them...

I remember my boss came in one day and he said, "Well, Rob, we got two people on the rolls today. We hired 650 and 648 quit." The reasons for quitting were isolation, dust and no place to live. For a while, we couldn't hire enough carpenters to build barracks. We got over that hurdle and made progress, and eventually I made 145,000 ID photos. We used to have a saying, if you quit Hanford and joined the Army, you were a coward.

Robley L. Johnson, quoted in S.L. Sanger's Hanford and the Bomb