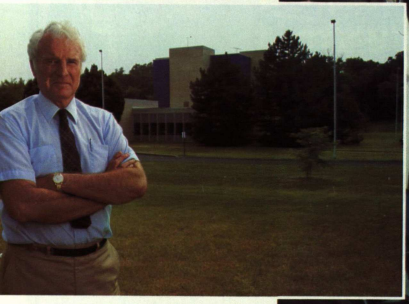
The blue glow of the core is at the heart of the nation's most powerful University research reactor.



Director Robert Brugger, above, and staff adhere to strict guidelines of the Nuclear Regulatory Commission.

Gary Ehrhardt photo

By JIM KELTY

THE RESEARCH REACTOR:

20 YEARS OF HELPING PEOPLE

THE UNIVERSITY'S NUCLEAR research reactor once helped track down a woman who was poisoning her husband with banana cream pie.

The case, which occurred in 1970, involved a Kansas City man who was suffering recurrent bouts of illness for no apparent reason. During his stays in the hospital, he improved immediately, but whenever he returned home, he experienced a relapse.

The mystery began to unravel when his wife brought her specialty to him in the hospital—banana cream pie. After eating a piece, the man's condition rapidly deteriorated.

The doctor, becoming suspicious, obtained some strands of the man's hair, which were sent to the reactor for radiation analysis. The analysis revealed the presence of arsenic. The wife later confessed to her crime.

Arsenic can be detected through a routine test at the University's reactor. And it's one that represents a mere fraction of the reactor's capabilities.

The 10-megawatt facility has also—for example—helped tree farmers detect decay in young seedlings, helped geologists plot the course of ancient riverbeds, helped pharmacists prevent staph and strep cosmetic infections, helped chemists examine hydrogen bondings and helped the American Dental Association test the abrasiveness of various toothpastes.

Known throughout the world by its call letters MURR, the facility is the highest-powered university research reactor in the United States. It supports the research of students and faculty from all four University campuses, scientists from 130 other universities, federal and state agencies, and industry.

MURR operates a mile south of Campus and 30 miles west of another, more powerful reactor—the Callaway County nuclear power plant. The difference between the two facilities is in the design: a power reactor produces heat and steam for electricity; a research reactor produces neutrons and gamma rays for research.

In a typical MURR experiment, researchers will lower their sample into a 30,000-gallon tank of water which surrounds the ghostly blue glow of the reactor core. Inside that glow, the sample—say an ancient bone—is bombarded with neutrons for a few minutes or an hour and briefly becomes radioactive. The bone's characteristics are then charted on a graph by a computer, and knowledge is the end product.

MURR'S 20TH ANNIVERSARY of service to science, education and industry is being celebrated this year. Back in the mid-'60s, the facility was constructed with state and federal funds on a 500-ton block of concrete at Research Park (the old polo field on South Providence Road, north of Hinkson Creek). Through the years, its capabilities and reputation have grown steadily.

"The reactor is what brought me here," says Dr. Bill Yelon, senior research scientist and adjunct professor of physics.

Yelon—who was drawn 11 years ago from another reactor in Grenoble, France—has worked closely with General Motors in the development of a magnetic compound that soon will revolutionize the electric-motor industry. Called "Magnequench," the compound has twice the lifting strength of other magnets and can be produced at a lower cost.

"It can be made into the most compact, powerful, permanent magnets in existence," reports *Science Digest* magazine. "The implications are enormous for any machine that incorporates an electric motor, from appliances to automobiles, because magnets, mounted on drive shafts and spinning in an electric field, are the central component of most electric motors."

GM recently undertook a $170 million project to make 180,000 magnets a day. Magnequench may soon be used in a flurry of commercial products such as air conditioners, refrigerators, mixers, blenders, food processors, power drills and furnace blowers.

"We're talking about a multibillion-dollar-a-year business," says Yelon, who did neutron diffraction studies on the compound to observe the way the neutrons were scattered and how the atoms were arranged.

Yelon admits the Magnequench research "was something of a tour de force."

"It was quite special to have solved the structure of the compound the way we did," he says. "Quite a number of our scientific competitors were skeptical, but we made believers out of them. We did a nice piece of research. Our methodologies were more powerful than they expected."

THE MAGNEQUENCH breakthrough has sprung new interest in the field of permanent magnetics.

MURR is breaking scientific ground in other areas as well. Physics Professor Sam Werner is using the reactor to conduct important fundamental research in quantum and classical physics, and MURR scientist Steve Morris is using neutrons to test claims that selenium deficiencies increase the likelihood of cancer.

As part of a study funded by the National Institutes of Health, Morris determines the selenium levels of thousands of volunteers. He sends their toenail clippings into the core of the reactor by way of a highspeed pneumatic tube system.

Five seconds later the nails are shot back "hot."

Morris then has only 15 seconds to remove the sample from the vial and place it on a metal rod that detects trace elements. The radioactive selenium only has a half-life of 17 seconds.

Selenium is a trace element that humans receive mostly from the soil through crops. It is poisonous in large amounts, but small quantities seem to aid the body's ability to resist tumor-like growths, Morris says.

In this country, Morris says, cancer rates are higher in known selenium-deficient areas, but some controversy still exists as to whether the nutrient prevents cancer.

"Ultimately, I think the results of tests with selenium will point to recommended supplements," says Morris, who receives periodic shipments of nail clippings from various universities and institutes such as Harvard Medical School. Harvard is one of the leaders in selenium studies.

"This reactor provides a type of radiation scientists need for certain experiments that is not available on any other campus," says MURR Director Robert Brugger. "This is a unique resource."

Brugger, who became MURR's head man in 1974, speaks in no uncertain terms about his workplace. He and his full-time staff of 72 operate MURR around the clock, seven days a week. They can keep several hundred experiments running simultaneously, all the while adhering to strict procedural guidelines handed down by the Nuclear Regulatory Commission.

A $15 million project to upgrade the reactor will triple the power produced by the world-class facility, allowing American scientists "to remain in international contention."

The Campus will celebrate the reactor's anniversary on Oct. 11 (Homecoming weekend) with a public open house and a banquet. The facility has already received one rather significant gift. Last May, the Board of Curators approved preliminary plans for a $15 million project to upgrade the reactor and triple the amount of power it produces. Under the expansion, MURR will produce as much as 30 megawatts of thermal power instead of the current 10.

In comparison, the Callaway County nuclear plant produces 3,500 megawatts.

THE UPGRADE will allow more experiments to be conducted, allow experiments to be conducted more quickly and allow experiments to be conducted that were impossible previously, Brugger says.

"This reactor has provided the University, and the United States, with a world-class facility, an eminent facility," Brugger says, matter-of-factly. "It can and should be upgraded to allow U.S. scientists to remain in serious international contention." □