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HOTLINE

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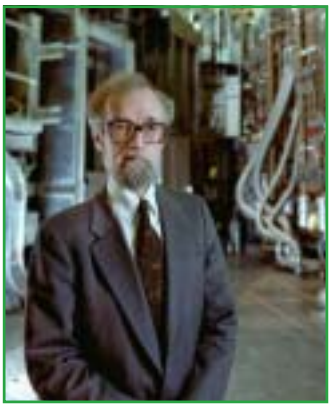
Harold Furth, the Passing of a Legend

Giant of the fusion science program, he initiated the Tokamak Fusion Test Reactor project at PPPL that went on to produce world record-setting results

Former PPPL Director Harold P. Furth, a pioneer in the U.S. fusion program and the originator of the Tokamak Fusion Test Reactor (TFTR) project, died February 21 in Philadelphia at the age of 72.

Furth made a career of research on controlled fusion, making countless contributions to the science of fusion plasmas and the fundamentals of plasma physics. He provided scientific and managerial leadership to the world fusion program throughout his career. In the early 1970s, he conceived the TFTR project, the most advanced and highest performance fusion device ever constructed in the U.S. Furth served as Director of PPPL from 1981 to 1990, during which time TFTR was launched. The machine produced world record-setting and major scientific results before closing down in 1997. In 1999, Furth became Professor Emeritus of Astrophysical Sciences at Princeton University. He was active in research at PPPL until shortly before his death. He is survived by his wife, Christiane A. Ludescher, of Princeton; son, John Furth, of New York City; and sister, Inge Steer, of Conn. Donations may be made to one of the following organizations: Princeton Senior Resource Center, Spruce Circle, Princeton, New Jersey 08540 or Womanspace, 1212 Stuyvesant Avenue, Trenton, NJ 08618. ● *A staff tribute is on page 2; a complete obituary is on the web at http://www.pppl.gov/news/pages/furth.html.*



Harold Furth at TFTR

PPPL Detection System Could Boost Antiterror Efforts

From left are PPPL's Steve Langish, Charlie Gentile, and Andy Carpe with the miniature nuclear detection system.

Anti-terrorism efforts may get a boost from PPPL. A team led by PPPL engineer Charlie Gentile is developing a miniature nuclear detection system to scan objects such as cars, luggage, and vessels for specific nuclear signatures associated with materials employed in nuclear weapons. This system could be installed at tollbooths and airports, as well as in police cruisers to detect unauthorized nuclear materials being transported.

The PPPL team of Gentile, Steve Langish, and Andy Carpe configured off-the-shelf components — a solid-state detector, multi-channel analyzer, hand-held computer, pre-amp, and amplifier — into a unique system that can determine various radiation energies, thus identifying

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Those at PPPL Pay Tribute to Harold Furth ...

Following Furth's death in February, staff at PPPL recalled the former Director and father of the Tokamak Fusion Test Reactor as a giant of fusion science and a profound thinker, as well as a wonderful friend full of graciousness and humor. Below are some of these remembrances.

"Harold was a giant of fusion science, a person of untiring energy and boundless optimism. He buoyed all of us. Harold led the U.S. fusion program to tremendous growth in the 1970s and 1980s. Indeed, many of the scientific accomplishments even in the 1990s are the result of his leadership. We will all miss him."

— Rob Goldston, PPPL Director

"Harold was a fusion Renaissance man. He was an ingenious theorist on one side. He was a master builder of experiments and he was the architect of the magnetic fusion program."

—Dale Meade, PPPL Advanced Reactor Concepts Head

"Everyone knows of Harold's wonderful sense of humor — I will always remember the day he tried to order a Lyme 'n Spitzer at Prospect. What is perhaps less well known is Harold's gracious spirit, his sense of humanity, and his gentleness. Here was a man who was one of the preeminent fusion researchers in the world, who took time to explain to me in great detail on the white board, the function of each and every diagnostic on TFTR. He was a man who felt comfortable holding my first-born son in his arms one moment, and testifying before Congress the next. Harold was a truly wonderful friend and I will always treasure his memory."

— Dolores Lawson, Assistant to the PPPL Director, who worked with Furth for nine years.

"Harold was my boss, my mentor, my friend. He was brilliant, clever, wise, witty, fun and, on occasion, playful. He was also one of the kindest, gentlest, and most gracious persons I have ever known. One of my fondest memories is of Harold playing with my son on a hot Saturday afternoon in 1982 in the pool at the Hyatt Regency in Baltimore, where the Lab was co-hosting the IAEA meeting. I also remember the time in 1972 when he came to work with a shoe box full of tinfoil stars and medals that he and his son, John, had made. He told me we were going to award them to everyone who had worked so very hard to bring the ATC [Adiabatic Toroidal Compressor] on-line. I consider the day Harold hired me as his secretary as one of the luckiest days of my life. I miss him.

— Carol Phillips, PPPL Information Officer, who worked with Furth from 1971 to 1984.

"Furth will be remembered for key contributions to a variety of approaches to plasma containment, including levitrons, mirrors, stellarators, heliacs, and pinches. His reputation as a profound thinker was already made by his 1963 paper on resistive tearing modes, which enabled us to see beyond the magnetohydrodynamic paradigms behind the then-popular approaches to magnetic confinement.

In the 1970s, at a time when the perceived scarcity and escalating prices of fossil fuels threatened our national security, more than anyone else, it was Harold who articulated for the nation the very real possibilities in harnessing nuclear fusion as an alternative energy source. In 1973, Furth, firm and convincing, put forth the basic ideas behind TFTR. Under Harold's leadership, and by sheer momentum thereafter, TFTR became a trove of scientific discovery that would take us with huge strides closer to harnessing fusion power.

The keenness with which we at PPPL feel Harold's absence goes far beyond the clever things that he did and the wit with which he put things, although we miss all that, too.

Harold was a physicist who inspired others to be their best. He inspired those around him to focus only on the loftiest goals of science, only on those goals that are worthy of commanding precious attention, only those goals that are the reasons, in fact, when we are all forced to recall it, why we all entered the field in the first place. I remember Harold cautioning against being diverted from those lofty goals by "taking in laundry," as he put it, just to pay the bills.

I am hoping that the inspiration that he was can live on. On a personal note, whether or not Harold read anything I wrote, I somehow always felt that I was writing for him, at least when I was writing at my best. I shall hope to go on just like that."

— Nathaniel Fisch, PPPL Associate Director for Academic Affairs

"Harold was always a gentleman — courteous and polite. His visits to my office were always welcomed as his cheerfulness and wonderful sense of humor made the day so much more pleasant. I enjoyed working with him as he was so gracious in appreciating my efforts of help. I will truly miss him."

— Barbara Sarfaty, PPPL Graduate Administrator

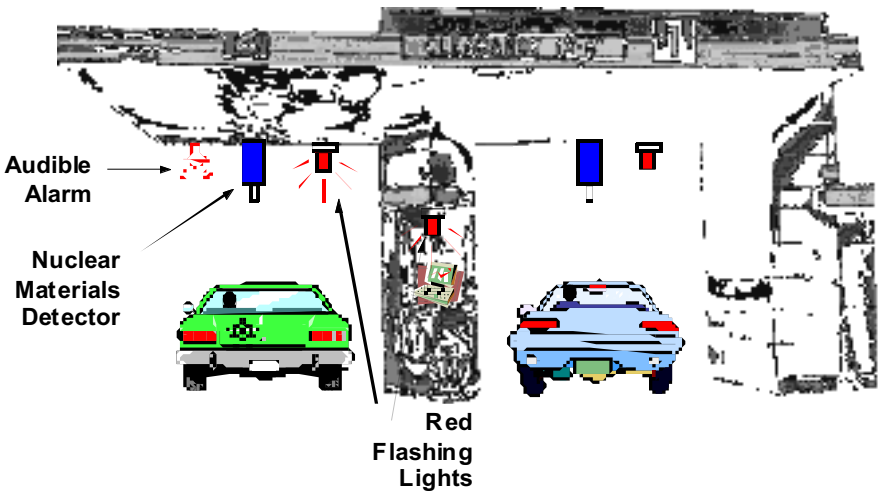
Detection

Continued from page 1

radionuclides. It will be tuned to flag suspect signatures only; normal nuclear signatures from medical isotopes and radiography equipment would not give false positives.

This capability to differentiate radionuclides with a high degree of spatial resolution in a device that is light, small, robust, and portable makes the PPPL application unique. "We made it quite small," said Gentile, Head of PPPL's Tritium Systems Group.

Its robustness makes it suitable for a tollbooth or bridge entrance. A similar system using a positive intrinsic negative (PIN) diode as a detector was sent to Mars to look at radionuclides in Martian soil. "That system, like ours, is physically rugged and can take swings in environmental conditions," said Gentile, who was involved in developing technology that used a PIN diode as a tritium detector for surface contamination in PPPL's Tokamak Fusion Test Reactor vacuum vessel.



Miniature Nuclear Detection System Conceptual Configuration

The PPPL-configured system includes a hand-held computer that stores databases of radionuclides for comparison, as well as three radiation detectors or heads to cover the whole gamut of nuclear signatures. The heads can include, for example, a boron trifluoride gas tube to detect neutrons; a PIN diode with a beryllium window to detect X-rays, including low-energy gamma rays; and sodium iodide crystals to detect higher energy gamma rays.

Radionuclides can be recognized and differentiated from one another since each has a distinctive energy signature or fingerprint. "Our detector looks at a fingerprint and reveals the nuclear material present," Gentile said, adding that there are a lot of electronics that can be configured to look at a nuclear spectrum.

The unit would typically be able to detect radiation (dependent on source quantity) up to about 10 feet away and would identify the type of radiation, but not the quantity. "We can't tell you how much source material there is, just that a particular kind of radionuclide, perhaps a transuranic or some unauthorized nuclear material, may be present. We can't say if it's a 1,000 curies or 200 curies, our goal is to identify the radionuclide," said Gentile.

The system could be configured with one, two, or three heads to suit the needs of law enforcement officials. For instance, airport officials might be interested in detecting materials such as cobalt or cesium that would be used in a "dirty" bomb. "Law enforcement officials would tell us what materials they might be looking for and we would tailor the configuration to detect those materials," said Gentile.

At tollbooths or in police cruisers on the turnpike, the system would be tuned to recognize, but not sound an alarm on radioactive material from legal uses such as medical radioisotopes. "We are only interested in material found in weapons of mass destruction. The system would differentiate between approved and unapproved nuclear materials in the environment," said Gentile.

The PPPL team is developing a library of specific spectra that would be associated with nuclear weapons. "Right now, up and down the New Jersey Turnpike, there are probably dozens of vehicles legally approved to transport nuclear materials such as medical isotopes. While a Geiger counter would detect nuclear materials in the environment, our system would detect and differentiate the materials, triggering an alarm only on those considered a risk," said Gentile.

Added PPPL's Steve Langish, "The system could be programmed to look only for specific nuclear fingerprints or spectra used for bomb making materials."

It also would be able to detect some shielded materials since shielding often results in the generation of certain energy X-rays. "Our software would be tuned to look for X-ray spectra associated with specific shielding configurations," said Gentile.

He added that transuranics put out several different energies or what he termed "very interesting spectra." A material with several specific energy peaks that the detec-

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Foraker Named Emergency Services Captain

PPPL's Wes Foraker was named a captain in the Emergency Services Unit in January. Foraker (at right), who joined the Lab's security group 22 years ago, is one of three captains in the Site Protection Division unit.

As captain of the six-person C Platoon, he handles day-to-day operations and oversees platoon activities, which include fire protection, emergency response, and security coverage.

Prior to coming to PPPL, he worked for two years at Princeton University, first in the stockroom of the Biology Department and then with the campus security group. When the Lab's security group merged with emergency services in the mid-1980s, Foraker expanded his duties, completing training in firefighting, emergency services, and hazardous materials handling. Presently, he also serves as one of the Bucks County Fire Marshals.

Twenty Years of Experience

"Wes has more than 20 years of experience at the Laboratory and University, and I look forward to him making an excellent contribution to the Laboratory and the ES&H/IS [Environmental Safety & Health and Infrastructure Support] Department," said PPPL Site Protection Division Head John Bavlish.

Congratulations, Wes! ●

Detector

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tor is scanning for may be noteworthy. "In addition, any neutron signal in the environment would be of considerable interest," said Gentile.

Once a unit is in place, it would be up to law enforcement officials to devise an alerting system. "For instance, it could be set up at a tollbooth so that when a vehicle is flagged, a picture is taken of it and an e-mail alert goes to authorities. The vehicle would then be stopped a short distance beyond the tollbooth," said Gentile.

The start-up cost for the whole system would be approximately $80,000, with a $17,000 price tag for each unit, not including installation charges. "This is relatively inexpensive," Gentile said.

In addition to using the technology for national defense in detecting unauthorized nuclear materials, the system may also be adapted to detect what is buried at a nuclear waste site. Department of Energy officials in Germantown expressed an interest in possibly using the system at Hanford to identify untagged barrels of radioactive waste material buried long ago. The system could measure the radiation that is emitted from the barrels to identify what they contain. "There are many possibilities for how this system could be deployed," said Gentile.

DOE Support

He thanked Department of Energy officals for their insightful support for the project, in particular Jeff Makiel and Leif Dietrich at the DOE Princeton Area Office. "Jeff secured funding early on for us to do the development work on this," noted Gentile. ● ***— By Patti Wieser***

HOTLINE

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Connolly Promoted in Maintenance and Ops Group

Working in the depths of the sea gave PPPL's Shawn Connolly just the right mix of skills to take on the Manager of Maintenance and Operations post at the Lab.

Connolly served as an engineering watch supervisor on a Navy submarine during part of the 1990s, overseeing maintenance, operations, and crew evaluations. The responsibilities were similar to those of the PPPL position, in which Connolly is required to have a familiarity with electronics, electrical maintenance, physics and mechanical testing, and employee evaluations. "Ten years in the Navy prepared me well," said Connolly.

Shawn Connolly

After his stint with the Navy, Connolly joined PPPL as a facilities engineer in May of 2000. He was promoted to his present position in December, reporting to Maintenance and Operations Division Head Carl Potensky.

"The position is immense, touching almost all aspects of PPPL's mission and personnel. Shawn's positive attitude and a willingness to get involved helps him find solutions to many of the challenges he encounters. He is a great asset to the Laboratory."

— Carl Potensky

Said Potensky, "The position is immense, touching almost all aspects of PPPL's mission and personnel. Shawn's positive attitude and a willingness to get involved helps him find solutions to many of the challenges he encounters. He is a great asset to the Laboratory."

Connolly's primary responsibilities are staff management and scheduling maintenance activities, both of which require knowledge about the duties and expertise of staff from the Building Maintenance, Pipe Fitters, Steam and Chiller, General Mechanics, Operations, Electrical, HVAC [heating, ventilating, and air conditioning], Data Systems, and Telecommunications Groups. The staff's work ranges from inspecting a chamber hoist to moving furniture and equipment to investigating heating problems to maintaining negative pressure at D-site.

"We're the stagehands of this big play," Connolly said, likening the group's work to that of a crew on a submarine responsible for handling all operations. "We are here to support the Lab."

Connolly also deals with personnel issues within his group and writes employee appraisals. Because of this responsibility, as well as that of scheduling work, he often assists staff in the field to get a better feel for what employees do and how long a project takes to complete.

Building Better Relationships

"It helps me create a realistic schedule and I can better understand various jobs and the challenges the employees face. This also helps in building better relationships with the group," noted Connolly. While in the Navy, he attended nuclear power school, was stationed on two nuclear submarines — the U.S.S. Key West based in Hawaii and the U.S.S. Batfish based in Connecticut— and was an instructor on a nuclear prototype at Saratoga Springs, New York. He also attended classes at institutions near where he was stationed, receiving a degree in nuclear engineering technology from Thomas Edison in 1998. He is presently taking courses at the New Jersey Institute of Technology for a master's degree.

Connolly, who is originally from New Jersey, lives with his wife and two children in Roselle Park. ●

PPPL Awarded for Developing Diamond Wire Cutting

Professional Engineers' Society of Mercer County Honors Lab During Ceremony and Banquet

At left, from left, are Bob Parsells, Erik Perry, Geoff Gettelfinger, and Keith Rule, the team that has filed for a provisional patent for the process for using the diamond wire cutting for complex metal vessels. At right, from left, are Timothy McGough, who presented the award, Perry, and Gettelfinger (holding plaque) at the engineering society's banquet. The Master of Ceremony was Beth DeAngelo.

PPPL has received an award for "Project of the Year 2002" from the Professional Engineers' Society of Mercer County. The Laboratory was cited for its "Process for Use of Diamond Wire Cutting of Complex Metal Vessels," which was used in the disassembly of the Tokamak Fusion Test Reactor (TFTR) vacuum vessel. Erik Perry, Head of the TFTR decommissioning project, accepted the award at the engineering society's February 23 dinner.

The Decommissioning Project developed this process for use in the safe disassembly of TFTR. TFTR, which operated from 1983 to 1997, used deuterium and tritium to fuel experiments beginning in 1993. As a result, the vacuum vessel was left radioactive and contaminated with tritium. In addition to the diamond wire cutting, PPPL staff developed lightweight concrete filling technologies to help complete the disassembly task safely, on time, and within budget.

The main components of the TFTR are the vacuum vessel; twenty 25-ton magnetic field coils, and a massive titanium and stainless steel support structure. The vacuum vessel is a donut-shaped stainless steel vacuum chamber, twenty-five feet across by eight feet high, and weighs 80 tons.

Conventional technologies such as abrasive sawing and flame cutting were considered, but were deemed unsuitable in satisfying the requirement of minimizing health and environmental hazards during the disassembly process. The diamond wire cutting technique was adapted and optimized for use on hollow, stainless-steel vessels. The TFTR chamber was filled with lightweight concrete to prevent the migration of contaminants and to provide the void space filler required by the disposal facility. Unique disassembly fixtures, ventilation systems, and numerous contamination barriers were specifically designed to accomplish the task safely.

PPPL's engineering team effectively addressed all challenges and developed a practical system that reduced worker radiation exposure, airborne emissions, and radwaste generation. In addition, PPPL has proven that this new technology is viable, cost-effective, and highly desirable for similar projects where segmentation of complex large metal structures is required.

"For an engineer, an enjoyable project often begins with the phrase, 'it can't be done.' This project has been fun."
— Erik Perry

Perry, while accepting the honors on behalf of PPPL, thanked the Department of Energy for its support of the project and PPPL staff members for their efforts in developing the process and coordinating the project. "For an engineer, an enjoyable project often begins with the phrase, 'it can't be done.' This project has been fun," said Perry. Congratulations, team! ●

Students Take a "Walk in the Shoes" of an Engineer

A group of PPPL engineers recently celebrated National Engineers Week by passing their skills onto the next generation of engineers. This "next generation" included five students from Trenton Central High School and Mercer County Technical School, who came to the Lab February 20 to "shadow" the engineers. The day, organized by PPPL's Alex Ilic and sponsored by the Professional Engineers' Society of Mercer County, also included a presentation by John DeLooper, a tour by Irving Zatz, and lunch.

The PPPL researchers who hosted the students included Tom Brown, Bob Ellis, Charlie Gentile, Mike Kalish, Charles Kessel, Long-Poe Ku, George Labik, John Parker, and Steve Raftopoulos. At left, PPPL engineer Bob Ellis (left) shows Mercer County Technical School student Nancy He the electron cyclotron heating launcher component Ellis is working on in one of the PPPL shops. Above, PPPL Engineer Irving Zatz (third from left) and PPPL physicist David Gates (second from left) lead the group on a tour of the National Spherical Torus Experiment Control Room. Third from right is Alex Ilic, who coordinated the students' visit to PPPL. ●

PPPL Hosts Science Bowl for the Tenth Year

For the tenth year, PPPL hosted the New Jersey Regional Competition of the National Science Bowl®. On February 23, twenty-two teams from 17 high schools in New Jersey and nearby Bucks County competed in the annual event. East Brunswick High School (in photo at right, along with PPPL Science Bowl Coordinator James Morgan at far right and Congressman Rush Holt third from right) placed first, followed by Governor Livingston High School and West Windsor Plainsboro High School North in second and third, respectively. Volunteers who helped conduct the science bowl included Bill Blanchard, Mark Boaz, Bill Davis, Michael Del Corso, John DeLooper, Russ Feder, Virginia Finley, Elizabeth Foley, Charlie Gentile, Tom Gibney, Linda Harmon, Keith Harvest, Rich Hawryluk, Dave Johnson, Diane Johnson, Brian Justice, Igor Kaganovich, Gary Kater, Paul LaMarche, Pam Lucas, Judy Malsbury, Tom McGeachen, Tobin Munsat, Susan Murphy-LaMarche, Raffi Nazikian, Carol Phillips, Andrew Post-Zwicker, Chris Ritter, Adam Rosenberg, Hans Schneider, John Schmidt, Daren Stotler, Marianne Tyrrell, Mike Viola, Patti Wieser, Regina Worthy, and Irving Zatz. The day was coordinated by James Morgan, who said, "Academic competitions such as Science Bowl can provide the reinforcement and motivation in academic areas that sports competitions do for many students. Even though every team cannot bring home a trophy, I believe that anybody who learned something or had fun was a winner." ●

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