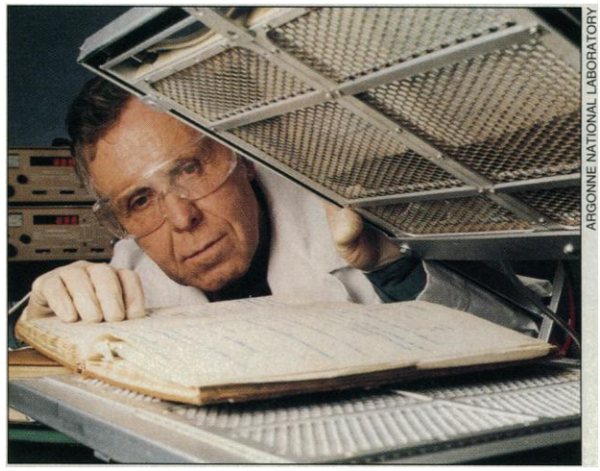
DOE Finds Physics Archives May Be Too Hot to Handle

University of Illinois physicist Albert Wattenberg didn't go to the Chicago branch of the National Archives last year looking for trouble. But when he could barely lift an 8-inch metal rod from a box containing artifacts used by nuclear physicist Enrico Fermi and his colleagues to build a nuclear pile under the University of Chicago's football stadium, he knew something was wrong. "There's only one metal that heavy," says Wattenberg, who was part of Fermi's team in the 1940s. "It was obviously uranium."

Wattenberg had literally put his fingers on a half-century of carelessness in preserving the beginnings of the nation's nuclear history. Thousands of artifacts contaminated by radionuclides during the testing and production of nuclear materials—laboratory notebooks, classified documents, components from experiments, and the like—were being stored along with nonradioactive material in files open to public inspection. Although the health hazards associated with these materials are small—the radiation levels pose "a public-relations risk, not a health risk," says Mary Ann Wallace, director of the records management division at the Department of Energy (DOE)—the contamination is presenting DOE and the National Archives with a major cleanup problem.



ARGONNE NATIONAL LABORATORY

No waffling. David Jones uses Argonne's "waffle iron" to check a lab notebook for possible contamination.

The uranium rod Wattenberg found emits about 10 milli-rem per hour at 3 cm. That's some 240 times the average background radiation level, but it represents no real danger to those exposed for a brief time. Even so, when Wattenberg told Archives officials about the rod, they quickly returned it to the Argonne National Laboratory and began looking for other radioactive records and artifacts. Their efforts uncovered hundreds of laboratory notebooks and other records at several DOE labs that appear to be contaminated with radioactive material. Some of the contaminated material even made it to the nation's capital, where last year staff at the National Archives found vials of radioactive chemicals dating from the Manhattan Project and some World War I-era objects painted with radium.

Most of the contaminated material dates from the 1940s, 1950s, and early 1960s, when, Wattenberg says, it was not uncommon for researchers to handle a variety of radioactive materials, including plutonium. Radioactive dust from their hands might then be transferred onto notebook covers and pages. Tight security forced Manhattan Project scientists to carry their notebooks with them, compounding the problem.

In other laboratories, accelerator physicists often attached radioactive targets—typically, metal disks through which particle beams have passed—to the notebooks in which they recorded the details of their experiments. Those radioactive materials and equipment were at times then combined with normal gear and transferred to archival storage. George Mosho, a health physicist at Argonne, remembers noticing one smear on a page of an old notebook headed for the public archives. "It looked funny, so we sent it out to be analyzed," he recalls. "It turned out to be some of the first plutonium-239 ever made."

Nuclear production and disposal facilities—such as the Fernald Plant in Ohio and the Hanford nuclear reservation in Washington state—have the greatest number of contaminated records, says Wallace. But the problem—amounting to at least 1800 cubic feet of contaminated material, according to a preliminary DOE estimate—also extends to basic research facilities such as DOE's Lawrence Berkeley and Brookhaven Laboratories, and even the Truman and Eisenhower presidential libraries, which have on display slightly radioactive artifacts from the Manhattan Project.

Berkeley, which has had accelerators ever since Ernest Lawrence built a 4-inch cyclotron in 1929, has an aggressive program to identify and reduce risks to archivists from radioactive accelerator targets and chemicals. On one occasion, says archivist Lori Hefner, archive staff were forced to undergo medical tests "to see what we had ingested" after coming in contact with a box of radioactive sources used for calibrating instruments. The tests revealed no problems, but the staff now wears dosimeters and takes precautions whenever working with old records. New lab rules also require records to be tested for radioactivity before they can be taken from an accelerator area.

Two days after being told about radioactive records in the National Archives, health physics specialists at Argonne had already cobbled together a machine to scan notebooks. Called the "waffle iron" for its resemblance to the kitchen appliance, the machine records the radiation level of a notebook by pressing it between two detector plates. But working with the machine is tedious: It takes 6 seconds to examine each spread of two pages. A team of six health physics technicians spent 2 months examining some 1500 notebooks at the Chicago Archives before concluding that one-third were contaminated. So Mosho is looking for a more automated method: "We're thinking about ripping the guts out of an old Xerox machine and converting that," he says.

The usual process for preserving important radioactive records is to make microfilm copies for public use and to discard the contaminated originals as radioactive waste. Archivists at Hanford, for example, use microfilm to avoid having to scan more than a million potentially contaminated records of chemical analysis of radioactive samples. Technicians in radiation suits use a microfilm camera in a radiation zone to convert boxes of potentially contaminated records into rolls of film for public archives.

But most archivists at DOE's basic research labs don't face such serious problems and feel that they can avoid health risks by taking a few simple precautions. "If I'm going to be looking at old records, I'll wear gloves," says Argonne archivist Mary Haider. "But I'm not afraid."

This month DOE and the National Archives hope to convene a task force to conduct a thorough inventory and to study how to dispose of contaminated files without historical importance, how to isolate contaminated records, and how to decontaminate or otherwise preserve important records. While the task force is expected to weigh the historical value of preserving particular documents against the potential health risks of working with them, there is already a consensus on one point: Nobody should be able to reach into a box of historical records and pull out a uranium rod.

–Christopher Anderson