

HOTLINE

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

Princeton and InSitech Sign Licensing Agreement to Commercialize MINDS

Nuclear Detection Technology Developed by PPPL Could Boost Homeland Security

Princenton University and InSitech, Inc. have signed a licensing agreement for InSitech to commercialize an anti-terrorism device developed by PPPL. The device, the Miniature Integrated Nuclear Detection System (MINDS), would have applications in transportation and site security.

MINDS would be used to scan moving vehicles, luggage, cargo vessels, and the like for specific nuclear signatures associated with materials employed in radiological weapons. The system could be employed at workplace entrances, post offices, tollbooths, airports, and commercial shipping ports, as well as in police cruisers, to detect the transportation of unauthorized nuclear materials.

"We are very pleased that technology we have developed through our fusion research at PPPL can also make an important contribution to Homeland Security. This is

a very good example of the kind of cooperation that can be most effective for the nation," said PPPL Director Rob Goldston.

A team of PPPL researchers led by Charles Gentile designed a prototype system and InSitech, through the licensing agreement signed March 28, has certain rights to the commercial development, manufacture, use, and sale of the product.

InSitech is a not-for-profit organization working for the U.S. Army to bring government-developed technology to market. InSitech's Chief Executive Officer Timothy N. Teen said, "We enjoy our relationship with the Princeton-PPPL team and are proud of our involvement with MINDS. This agreement typifies InSitech's initiative to transfer federally funded technology into the commercial sector."

Continued on page 3



Photo by Patti Wieser

Andrew Post-Zwicker (left) and Elle Starkman with their collaborative art, "Plasma Table," at left.

PPPL "Artists" Win Art of Science Competition

PPPPL's Elle Starkman and Andrew Post-Zwicker won the first-place prize May 3 for their photographic submission, "Plasma Table," in the "Art of Science" Competition at Princeton University. Starkman's and Post-Zwicker's winning artwork, for which they received a \$250 prize, is displayed at the Friend's Center for Engineering Education, along with several of the other top submissions out of more than 200 received. Starkman is PPPL's staff photographer and Post-Zwicker is the Head of the PPPL Science Education Program.

They found out they were the first-place winners while attending a reception for the top 50. Starkman said

Continued on page 2

ART

Continued from page 1

she was “stunned” to hear their names announced. She and Post-Zwicker worked on the photo project in 2003. “We weren’t shooting for the beauty of it. We were documenting the science,” said Starkman.

Plasma Table, also called Dusty Table, is a photograph of a dust cloud of silica microspheres illuminated by laser light and suspended in a plasma. The dust cloud is approximately 0.5 inches high and floats in a conical shape between the dust tray and an electrode as long as the plasma is maintained. Fundamental dust cloud properties and dynamics have applications ranging from plasma processing to space plasmas.

Plasma Table was created when Post-Zwicker asked Starkman to take a picture of a dusty plasma, a student experiment in the Science Education Lab involving undergraduate and high school students during the last 18 months. Starkman used an Olympus digital camera for the complicated task. The machine is tiny and the shot had to be taken inside and in the dark.

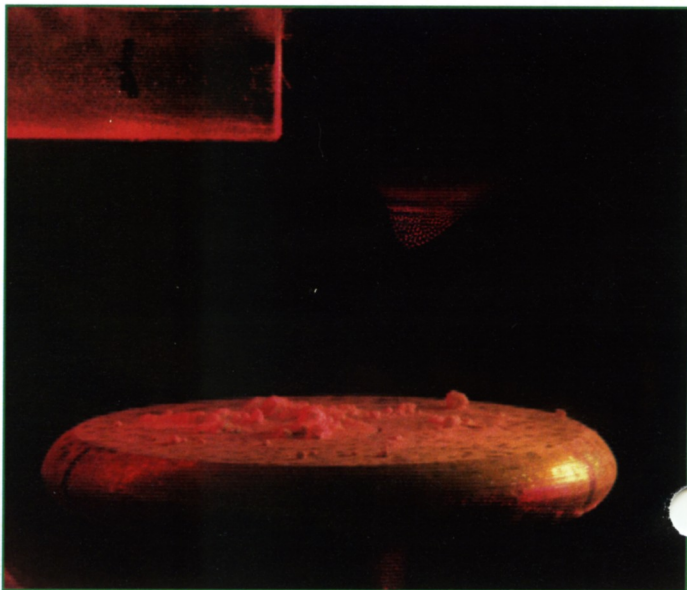
“All we had was a laser to light it,” Starkman recalled. “The challenge was focusing on it in the dark, which I did manually, and doing a still of the particles suspended in the plasma. We were trying to get the depth of field and bring everything into the image — the electrode and the particles. I took many shots, going to the Science Ed Lab four days in a row for short bursts of time. That was one of the toughest shoots ever.”

Starkman, who came to PPPL in 1997, noted how students in the Science Ed Lab controlled the dusty plasma experimental device and built small mounts and gadgets that would help with getting the image. Post Zwicker, who would call her when the experiment seemed right to photograph, explained, “We couldn’t get a regular tripod close enough so the students made a mount where the camera could be placed.”

The two, with the help of the students, would document the focal length, the shutter speed, and the exposure time. The result was winning, and the prize, said Post-Zwicker, was “totally unexpected. “I have always been personally fascinated by the blurring of the boundaries of art and science. For a long time, we’ve used plasmas in classrooms because they are so beautiful and this was another way to use them,” he said.

When Post-Zwicker saw the notice for the competition this spring, he talked to Starkman and they came up with some photos to submit. “I knew we had images from a variety of different experiments that were suitable. We spent our time studying the cloud in the dusty plasma experiment for its physical properties and take for granted its intrinsic beauty,” he said.

The competition was launched by students and faculty from a number of departments seeking entries of images that came directly from research in science and engineering or works by artists incorporating tools and concepts from



“Plasma Table,” by PPPL’s Elle Starkman and Andrew Post-Zwicker, won first place in the “Art of Science” contest. The image features a dust cloud of silica microspheres suspended in a plasma and illuminated by laser light.

science. Images were submitted by students, faculty, and staff from 16 departments across campus. The contest and exhibition were created to get people at Princeton who use imagery as part of their research more involved in the visual arts program and in the arts in general.

Both Starkman and Post-Zwicker agree their winning entry was a true collaboration, with neither being able to produce the art on his or her own. “She is so amazingly talented. That was an incredibly difficult photo to take,” said Post-Zwicker of Starkman.

Added Starkman, “I couldn’t have done it alone.” ●

Hotline

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Layout: Patti Wieser

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MINDS

Continued from page 1

MINDS, which combines many off-the-shelf components with specific nuclear detection software, is capable of detecting X-rays, soft gammas, gammas, and neutrons. The system is specifically designed to identify, in real-time, gamma emitting radionuclides at levels slightly above background and in radiologically noisy environments. Radionuclides can be recognized and differentiated from one another since each has a distinctive energy signature or "fingerprint." MINDS compares the energy spectrum of the detected radionuclide with the spectra of particular radiological materials that might be used in weapons. While InSitech proceeds with commercialization of the product, PPPL will continue to develop the library for MINDS, collecting data for radionuclides.

The MINDS system is configured to employ a lap-top computer and can also be used with other types of processors for the storage of radionuclide databases. The unit uses proprietary detection software, and three different radiation detectors, or heads, to cover a wide gamut of nuclear signatures. It would typically be able to detect radiation — dependent on source quantity — from several feet away and would identify the type of radiation, but not specifically the quantity. System hardware could be configured with one, two, or more heads to suit the needs of law enforcement and Homeland Security officials. For instance, airport officials might be interested in detecting materials such as cobalt or cesium that could be used in a "dirty" bomb. At tollbooths or in police cruisers, the system would be tuned to recognize but not sound an alarm for radioactive materials with legal uses such as medical radioisotopes. It will be programmed to respond only to signatures of threat-specific radionuclides, greatly minimizing false positive alarms. MINDS also would be able to detect some shielded materials since shielding often results in the generation of X-rays of certain energies.

"The MINDS system is a sophisticated solution that can identify — not just detect — in real time, one-one-billionth of the material required in a dirty bomb, yet it is cost effective, easy to use, and can be deployed as a stand-alone device or as part of a larger system. MINDS has achieved successful results in field trials, and we have recently secured extended demonstrations, and full-scale deployments, with customers and government agencies to further validate this compelling breakthrough," said Teen.

Once a unit is in place, law enforcement agencies would incorporate it into an alerting system. For example, it could be set up at a tollbooth so that when a suspicious vehicle is detected, a picture would be taken, and an e-mail or wireless alert would be sent to authorities. The vehicle could then be stopped a short distance beyond the tollbooth.

For more information about MINDS, go to www.pppl.gov, select publications, and then go to PPPL Digests and choose, "PPPL Researchers Develop Anti-terrorism Device."

The MINDS team from PPPL includes Bill Davis, Charlie Gentile, Steve Langish, Dana Mastrovito, Lewis Meixler, and Kenny Silber. ●



At a recent meeting at PPPL to discuss upcoming MINDS deployments for homeland security applications are, from left, PPPL's Lewis Meixler; Picatinny Arsenal's Tom McWilliams; PPPL's Kenny Silber, Bill Davis, Steve Langish, and Charlie Gentile; Advanced Logic Systems' Kaydon Stanzone and Michael Fisher; and InSitech's Roger Adams.

Running PC Programs on a Mac Computer

Have you ever needed to run a Windows program on your Macintosh computer? The recommended solution is to use the Microsoft Desktop Connection tool available for Mac OS X. With this tool you can connect to the PPPL Windows application server called TERMSRV and run the installed applications.

The tool accomplishes this by connecting your keyboard, mouse, and monitor to this server. The server runs the applications, with good response. This server is available to

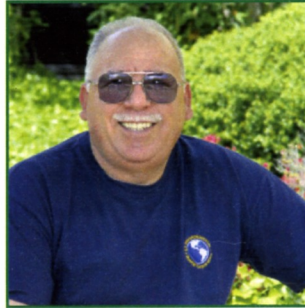
use outside the Lab if you are authenticated at the PPPL firewall. Detailed instruction on how to establish a connection to TERMSRV can be found at <http://user-support.pppl.gov/Guides/RDC>. If the application needed is not installed on TERMSRV, please let the HelpDesk know so it can investigate the possibility of including this for you. If you would like to see a demonstration of the Microsoft Desktop Connection tool, please stop by the Computer Help Desk (B-153). ●



Best Wishes Retirees



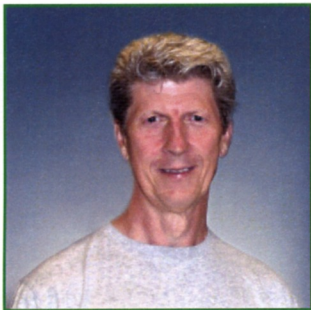
Dori Barnes



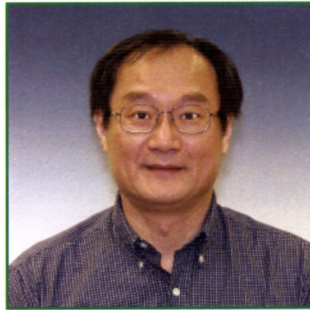
Robert Cancel



Joseph Frangipani



Trevor A. Bayes



Chiao Zong (Frank) Cheng



John M. Gennuso



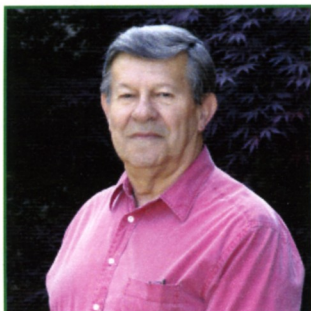
Dolores P. Bergmann



Steven L. Davis



Gerald J. Hart (right)



Richard W. Borusovic



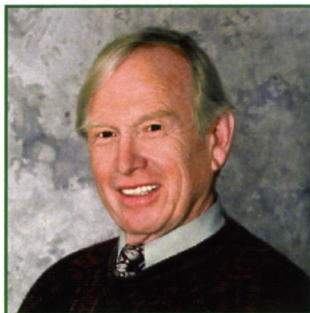
Bobbie N. Forcier



Aleksandar V. Ilic



Stephen G. Kemp



Robert F. Parsells



John A. Schmidt



Dale M. Meade (center)



Carol A. Phillips



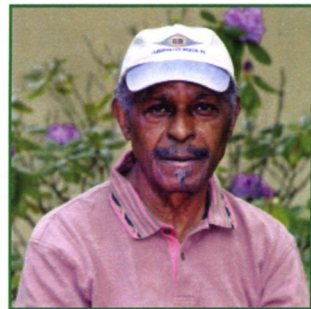
John K. Semler



Sallie Meade



Carl Potensky



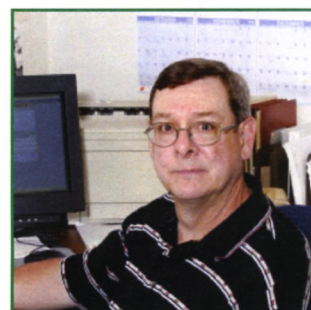
Roland H. Snead



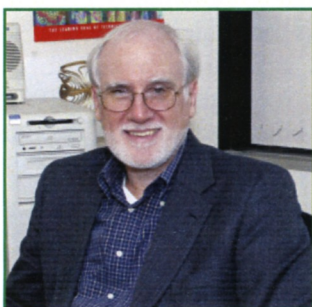
John E. Mount



Martha H. Redi



John W. Wheeler



Gary E. Oliaro



Gerd Schilling



Loretta H. Wohar

Progress for Women in the Division of Plasma Physics

by Martha H. Redi, PPPL Principal Research Physicist

While the representation of women in physics remains low (approximately 15 percent of physics Ph.D.s), their representation in certain fields is smaller yet. Five years ago, in response to many discussions with women in the Division of Plasma Physics of the American Physical Society (DPP-APS), we surveyed the situation for women in plasma physics and subsequently drafted a letter to the APS Executive Committee that was signed by 20 percent of the women who were members of the DPP. The letter pointed out that there were anomalously few women in the Division (roughly half the percentage found in other Divisions of the APS), very few women fellows in plasma physics and that while we greatly enjoy working in the field, we felt that women's contributions to the field were not being appropriately recognized through receiving invited talks, Division committee assignments, or being elected to fellowship in the APS.

In fact, the changes in DPP are nothing short of astounding.

Five years later seems an appropriate time to take stock of how things have changed in the DPP. In fact, the changes in DPP are nothing short of astounding. The response by the leadership of the DPP to the women's letter was swift and far reaching. They were very concerned by the statistics presented, which painted a picture they had not clearly seen before and the issues facing women DPP members. A standing committee was established, the Committee for Women in Plasma Physics. This Committee serves the DPP by monitoring the membership, the number of invited talks given by women at each meeting, the distribution of committee assignments, the assignment of session chairs and, most importantly, advocating for the nomination and election to fellowship of well-qualified women in the Division.

One of the DPP's first actions was to establish an award for the most outstanding early career woman (within ten years of receiving her Ph.D.) in plasma physics. \$30,000 was raised, half from Division funds and half from friends and colleagues of Dr. Weimer, for whom the award was named. Katherine E. Weimer was a pioneering, research physicist at PPPL. She made many important contributions to research advancements in magnetohydrodynamic equilibrium and stability theory for magnetically confined plasmas. In 2003 the first recipient of the award was selected, Professor Yu Lin of Auburn University. Professor Lin was recognized for her theoretical and computational research in nonlinear physics in the boundary layers of space plasmas. The second call for nominations was issued with a deadline of April 1.

The APS has provided assistance to the Division as well through arrangements for a networking luncheon for women at the annual DPP meeting, held on the first full day of the conference. This luncheon has grown to 40-50 women, with typically at least half of the participants being students. The DPP Executive Committee underwrites the cost of this lunch so students can attend for \$10. Another very popular activity is the Women in Plasma Physics Reception, held the first evening of the conference. The Reception is attended by hundreds of conferees, both men and women, and features a speaker discussing an issue relevant to concerns of women in physics along with complimentary refreshments. This event is an opportunity to provide attendees with information and resources for improving the situation for women in physics at their home institution, as well as to build a network of women in plasma physics.

One of the key indicators of technical success is the recognition of being asked to give an invited talk at the annual meeting. Such recognition is critical to career advancement and, for early career scientists, to finding a job. Due to the diligence of the Committee for Women in Plasma Physics and the efforts of the DPP Executive Committee to raise the awareness of conference program committees, women are now regularly receiving these important invitations.

Finally, the Committee has worked to ensure that deserving women are being nominated for fellowship in the DPP. An APS investigation of the number of women fellows has indicated that women were being elected in rough proportion to the rate at which they were being nominated. This suggested that many successful women in plasma physics needed sponsors and DPP members were strongly encouraged to consider nominating a female colleague. The number of women fellows in the DPP has grown from four to 17 since 1999.

The representation of women in leadership roles in the DPP has also improved dramatically. The present chair of the DPP is Jill Dahlburg, of the Naval Research Laboratory and the chair-elect is Melissa Douglas, of the Los Alamos National Laboratory. Martha Redi (PPPL) is chair of the Nominating Committee, Gail Glendinning (Lawrence Livermore National Laboratory, LLNL) is the chair of the Committee for Women in Plasma Physics, and Christina Back (LLNL) is a member of the APS Executive Committee. In addition, women plasma physicists are being included on important national committees advising DOE. Cynthia Phillips, PPPL, and Amanda Hubbard, MIT, have participated in FESAC panels in the last few years.

Continued on page 7

Redi Receives DOE Mentoring Award



PPPL Principal Research Physicist Martha Redi recently received the Outstanding Mentor Award from the Department of Energy's Office of Science. The citation, which honors Redi for her mentoring efforts in 2004, reads, "In recognition of your dedication as a mentor, to share knowledge and to inspire and instill confidence in the next generation of scientists and engineers by setting high expectations, seeking for creative solutions, and immersing inquisitive minds in the world of science." Redi is the only PPPL recipient of the 2004 award, which is given through the Office of Science Undergraduate Research Program.

PPPL Director Rob Goldston (left) and PPPL Deputy Director Rich Hawryluk (right) congratulate Redi on receiving the award. Congratulations, Martha! ●

Women

Continued from page 6

In the academic community, progress is being made as well. More than 20 percent of graduate students in plasma physics programs at major research universities are women and we are pleased that the environment in which they will pursue their careers is steadily improving. However, there are still concerns to be addressed. For example, while women are relatively well represented in astrophysics and space plasma faculty, there are only two female professors of fusion science plasma physics (Linda Vahala, Old Dominion University, and Halima Ali, Hampton University) versus 105 male professors in this subfield.

A great deal has changed in the DPP. The response of the DPP leadership to the concerns of the women members has been overwhelmingly positive and effective. The lesson from the experience of the women in the DPP is that it is worthwhile to raise awareness of issues and to continuously monitor progress.

At PPPL, six women plasma physicists, Martha Redi, Cynthia Phillips, Elena Belova and Jin Chen, along with Jill Foley and Karen Hirst of Nova Photonics, contribute to research on NSTX and Theory projects. The Princeton University plasma physics graduate program includes five young women, Emily Belli, Stephanie Diem, Laura Berzak, Yansong Wang, and Xiaoyan Ma. ●

— This article was published in the Spring 2005 issue of the American Physical Society's *CSWP Gazette*. CSWP is the Committee on the Status of Women in Physics.

Vehicle and Pedestrian Traffic Concerns

Traffic signs and speed limits are posted for the safety of everyone. PPPL roadways are often narrow with limited visibility. Reducing speeds and observing posted signs increases the level of safety for all.

PPPL experiences a high volume of pedestrian, slow moving, and wildlife traffic on our roadways. Disregard for caution can only lead to disaster. For your safety and the safety of others; always operate vehicles with extreme caution, especially in the construction areas on Campus and Stellarator Roads.

When you are proceeding through the front gates on foot remember that although the vehicle gates have safety features built in, the safety features are triggered by sensors that are designed to detect the weight of a vehicle, not an individual. Walk around the gates, not between them. Please do not risk it. The force from the closing gate would severely injure any person struck or trapped by these devices.

If you need further information, please contact Site Protection for a copy of the PPPL Parking and Traffic Regulations. Thank you for your cooperation. ●



PPPL Garners Small Business Administration Award



At the award ceremony are (from left) SBA's Allison Randolph, Princeton University's Michelle Christy, PPPL's Arlene White, SBA's William Manger, PPPL's Rodney Templon and Rob Goldston, SBA's Larry Hansen and Janette Fasano, PPPL's Ed Winkler, and U.S. Department of Energy's Greg Pitonak. The award is on display in the Director's Office lobby.

On May 19, Representatives of the U.S. Small Business Administration (SBA) presented PPPL Director Rob Goldston with an "Award of Distinction" in recognition of the Laboratory's "Outstanding Public Service" in providing subcontracting opportunities and assistance to small business. This is the second time the Laboratory has received the award. Less than two percent of SBA's portfolio of large contractors are active recipients of this award. Denise Benjamin, SBA's Acting Associate Director for Government Contracting, said in a letter to Goldston, "I especially wish to commend Arlene White, Small Business Liaison Officer [at PPPL]. She shows exceptionally strong support of the company's small business program and plays a significant role in promoting opportunities for small businesses at your company. Her efforts have produced significant results." ●

PPPL Celebrates April as "Earth Month"

In observance of "Earth Month," Materiel and Environmental Services, and Maintenance and Operations set up displays in the Lobby in April about how PPPL is protecting the Earth. The exhibits covered recycling and buying recycled products; energy use and conservation; and a preview of the upcoming Environmental Management System [EMS].

As part of the observance, a contest that included environmental questions was held. The contest winners — Spence Holcombe, Bill Slavin, and Cheryl Such — answered all the questions correctly and each received awards made of recycled materials.

Spring Clean Up

April was also "Spring Clean Up" and PPPL reached a 58 percent trash recycling rate. "We have a goal of an annual trash recycling rate of 55 percent and we are at 51 percent so far, so we are asking staff to keep up the clean-up attitude. A clean work area is also a safe work area," said PPPL's Tom McGeachen, one of the co-organizers of the Lab's Earth Month activities. ●



At the Earth Month exhibit are, from left, PPPL's Jack Anderson, contest winners Cheryl Such, Bill Slavin, and Spence Holcombe, and PPPL's Margaret Kevin-King, one of the exhibit and contest co-organizers.