

# The Bomb's Chicago fallout

## U.S. says '40s research put thousands at high risk

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TRIBUNE STAFF WRITERS



**Herbert Anderson** was a major figure in the race for the atomic bomb, a pioneering physicist who made history at the University of Chicago in 1942 when he helped create the world's first controlled nuclear chain reaction.

But Anderson paid a heavy price for such achievements.

He contracted a rare lung disease from handling beryllium, an extraordinarily toxic metal critical to nuclear weapons production. Before he died, his lungs were so damaged he couldn't breathe without an oxygen tank, and his bones were so brittle he once broke two fingers just by shaking someone's hand.

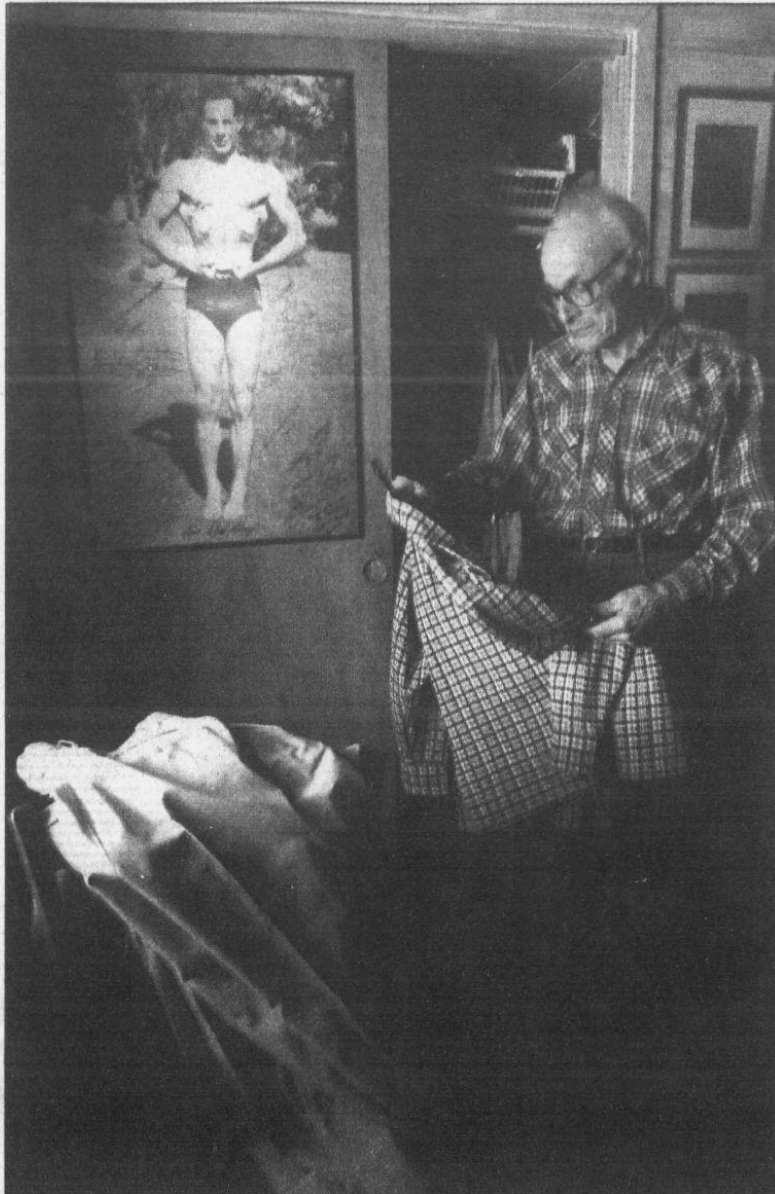
Now, more than a half-century after the dawn of the nuclear age, America is beginning to get a glimpse of how thousands of scientists and ordinary laborers—many in the Chicago area—may have risked their lives to develop and build the country's nuclear arsenal.

In an unprecedented move, the federal government last month released a list of 317 mills, factories and research institutions that it believes may have exposed workers to toxic and radioactive materials during nuclear weapons production or in work for the Department of Energy.

Fifteen sites are in Chicago—more than any other U.S. city—and a total of 24 are in the Chicago area. They range from the secret wartime headquarters of atomic bomb research at the U. of C. to factories, machine shops and storage sites far beyond the university gates.

At a West Chicago factory thousands of workers breathed air laced with the radioactive metal thorium; at the Museum of Science and Industry, radioactive materials were stored—and spilled—in the early years of the Cold War; and at the U. of C., at least 10 workers became sick after being exposed to beryllium at a clandestine lab code-named Site B.

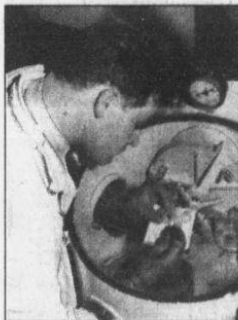
"There's been so much secrecy and denial in the history of the nuclear weapons complex that just getting this information out is of his-



Tribune photo by John Kringas

Larry Kelman, 81, who has beryllium disease, sorts through clothes that no longer fit him. On the wall is a picture of him at 23, around the time he joined the Manhattan Project.

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Tribune file photo

A worker at the Metallurgical Laboratory at the University of Chicago in 1946.

### Health risks of elements used in nuclear weapons research

Several Chicago-area facilities handled these hazardous materials during World War II and the decades that followed:

#### BERYLLIUM

Beryllium is an extremely lightweight metal that is six times stiffer than steel. It often is used in industrial manufacturing, especially in aerospace and defense, and also in nuclear reactors. It is very brittle, and its dust and fumes are toxic.

#### Effects of exposure

Even tiny amounts can cause chronic beryllium disease, a treatable but often fatal lung condition. Beryllium also can affect the liver, kidneys and heart. Symptoms might not appear for years after exposure.

#### URANIUM

Uranium, a radioactive metal, is the main fuel for nuclear reactors and the principal building block in nuclear weapons. Many minerals contain uranium; it is converted to metal by chemical processing.

#### Effects of exposure

Uranium poses increased risk of lung and bone cancers if it is inhaled or ingested. It is toxic at high concentrations and can damage the kidneys and other organs. Studies suggest it might also affect reproduction.

#### THORIUM

Thorium, a natural ore mined from the Earth's crust, is a radioactive, crystalline powder. It is valued as a fuel for nuclear reactors, where it can be converted to uranium.

#### Effects of exposure

Radioactive materials can damage DNA in cells, increasing the risk of some cancers. Thorium has been linked with an increase in liver cancer and leukemia.

Source: U.S. Department of Energy, Concise Encyclopedia of Science and Technology, Institute for Energy and Environmental Research

Despite tests (left) for radioactive contamination, more than 8,000 workers nationwide may have been harmed in nuclear weapons research in the 1940s.

# Developing nuclear arsenal put thousands of lives at risk

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toric importance," said David Michaels, who was the Energy Department's top health official in the Clinton administration. The government estimates that more than 8,000 workers nationwide may have been harmed. But no one knows every facility where workers were injured or how serious the hazards were.

While nuclear weapons-related work continues in other parts of the nation, Chicago's ties to the industry have dropped. In fact, few Chicago-area companies on the government's nuclear weapons list were involved after 1960, and about half no longer exist.

At some sites, it appears the risks were slight. Government records indicate that relatively little radioactive material was stored at the Museum of Science and Industry, and two radiological surveys have revealed no lasting contamination.

But the dangerous work done at other facilities offers ample reason for concern. At least two scientists, including Anderson, died of beryllium disease after doing wartime research at the U. of C.

The government really ruined the lives of many people," said Larry Kelman, 81, a Naperville resident who developed beryllium disease after working at Site B.

## Groundbreaking effort

For decades the federal government denied that workers were being harmed by nuclear weapons production. But in 1996, the government admitted for the first time that weapons work had caused illnesses, and Congress approved a program to provide victims with government-paid medical care plus \$150,000 in compensation. The recently released list of weapons-related sites is the latest step in that groundbreaking effort.

Taken together with other government documents and interviews, the list opens a window on Chicago's historic role in the nuclear weapons industry and hints at the hazards that faced thousands of area workers, including machinists, welders, millwrights and engineers.

Their work was ordinary—grinding, sawing, sanding—but the use of exotic metals such as uranium and beryllium was not.

"Nuclear weapons production is largely this industrial process that looks like a lot of other industrial processes—it just uses some really weird materials," said Josh Silverman, a research analyst and historian for the Energy Department and an expert on nuclear weapons production.

Silverman said the main reason Chicago had so many firms doing weapons work was the proximity of the U. of C., where researchers with the top-secret Manhattan Project led the nation's World War II effort to build an atomic bomb.

According to press accounts at the time, 5,000 scientists helped develop the bomb at the university; another 3,000 local skilled and unskilled workers pitched in.

## Risks of beryllium

To make the government's weapons list, a facility had to handle beryllium or a radioactive material such as uranium only once in the course of nuclear weapons production or in work for the Energy Department.

Beryllium is the hazard that researchers can most easily tie to weapons production. More than 300 people have contracted beryllium disease at facilities doing weapons work, government and industry documents show.

Lighter than aluminum but stiffer than steel, beryllium is used to amplify the chain reaction in a nuclear bomb. In bulk form the metal is relatively harmless. But when workers grind, sand or cut it and inhale the resulting dust, they can develop an incurable disease that slowly eats away at their lungs. A third die of the illness, a third become disabled and a third remain relatively healthy, doctors say.

Back in the mid-1940s, researchers knew beryllium dust was deadly, but they did not fully understand that microscopic particles could be harmful or that workers could become sick years after their last exposure. Consequently, few Manhat-

tan Project workers wore respirators—a common safeguard today.

One scientist who worked with beryllium was Anderson, who did wartime research involving the metal at Columbia University in New York and at the U. of C. In 1942, he and about 40 other scientists, including Nobel Prize winner Enrico Fermi, gathered at a makeshift laboratory at the U. of C.'s Stagg athletic field and produced the first self-sustained nuclear chain reaction. The event helped usher in the nuclear age and paved the way for a vast nuclear weapons industry.

Anderson's widow, Betsy, recalled how her husband used a mortar and pestle to grind beryllium like flour. "He would just sort of grind it up by hand and be breathing the dust," she said.

It wasn't until 1948 that Anderson noticed he was losing weight and becoming easily winded. At 34 years old, he was told he had beryllium disease. Steroids stabilized his condition, and he went on to enjoy a long career as a researcher and U. of C. physics professor. But in his final few years, his lungs deteriorated to the point where he needed to carry a portable oxygen tank wherever he went. Side effects from the steroids made his bones as fragile as glass.

"He began to break ribs when he coughed badly," said his wife, a retired physics research technician in Santa Fe. "One time someone shook his hand and broke a couple of his fingers." He died in 1988 at age 74.

"The last year before his death, he was never getting enough air. It was this very labored gasping," his wife said. "It was a lot like strangling slowly."

Lower-profile workers faced similar risks—and harm.

Kelman joined the Manhattan

C, alleging that he was not warned of beryllium's dangers and that his condition was not detected earlier.

But a judge threw out the suit, ruling Kelman did not demonstrate enough evidence of wrongdoing for the court to allow the case to go to trial. Kelman did receive \$15,000 in a worker's compensation settlement and about \$45,000 in medical expenses, according to the university.

At least 10 workers developed beryllium disease after working at Site B, Argonne reports. But Argonne, citing state laws governing the privacy of medical records, would not release the names of the victims or details of their illnesses.

Kelman, who retired from Argonne in 1989 as a senior metallurgist, acknowledged he is lucky. He shows few visible signs of beryllium disease and still drives, gardens and travels with his wife—even shovels snow.

But he said he has a bad cough and has lived for years with the knowledge that he has a potentially fatal disease. "It's there and it will always be there," he said.

Site B no longer poses a health problem. It was torn down more than 25 years ago, and "all underground piping and structure removed to a minimum depth of 4 feet," an Energy Department document states.

## Exposed to thorium

Beryllium is not the only potentially hazardous material that qualified facilities for the government list. For decades, a West Chicago plant originally owned by Lindsay Light and Chemical Co. exposed thousands of workers and West Chicago residents to thorium, a radioactive element that helps fuel nuclear reactors and nuclear bombs.

Use of the metal was a closely guarded secret. During World War II, it even carried a code name, "Penbarmitte."

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Only after the plant closed in 1973 did federal officials discover the extent of medical and environmental effects from the operation.

A 1980 study of more than 3,000 workers at the plant found a somewhat elevated rates of death from cancer, especially lung cancer. Argonne researcher Andrew Stehney also examined autopsy results of former plant workers. One 28-year-old veteran of the facility had thorium concentrations 6,000 times higher than normal in his lungs and lymph nodes. The man had died of pancreatic cancer.

Waste and leftover thorium ore from the plant had been created a health hazard that still affects local residents. Operating at a time before stringent regulation of radioactive materials, the plant trucked the sandy thorium waste to ordinary dumps or let people take it away for use as landfill.

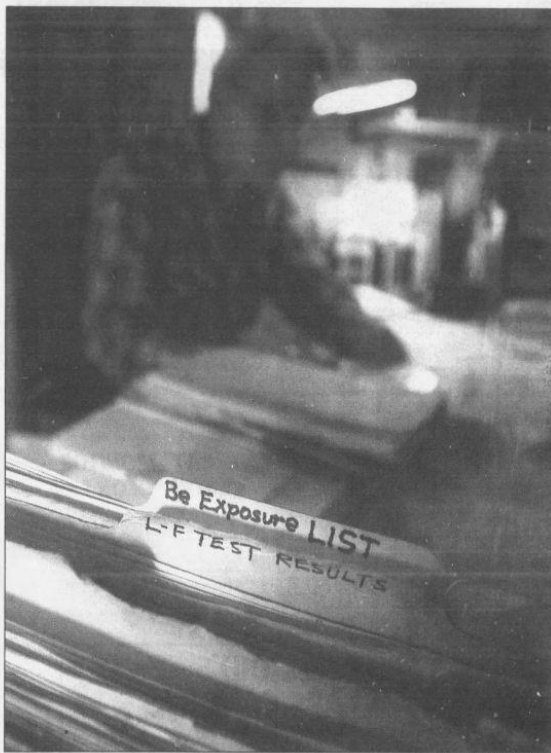
More than 600 homes near the plant have been targeted for clean-up since the mid-1990s, said officials at Kerr-McGee Chemical LLC, which bought the West Chicago plant in 1987. At last count, Kerr-McGee had shipped nearly 1 million tons of contaminated soil from West Chicago to a dump in Utah.

## Others on the list

At other area weapons-related sites, the record on potential health risks is less clear.

In 1943 FaNSTeel Metallurgical Corp. of North Chicago obtained a \$44,200 contract to provide 720 beryllium bricks to the Manhattan Project. Government officials said FaNSTeel was still processing beryllium in 1943, but no one knows how long the work continued.

Michael Moczniak, vice president and general counsel for FaNSTeel, said he had not known the company had ever done work with the highly hazardous metal. The company has changed locations since the war, and Moczniak said he does not know where the beryllium processing was done or what the building might be used for now. At the Museum of Science and In-



Larry Kelman of Naperville looks through files he has kept on beryllium disease. He sued the University of Chicago over his exposure to beryllium. The suit was thrown out, but he did receive a settlement.

## Area facilities associated with nuclear weapons work or energy research

The U.S. Department of Energy has identified the following facilities as having handled beryllium or radioactive materials at least once over the last 60 years in the course of nuclear weapons production or in work for the department.

- Argonne National Laboratory (near Lemont)**  
 Created in 1946, Argonne is the civilian successor to the University of Chicago's Metallurgical Laboratory and Manhattan Project operation. After the war, work at Argonne shifted from weapons development to nuclear energy, but workers still handled radioactive materials and hazardous beryllium.
- Armour Research Foundation (Chicago)**  
 Operated a research reactor for the Atomic Energy Commission. Government records indicate the group may have been investigating chemical properties of uranium. The foundation had government contracts at least in the 1940s through '50s.
- Bloekman Chemical Co. (Joliet)**  
 Produced byproduct uranium from phosphate rock. Records show work lasted at least from 1954 to 1956.
- C-B Tool Products Co. (Chicago)**  
 Subcontracted work for the Manhattan Project at U. of C. in 1944. Government officials believe the work may have involved machining of uranium.
- Crane Co. (Chicago)**  
 Records show that in the late 1940s the company tested designs for valves, probably for use with radioactive material reactors. May also have worked for nuclear weapons industry in the 1950s and 1960s.
- ERA Tool and Engineering Co. (Chicago)**  
 From February to June 1944, ERA subcontracted to provide "supplies and services" to the U. of C. Metallurgical Laboratory. No further details available.
- FaNSTeel Metallurgical Corp. (North Chicago)**  
 Contracted in 1943 to make 720 bricks of beryllium for the Manhattan Project. Records indicate the work lasted at least until 1944.
- Fermi National Accelerator Laboratory (Batavia)**  
 Never involved in nuclear weapons work since its creation in 1968. The Department of Energy included Fermilab on its list because it is a DOE facility where workers handle beryllium and radioactive material.
- Great Lakes Carbon Corp. (Chicago)**  
 Provided special graphite, which is used to control nuclear reactions, to the Atomic Energy Commission from 1952 to 1958. Records show the company also worked with a reactor fuel, possibly uranium, in 1958.
- 654 39th Street Warehouse (Chicago)**  
 Used to store radioactive materials for the Manhattan Project and other defense work from the 1940s to 1953.
- International Register (Chicago)**  
 Used only once by the Metallurgical Laboratory in the early 1940s to conduct grinding experiments on uranium rods. Company has since changed its name to Intermatic Inc. and moved to Spring Grove.
- Kaiser Aluminum Corp. (Dolton)**  
 Machined uranium rods for Argonne National Laboratory in 1959.
- Lindsay Light and Chemical Co. (West Chicago)**  
 Lindsay was the government's main source of radioactive thorium for reactors and weapons, producing 11.7 million pounds of the purified element for the Atomic Energy Commission from 1945 to 1963. Environmental cleanup of the site is still ongoing.
- Midwest Manufacturing Co. (Salesburg)**  
 In 1944, Midwest did uranium foundry work (melting and casting) for the Metallurgical Laboratory, according to the Energy Department. It also did aluminum jacketing of uranium slugs.
- Museum of Science and Industry (Chicago)**  
 The U. of C.'s nuclear program occupied space at the museum from 1946 to 1953, mostly for overflow office space. Government records show there was some handling of radioactive materials at the museum. Radiation surveys conducted in 1949 and 1977 found normal levels.
- National Guard Army (Chicago)**  
 Manhattan Project and other defense projects used the site for storage and processing of uranium metal from 1942 to 1961. Located at 52nd Street and Cottage Grove Avenue. Cleanup of the property, now owned by the State of Illinois, was completed in 1988.
- Podbielniak Corp. (Chicago)**  
 Tested a uranium solution in 1957 for National Lead of Ohio, a weapons contractor.
- Precision Extrusion Co. (Bensenville)**  
 Shaped pieces of uranium for Argonne National Laboratory from 1956 to 1959.
- Quality Hardware and Machine Co. (Chicago)**  
 Provided tools, dies and fixtures to the U. of C. in February 1944 under a government contract. The company produced experimental uranium fuel slugs in the summer of 1944.
- R. Krasburg and Sons Manufacturing Co. (Chicago)**  
 From April to December 1944, Krasburg had a subcontract to provide "services and supplies" to the U. of C. Metallurgical Laboratory, according to DOE records. No further details available.
- Selsky Brothers Inc. (Chicago)**  
 Performed a one-time experiment in 1953 involving welding of uranium metal.
- University of Chicago (Chicago)**  
 Original home of the Manhattan Project and site of world's first controlled nuclear chain reaction on Dec. 2, 1942. Researchers and laborers handled hazardous materials, such as beryllium and uranium. The university was chosen to run Argonne National Laboratory after World War II.
- W.E. Pratt Manufacturing Co. (Joliet)**  
 In Spring 1943, Pratt and its parent company, Joslyn Manufacturing and Supply Co., began machining uranium slugs for the first reactors built at the U. of C. in 1944. Pratt, also machined uranium rods for the Metallurgical Laboratory.
- Wycoff Drawn Steel Co. (Chicago)**  
 Machined uranium slugs for the Metallurgical Laboratory in 1943.

Source: U.S. Department of Energy

Chicago Tribune