

HOTLINE

The Princeton Plasma Physics Laboratory is a United States Department of Energy Facility

Princeton Bestows Presidential Achievement Award on PPPL's Cylinder

PPPPL's David Cylinder is always on the lookout for a new challenge. Since Cylinder joined the Lab's staff as a technician nearly 25 years ago, he has put his inventive genius to the test time after time, beginning with various tasks that included working as a tokamak mechanic on the Princeton Large Torus, developing and constructing diagnostics for the Tokamak Fusion Test Reactor, and serving as the chief technician building the Magnetic Reconnection Experiment (MRX). Eventually, the technical associate took on his dream project, designing and building micro-air vehicles.

Recently, Cylinder was rewarded for his exceptional performance. He was chosen, along with four other University staff members, to receive the 2004 President's Achievement Award. Princeton President Shirley Tilghman presented the honors during the annual Service Recognition Luncheon March 2 at Jadwin Gymnasium.

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Photo by Denise Applewhite

Princeton University President Shirley Tilghman (left) stops by Dave Cylinder's table to congratulate him on being awarded.



PPPL-Led Team Completes Work on JET Alpha Detector

By Anthony DeMeo

Studying the behavior of alpha particles produced in fusion plasmas is of paramount importance for ITER and other advanced fusion devices in which these particles are expected to be the predominant source of plasma heating. An international team led by PPPL physicist Doug Darrow recently completed work at PPPL on the construction of diagnostic equipment that will be used to measure alpha particles and other energetic particles ejected from the plasma in the Joint European Torus (JET) in Culham, England.

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At left is the JET Alpha Detector built at PPPL with (clockwise from left front) Dave Miller, Bob Ellis, Doug Darrow, and Joe Frangipani.

Detector

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Neutrons and alpha particles are produced when deuterium (D) and tritium (T) ions fuse. The neutrons carry away about 80 percent of the fusion energy produced, the alphas the rest. The positively charged alpha particles (helium-4 nuclei) can impart energy to the plasma, heating it. "PPPL did a good bit of work on alpha detection for the deuterium-tritium experiments on TFTR [Tokamak Fusion Test Reactor]. A lot of good results came out of that work, and that's what sold JET on getting into this in earnest," noted Darrow, who was involved in the TFTR measurements.

The diagnostic equipment, built at PPPL, is one of two different kinds of JET alpha particle detectors being supplied under a collaboration among researchers from the UKAEA, the Max Planck Institute for Plasma Physics (IPP) in Greifswald, Germany, and the Colorado School of Mines in the U.S. PPPL's effort began in early 2002. Since then, the Laboratory has received about \$1.5 million from the Department of Energy for the design and fabrication of one of the two detectors. In addition, the IPP has invested roughly \$1.0 million for the design and fabrication of the second detector at Greifswald.

Lost Alphas

The collaboration's primary interest is the measurement of alpha particles that exit the plasma before having a chance to heat it. "Alphas and other energetic particles can drive instabilities in the plasma that cause the alphas to be ejected. Studies on JET using these lost alpha diagnostics will provide new insights into the causes and nature of instabilities driven by alpha particles and other energetic particles," said Darrow. The lost alphas can also have a deleterious effect on the first wall of a fusion reactor. They tend to strike in specific locations, which can result in hot spots that affect the integrity of the first wall. So it is critically important to understand the loss mechanism of the alphas.

The two diagnostics being built under the collaboration will use different detection methodologies that together provide complementary information about the lost alphas. Darrow said, "The detector that we just finished building here at PPPL uses Faraday cups — metal foils that collect alpha particles coming out of the plasma. We measure the electrical current coming from each foil to infer the number of alphas striking the foil. The current will be very tiny, but it

is measurable." Professor Ed Cecil of the Colorado School of Mines pioneered the thin foil Faraday cup approach. PPPL's Bob Ellis, Mike Messineo, Dave Miller, and Joe Frangipani comprised the team that did the engineering, drafting, and technical work required to design and build the Faraday cup diagnostic.

The other diagnostic, being built at IPP, is a scintillator detector that uses metal plates covered with a phosphor of the kind found on a TV monitor, or any cathode ray tube. The alpha particles hit the phosphor creating light. A CCD camera records successive images from the phosphor. The images will indicate where and how many alpha particles are striking the plate. The Faraday cups will be deployed at multiple locations around the plasma, comprising an array of detectors that will measure where the alphas are coming from. The scintillator detector will provide a more precise measurement of the energy of the alphas and their directions, or pitch angles, but at only one location.

The directional information from the scintillator detector pinpoints the actual orbits of the alphas as they leave the plasma, and physicists are hoping to use this data to determine what's going on inside the plasma. At present, researchers do not have a reliable method for measuring directly the alpha population inside the plasma. Consequently, they would have to calculate the alpha particle heating profile based on other experimental data. Until direct measurements are available, physicists plan to extract as much information as possible from the location and orbits of the lost alphas as they leave the plasma.

Experiments to Begin This Fall

Experimental operations on JET employing the new alpha particle diagnostics are scheduled to begin in November of this year. While another round of JET D-T experiments is not anticipated in the near term, initial experiments with the new diagnostics will be performed in plasmas heated by a variety of energetic ions. In deuterium plasmas, JET has a variety of ways of generating particles with energies approaching the 3.5-million-electron-volt (MeV) alpha particles produced in D-T fusion reactions. The new alpha particle detectors can measure these particles as well. For example, D-D fusion reactions yield 3-MeV protons and 1-MeV tritons.

Additionally, JET has strong radio-frequency (ion cyclotron) heating that can energize hydrogen ions (protons)

Hotline

Editor/Writer:	Patti Wieser	Graphic Artist:	Greg Czechowicz
Photographer:	Elle Starkman	Layout:	Patti Wieser

The HOTLINE is issued by the Princeton Plasma Physics Laboratory, a research facility supported by the United States Department of Energy. It is primarily an internal publication. Correspondence and requests to reprint material should be directed to the Editor, PPPL HOTLINE, P.O. Box 451, Princeton, NJ 08543; Interoffice correspondence should be addressed to MS-38, LSB Bldg., C-Site; fax 609-243-2751; telephone 609-243-2757; e-mail pwieser@pppl.gov.

in the plasma, raising them into the MeV range. JET also has the ability to heat 150-kilo-electron-volt (keV) helium neutral-beam ions with radio-frequency power, kicking them up to the MeV range to simulate the behavior of D-T fusion produced alphas. Consequently, PPPL and JET fusion scientists expect the alpha particle detectors to provide new insights into the dynamics of energetic particles and how they interact with the plasma over a wide range of conditions.

Relevance to ITER

ITER's mission is to produce "burning plasmas" in which heating is predominantly supplied by alpha particles produced by D-T reactions, as opposed to auxiliary heating from neutral-beam injection or radio-frequency waves in present experiments. The study of burning plasmas is essential for the development of practical fusion power. Experiments planned on JET in the next few years will add

much needed knowledge to support the work planned on ITER. But ITER's success depends on more than just the physics results coming from JET collaborations. It also hangs on the ability of scientists and engineers from around the world to work together effectively to design and build the needed equipment.

"JET is an experiment in two ways. First it is a scientific experiment approaching a reactor-relevant scale that is not available in the U.S., but it is also an experiment in multi-national collaboration. A consortium of fusion partners has developed, not without pains, methods by which this can be done effectively and efficiently. By engaging in the JET collaboration, we prepare ourselves for ITER and beyond. The success of our collaboration bodes well for the future of fusion research," said Raffi Nazikian, who oversees international collaborations within PPPL's Office of Off-site Research. ●

Volunteers Needed in May for Super Science Weekend and Middle School Science Bowl

Fun, fun, and more fun is promised for volunteers at two outreach efforts — Super Science Weekend and Middle School Science Bowl — planned for May in Trenton.

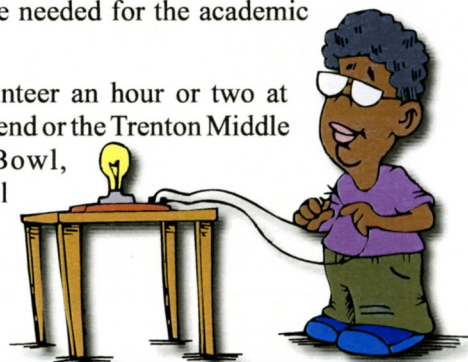
Super Science Weekend — Saturday, May 21, from 9 a.m. to 6 p.m. and Sunday, May 22, from 11 a.m. to 5 p.m. at the New Jersey State Museum in Trenton. Volunteers are needed to do hands-on science demonstrations at PPPL's exhibit. No experience necessary; training will be provided.

Middle School Science Bowl — Saturday, May 14, from 8:30 a.m. to 3 p.m. at the New Jersey Education Association, 180 West State Street, Trenton.

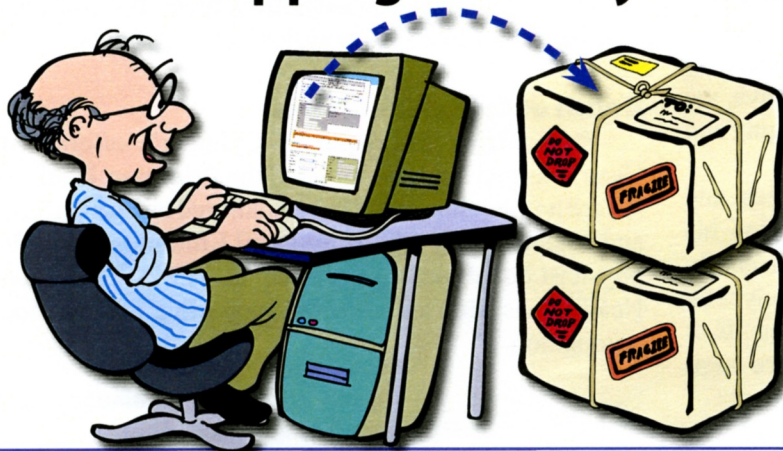
Eleven middle school teams are scheduled to participate in the Trenton Regional Competition of the National Middle School Science Bowl®. The bowl includes two por-

tions — a model hydrogen fuel cell car competition and an academic, fast-paced question-and-answer contest in which students answer questions about earth, physical, life, general sciences, and math. Timers are needed for the model car competition and science judges, timekeepers, moderators, and scorekeepers are needed for the academic portion.

If you can volunteer an hour or two at Super Science Weekend or the Trenton Middle School Science Bowl, please send an e-mail to James Morgan at jmorgan@pppl.gov or call him at ext. 2116. ●



Online Shipping Order System Is Up and Running



PPPPL's new online shipping order system is now operational. A web link to the shipping order system and a users' guide can be found on the Materiel Services Home Page at <http://oorm-1-priv.pppl.gov/users/mat/>.

Please use the electronic form when submitting shipping orders. It was designed to look like its paper predecessor. Only online shipping orders will be accepted after Friday, April 29. For more information, call Jerry Siminoff at ext. 3572 or send him an e-mail at siminoff@pppl.gov. ●

In her remarks, Tilghman quoted Andrew Post-Zwicker, Head of PPPL's Science Education Program, on Cylinder: "Dave's enthusiasm is contagious, his pursuit of excellence is inspiring, his creativity limitless."

Throughout Cylinder's career at the Lab, he has relished each new assignment, often seeking them out. "String after string of interesting opportunities at the Lab have presented themselves," said Cylinder, adding that he enjoys the creative challenge of designing and building machines and diagnostics, but is always ready for something new when a project is done. His efforts and creativity are well known around the Lab.

PPPL Director Rob Goldston said, "Dave Cylinder is extraordinarily creative and skilled. He is arguably the world's most ingenious designer of tiny probes for high-frequency signals in plasmas. His work has led to a string of powerful discoveries on the MRX experiment. In parallel with this, Dave has had a lifelong hobby of designing and building model aircraft."

Designs Miniature Flying Machines

Cylinder, who designs and constructs miniature flying machines using birds, insects, and falling seeds as models, now leads a micro-aviation effort at PPPL supported by the U.S. Naval Research Laboratory (NRL). "When the micro-aviation group at the Naval Research Laboratory was introduced to his work, it was stunned to find that designs superior to what it had on paper were actually flying," said Goldston. The NRL has credited Cylinder with creating "an entirely new family of aircraft." His flapping-wing machines can fly, hover, and crawl.

Throughout his career at PPPL, Cylinder has worked directly with physicists and engineers to solve complex problems and develop innovative designs for diagnostics, such as a magnetic field measuring probe.

When PPPL's Masaaki Yamada asked Cylinder to work for him several years ago to construct the MRX, Cylinder readily agreed. "Masaaki was a special challenge and so was his group, and I took the job," said Cylinder. "Each person had his own expertise on the machine and we were working together to make it succeed. In our own special ways, we could make a difference. MRX was always challenging and interesting, and it still is."

In addition to building machines and diagnostics, and inventing micro-aviation vehicles, Cylinder shares his knowledge with a wide circle of students, faculty, researchers, and members of the public. He has worked closely with undergraduate and graduate students in the departments of astrophysical sciences and mechanical and aerospace engineering. He also has reached out to school-age students.

Outreach to students began on main campus in 1997 while Cylinder was "goofing around" with wind tunnels. "I mentored four seniors majoring in engineering for the project. It gave me more incentive to actually finish things I wanted to work on so I started building my own designs," he recalled.

Modern-day Da Vinci

One of the Princeton seniors he mentored was Matt Nuffort, presently a Captain in the U. S. Air Force, and the Director of Executive Operations for the Office of Military Cooperation-Afghanistan in Kabul. "Dave did a lot more than simply mentor us. He inspired us. We used to call him Leonardo, because he reminded us so much of a modern-day Leonardo Da Vinci," said Nuffort. "He truly expanded our visions of the possible."

The group's senior thesis project on micro-air vehicle design won an award for the best senior thesis in the Mechanical and Aerospace Engineering Department. "Dave was the catalyst for that excellence. He mentored us on both concepts for design and techniques for actually building the design. What made his support even more amazing was that he was doing it simply because he was interested in helping us and wanted to see us succeed," said Nuffort.

Scott Hsu, now a Fellow at Los Alamos National Laboratory, worked with Cylinder when the former was a Princeton University graduate student at PPPL. "Dave consistently set the highest standards of excellence when tackling work assignments. For example, he invented the methods, tools, and assembly procedures for constructing magnetic field measurement probes. Without these instruments, the scientific discoveries made on our project would not have been possible."

Last summer, Cylinder mentored a high school student at PPPL for 10 weeks, guiding her as she designed and built a low-speed wind tunnel in support of his research on micro-air vehicles. He also worked with her on designing and building a chair on wheels that rolls across the ground powered by someone flapping the wings attached — a prototype that was a hit at PPPL's 2004 Open House.

"It's nice to see things you created being used and to see students extracting knowledge from them. It's gratifying to help them make new discoveries," said Cylinder.

Depth of Cylinder's Efforts

Recognizing the depth of Cylinder's efforts, MRX Head Masaaki Yamada initiated the Princeton Presidential Award nomination, which was submitted by Plasma Science and Technology (PS&T) Head Phil Efthimion. Jill Foley, a physicist collaborating at PPPL, and PPPL Tech Transfer Head Lewis Meixler collected supporting material for the nomination.

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Traveling to the Caribbean, Bermuda, Panama, Canada, or Mexico? New Passport Requirement

A new initiative will require all travelers entering or re-entering the United States from the Caribbean, Bermuda, Central and South America, Mexico, and Canada to have a passport or other accepted document that establishes the bearer's identity and nationality. This is a change from prior travel requirements.

The Western Hemisphere Travel Initiative will be rolled out in phases, providing as much advance notice as possible to those affected so they can meet the terms of the new guidelines. The proposed timeline is as follows:

December 31, 2005 — Requirement applied to all air and sea travel to or from the Caribbean, Bermuda, and Central and South America.

December 31, 2006 — Requirement extended to all air and sea travel to or from Mexico and Canada.

December 31, 2007 — Requirement extended to all air, sea, and land border crossings.

U.S. citizens may visit the State Department's travel web site (<http://www.travel.state.gov/>) or call the National Passport Information Center at 1-877-487-2778; TDD/TTY: 1-888-874-7793.



Passport customers should allow a sufficient amount of time to apply and receive their passports in advance of travel. Please allow six weeks for routine processing of passport applications. If urgent travel is needed and a passport is required sooner, please go to <http://www.travel.state.gov> for additional information.

The new initiative resulted from an Intelligence Reform and Terrorism Prevention Act of 2004 (IRTPA) mandate. ●



Cylinder

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"When I heard I was being nominated, I was kind of surprised. I was flattered and touched by Masaaki even thinking about it," said Cylinder.

Yamada and Efthimion said, "We congratulate Dave for receiving this great award from the University and are pleased that our PS&T Department activities helped Dave in developing his promising new career in micro-air vehicles."

Foley said, "It's wonderful to see Dave recognized for his outstanding talents. I'm amazed by his ability to observe and understand nature, and his kindness and respect for it."

The award was established in 1997 to recognize members of the support and administrative staff with five or more years of service whose dedication, excellent work, and special efforts have contributed significantly to the success of their departments and the University. The winners each

received a framed certificate and a \$2,000 award and have their names inscribed on a plaque that is displayed in the Office of Human Resources. Cylinder attended the ceremony with his wife, parents, and an NRL representative.

"It's wonderful to see Dave recognized for his outstanding talents. I'm amazed by his ability to observe and understand nature, and his kindness and respect for it."

— Jill Foley

After the festivities — and marking his career at PPPL — it is on to the next challenge for Cylinder. So far, his creative juices have not diminished, and he hopes he can continue to be inventive. "I always want to come up with new ideas. I don't want to get stagnant," he said. ●

Co-workers Pay Tribute to Tom Gibney

PPPL computer programmer Thomas Gibney died April 9 at his home, surrounded by his family. Ocular melanoma was the cause of his death. Gibney, remembered as a superb programmer who loved solving problems and deeply enjoyed the world around him, was 56 years old.

"Tom was a superb C programmer. He was a tool builder. He loved to make his code efficient and elegant. He was perfect for the control system. Paring microseconds off complex processes presented the perfect challenge for him," said PPPL Principal Software Engineer Phyllis Roney.

She joined others in describing Gibney as "mellow" and "relaxed" — even during not-infrequent computer crises — and full of generosity. "He was always willing to give his time to help you solve your problem. He loved solving problems," she said.

Added PPPL physicist David Gates, "Tom was a brilliant programmer who was always at the center of making NSTX run. He worked in a high-pressure environment, but always made things seem relaxed and easy. He was a good friend who suffered a terrible disease for many years, but always insisted on living life to its fullest. I miss him."

Steve Davis, Head of PPPL's Computer Systems Development, said, "Tom left a real vacuum at PPPL, not because he was such a superb engineer, which he was, and not because he made such important contributions, which he clearly did, but because he treated us all as his friends. His continuously cheerful and engaging attitude made it a pleasure to interact with him. In all the years I knew Tom, I never heard a single harsh or unfriendly word. He was always friendly and cooperative. Thanks, Tom, for your patience with us. And I promise I'll never chide you again for being late with your time-sheet."

Gibney, who received a bachelor of science in humanities from the Massachusetts Institute of Technology in 1972, moved to Princeton in 1975, where he worked for Princeton University until his death, including at the Princeton University Library, the Department of Astrophysical Sciences, and finally, for the past 22 years, as a computer programmer at PPPL.

Said PPPL Software Engineer Bill Davis, "I thoroughly enjoyed working with Tom these past 22 years. He was a world-class programmer with problem solving skills that seemed uncanny at times — most of the time, actually. If he was on your project, you knew there was a great likelihood of success. When someone else would get stuck on a problem, whether an arcane idiosyncrasy of the VMS file system, or twiddling bits in the bowels of a control and data acquisition system, or needing a sophisticated C program to do something that seemed possible only in your dreams, Tom was *The Man*."



Davis recalled Gibney's sense of humor and unique personality, as well as his humbleness and willingness to always help out. "Tom was a great programmer, but his personality was an even greater contribution to my working pleasure," said Davis, who enjoyed swapping stories with Gibney about sports and their kids.

Outside work, Gibney enjoyed spending time with his family and playing music. Gibney was devoted to his wife, Patricia, and their two sons, Michael and David. He also played several musical instruments and was a respected singer of traditional songs. He appreciated the songs of Ireland, where his parents were born, but was especially known for singing American and British ballads and songs. He did many solo performances at folk festivals and also sang with several groups.

He also enjoyed sports. PPPL UNIX System Administrator Kenny Silber recalled Gibney as a "great listener" during their many chat sessions about sports, particularly Princeton athletics, including Princeton Baseball. Silber recalled a Computer Division competitive softball game that pitted hardware against software folks.

"Tom, on the software team, came into the game in the later innings when the hardware group was ahead. Well, Tom hit a triple and the software group won the game. The way he ran around the bases reminded me of Ted

Williams (a Hall of Famer who played for the Red Sox). I started calling Tom the "Splendid Splinter," the nickname for Williams. I think Tom got a real kick out of that. And it was a fitting nickname. Williams was a proud, well respected professional — one of the best who ever played the game — and I think that's how most of us felt about Tom. He was one of the best there was," said Silber.

Gary Oliaro, Computer and Network Engineering Branch Manager at PPPL, described Gibney as "truly a unique and special individual."

"He had the most wonderful quirky and self-deprecating sense of humor. His mild-mannered, soft-spoken nature had

a wonderful calming effect on me and others. His heroic fight against cancer while maintaining a demanding software schedule was awe inspiring to all of us," said Oliaro.

PPPL physicist Stephen Paul offered, "If I can muster one ounce of the grace and serenity of Tom Gibney and his family in the face of such difficult circumstances, I will consider myself to be very accomplished."

A memorial service was held April 16 at the Princeton University Chapel. Memorial contributions may be made to the Trenton Area Soup Kitchen (TASK), P.O. Box 872, Trenton 08605. ●

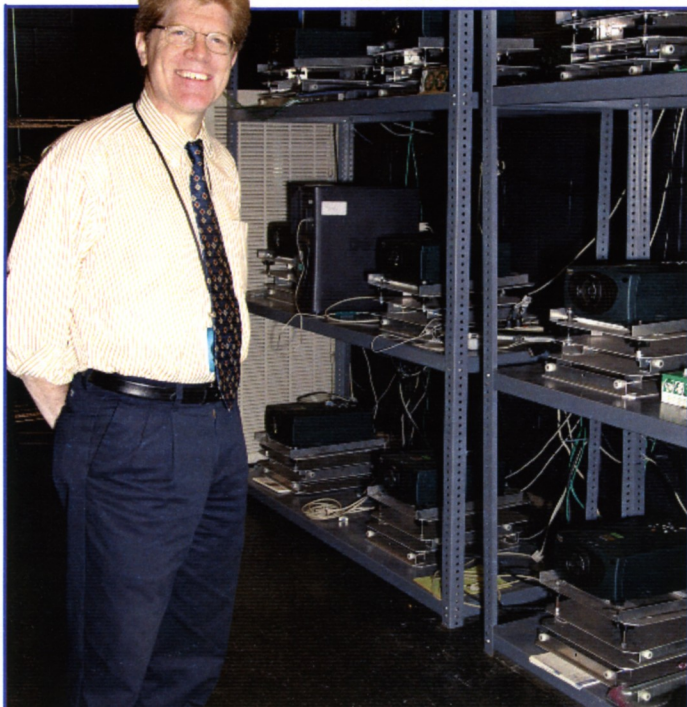
Michael Gibney Delivers a Remembrance of His Father at Memorial Service

On behalf of my family, I want to thank you all, my father's friends, for everything that you've done for him and for us. Your love and support has meant the world to my family. I want to speak a little bit of some impressions I have of my father... from the almost unique experience of being his son. Thanks to my mother and brother for helping me in preparing these words.

When I was two years old, my parents took me to the zoo. Of all the animals I saw there... tigers, elephants, giraffes... the ones that most fascinated me were the small brown sparrows. I don't remember much from when I was two years old. I know this story because it was one of my father's favorites. You could tell so much about my father's personality from the way he told this story. His love for his family, and his appreciation for the small things... for the details in life... came through so clearly. My father appreciated and enjoyed the world around him so intensely... nothing was ever old to him. Not only did he think it was cool that I was fascinated by the sparrows... he was fascinated with the sparrows... fascinated by me... by the idea that nothing is mundane, if you look at the world in the right way. This quality influenced every aspect of his life, and every aspect of our family's life. It made him a wonderful friend, husband, and father. His love and care for his friends and family did not arise from a sense of obligation, but from a sincere and deeply felt enjoyment of the world around him.

He appreciated sincerity and genuineness, in life and in music. He believed and felt every song he sang, every tune he played, every word he said, and everything he did. This first became apparent to me through his music, but I believe that his musical sincerity was simply an extension of the principles by which he lived his life as a whole. Of his principles... he liked for things to be clever, neat... he thought carefully about how to do things, and always had reasons for doing things in the specific way he thought was best. This may sound a bit serious for someone who would often howl, in a surprisingly convincing wolf imitation, many mornings when he got out of bed.

But seeming contradictions never bothered my father. He was silly, and he was serious. He was self-effacing and he was self-assured. He was gentle and he was intense. The common thread tying his personality together is that he was himself, always. It is comforting to know that he will always be himself... as a part of our family, and as a part of all of our lives. ●



Name: Irving Zatz

Positions: Senior Structural/Mechanical Engineer in the Mechanical Engineering Division. Current responsibilities include providing analytical support for the magnetic coils on the National Spherical Torus Experiment (NSTX), working on the High-Resolution Wall Project, and setting up the NSTX Control Room visualization wall. In the past year, he also has assumed the duties of a Quality Assurance Engineer in the ES&H/IS Department. In addition, Zatz is involved in developing the engineering structural design criteria for all fusion devices at PPPL. He is an active participant in the Laboratory's outreach efforts, serving as a frequent tour guide, Science Bowl and Open House volunteer, and Fusion Day participant in Washington, D.C.

Quote: I knew I would be a structural engineer going into college, but I never knew I would be involved in designing fusion devices — I thought I would be doing skyscrapers and bridges. I ended up in the air and spacecraft field at Grumman Corp., which led me to PPPL. I came here more than 25 years ago as a Grumman Corp. contractor working on TFTR as the "TF or toroidal-field coils guy" and never left, eventually becoming a PPPL employee.

Zatz says he has stayed at the Lab because it fits in well with his lifestyle. "It is a good working environment with great people and a sense of community."

Other interests: Family, music, travel, dining, community service, and sports dominate Zatz's free time. At the top of his list is spending time with his wife, Janet, and their sons Jonathan, a junior at the University of Pennsylvania, and Eric, a junior in high school. "My wife and I really love to travel and eat. We often take our vacations at national parks, where we enjoy horseback riding." The couple has saddled up in Yosemite, Yellowstone, and the Great Smokey Mountains. Their favorite spot to ride is Monument Valley, Utah. "We've taken all kinds of trips, visiting many U.S. states, the Far East, and Europe," Zatz says, adding that they sample the local fare wherever they go, from steaks to sushi.

Zatz is a music lover, expert, and collector, as anyone who has attended a PPPL party knows. He is responsible for putting together the music mixes for the picnics, holiday bashes, and celebrations. "If people need music at the Lab, somehow someone calls me," Zatz notes. He is a self-described music buff of all genres, except country. He plays acoustic and electric guitar — he was in a band in college — and has a large collection of music in his home. "I have a piece of furniture in our house that I designed to accommodate as much musical equipment, records, tapes, and CDs as possible, but it is not big enough. It is full and overflowing," he says, estimating that he has well over 1,000 records, tapes, and CDs. "I haven't been stumped yet when asked for a recording of a song."

He is active in his local community of West Windsor Township. Fifteen years ago he was concerned about local traffic, especially about roads becoming highways. So he designed a new road for the township — one-lane in each direction flanked by a grassy median and a bike lane, with speed limits of 35 miles per hour. Any main thoroughfare in the township built since 1990 conforms to the Zatz design, which earned him a Community Service Award from West Windsor.

He has served on the road planning and traffic committees in his municipality and was president of his homeowners' association. "My wife and I grew up in the New York City suburbs and then moved to the wide, open spaces of Central New Jersey more than two decades ago. I enjoy being active in the community, including at PPPL, which is like a small community," says Zatz.

Zatz, an avid Mets fan, also is a sports enthusiast, playing in competitive baseball and basketball leagues before switching to coaching when his sons were sports participants.

Oh, and he seems to have some writing, graphics, and audio mixing skills. But when asked about his relationship with Anonymous, the authors of the annual PPPL Holiday Ski, Zatz coyly replies, "We're just good friends." ●