

DOE Awards Technology Transfer Personnel Exchange Grants

Hulse, Skinner are Project Leaders

The first-ever Department of Energy awards to PPPL for technology transfer activities have been granted to two Lab physicists, Russell Hulse and Charles Skinner. These six-month awards support personnel exchanges among staff from the Lab, private industry, and universities, according to Richard Rossi of the PPPL Office of Technology Transfer.

Explains Rossi, "The main purpose of this 'seed money' program is to trigger technology transfer interactions that can lead to collaborations, such as formal Cooperative Research and Development Agreements (CRADAs), which are designed to spark innovative uses of technology and thereby enhance this country's global economic competitiveness."

"Hulse and Skinner are to be commended both for their ingenuity and for bringing this honor to the Laboratory," commented PPPL Director Ron Davidson.

Hulse

The Hulse project, titled "Advanced Computer Modeling Environments," involves a three-way partnership of PPPL, Rutgers, and Superconcurrency System Solutions, Inc. (S³ Inc.). The purpose of the project is to create tokamak plasma transport codes that are more flexible and easier to use. (See page 2 for story about the project.)

In addition to Hulse, Walter Stark will provide software engineering



Photo: D. Applewhite

Charles Skinner (left), PPPL Director Ron Davidson, and Russell Hulse discuss the implications of Personnel Exchanges for Technology Transfer purposes.

expertise for PPPL. Participating from Rutgers is Professor Richard Peskin of the Rutgers University Center for Computer Aids for Industrial Productivity (CAIP). He

"The main purpose of this 'seed' money program is to trigger technology transfer interactions that can lead to collaborations, such as CRADAs..."

will be on site at PPPL intermittently this fall. Christopher Nicklaw of S³ completes the partnership. He

will work closely with Hulse, Stark, and Peskin to modify and develop appropriate software to utilize the full potential of currently available computers.

Comments Hulse, "Ultimately, projects like this can help redefine the relationship among industry, government laboratories, and universities. Personnel exchanges are an excellent first step because they encourage the necessary communication among the three sectors that allows us to pull together and thus develop useful technologies."

"Each of the three partners will be contributing expertise, and each will benefit from the research and development results, so it's a win, win, win situation," observes Hulse.

continued on page 2

Tech Transfer Grants

continued from page 1

Skinner

The Skinner project, titled "*Direct Soft X-ray Imaging with CCDs*" (charge-coupled devices) involves collaboration with Yair Talmi, President of Princeton Instruments Inc., a small company in Trenton, New Jersey. The company develops scientific imaging devices using CCD-based systems. CCDs

convert light photons into electronic signals that produce images, for example, as in a video camcorder. (See page 3 for a story about the project.)

Says Lew Meixler, Head of the PPPL Office of Technology Transfer, "We're delighted that both these projects have been funded. Each has great potential to expand the technology horizons of all parties

involved and to eventually lead to full-fledged CRADAs. The impact could be significant in terms of expanded financial and employment possibilities arising from innovative uses of these technologies in the participating companies. At the same time, technically challenging and intellectually stimulating work will be brought to the Laboratory." ♦

Advanced Computer Modeling Environments

The purpose of the "*Advanced Computer Modeling Environments*" project is to develop advanced approaches to scientific computing that encourage innovative work by enabling the creation of powerful yet easily modifiable computer codes.

According to Principal Investigator Russell Hulse, computer codes are difficult to modify, and users tend to stick with tried and true methods. Therefore, new, innovative approaches to research that relies on such codes are often ignored in favor of long-standing approaches.

In this project, two building blocks will be used to make powerful computer modeling more accessible and attractive to users. First, codes will be encapsulated into modular chunks. These modules can then be plugged together to create "modular reconfigurable codes" to meet the user's specific needs. These modules will allow the user to avoid working at the computer language level when modifying a code.

Observes Hulse, "These modules, which can come from well-established and trusted existing codes, will then be available for sharing and reuse. In addition, new modules can be written for encapsulation in whatever computer language is convenient."

According to Hulse, tokamak transport codes will be used as a testbed application environment. To make module choices from these codes accessible to users, a flow-chart-like graphical representation of the computer model will be developed. Development of this point-and-click graphical user interface, (GUI) will use object-oriented methods—an area in which the Rutgers group has extensive expertise.

The other major building block will be the use of HARNESS software donated by S³ Inc. HARNESS will be configured to provide a blackboard approach to handling inter-module communications. Using HARNESS, different code modules in different languages running on different computer workstations and processors can transparently transfer information back and forth.

The combination of the use of encapsulated modules and a blackboard approach will allow the many aspects of a complex computational task to be combined by the user into a unified whole. It will also allow the resulting code to run in a distributed or parallel fashion across many separate (and possibly very different) individual computer processors.

Notes Hulse, "Such an advanced computer environment would take

advantage of the rapidly expanding power and diversity of available computing resources, while simultaneously making this power more accessible to an ever-wider range of potential users."

Research, Commercial, Educational Benefits

"The ease of access to powerful computational modeling that this project could provide would be unprecedented," observes Hulse, "and it would enhance performance, productivity, and competitiveness in the research, commercial, and educational sectors."

The three-way collaboration in this project is expected to benefit all parties involved in various ways. For example, PPPL will gain through the development of a state-of-the-art computing environment in support of magnetic fusion.

In addition, Rutgers will gain access to the rich application domain available at PPPL and will benefit from the expertise here to further its research and education objectives. And finally, the S³ company will benefit from the opportunity to develop advanced computing products in the context of understanding and satisfying the needs of PPPL's complex fusion research effort. ♦

Direct Soft X-ray Imaging with CCDs

The purpose of the "*Direct Soft X-ray Imaging with CCDs*" project is to explore the possible applications of CCDs to direct imaging of soft X-rays, according to Principal Investigator Charles Skinner. PPPL's X-ray Laser Project will provide the soft X-rays and instrumentation, while Princeton Instruments will provide the electronics to control the CCDs.

Soft X-rays and CCDs

Soft X-rays are those in the longer wavelength part of the X-ray spectrum. They are termed "soft" because they emit less intense energy than shorter wavelength X-rays, termed "hard" X-rays. (Hard X-rays are used for bone and dental diagnostic images.) During the mid 1980s, one of the first soft X-ray lasers (SXL) in the world was developed at PPPL by the X-ray Laser Group, under the direction of Professor Szymon Suckewer.

Best known for their impact on video camcorders, charged-coupled devices (CCDs) capture light photons and convert them into electronic signals to create an image. (Because of their very high sensitivity to light, CCDs allow video camcorders to record images in very low light.)

Up to now, according to Skinner, it has been necessary to convert soft X-rays to visible light in order to record soft X-ray images with CCDs. Recently, however, specialized "thinned backed" CCDs have been developed for the detection of ultraviolet light. They are predicted to be sensitive to soft X-rays, but so far this has not been demonstrated experimentally.

Says Skinner, "This project's goal is to measure the direct sensitivity of these specialized CCDs to soft X-rays. One exciting potential appli-

cation would be to enable scientists to use CCDs to "see" a much clearer picture of the generation of soft X-ray laser action in plasma than has been possible up to now."

CCDs have a very high quantum efficiency—high enough to detect even single photons in many cases. Such sensitivity will greatly enhance detection in imaging soft X-ray spectrometers, greatly increasing their capabilities and usefulness in plasma diagnostics, as well as in other applications.

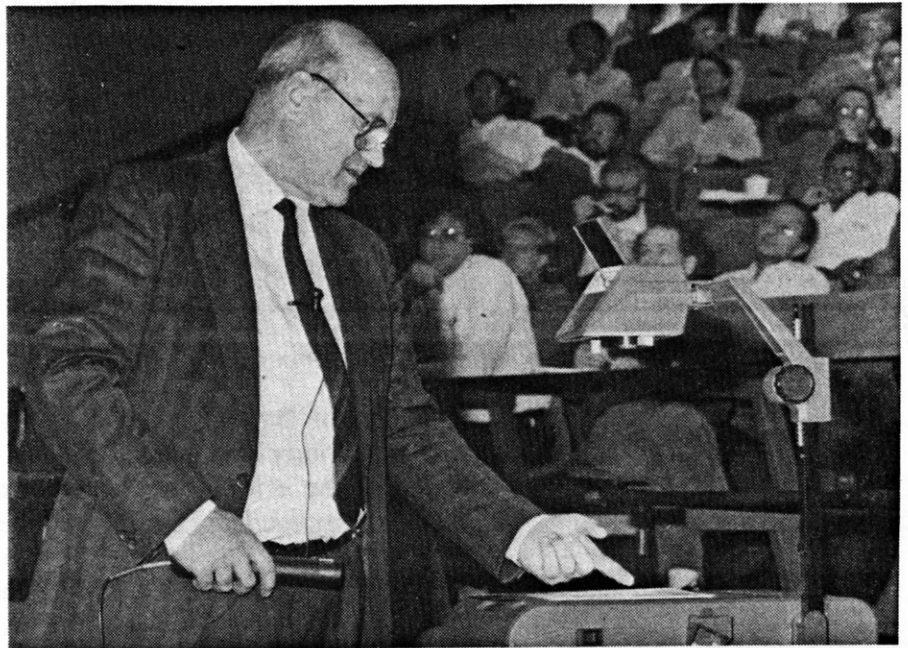
Benefits

Notes Skinner, "The capability of being able to image soft X-rays directly using CCDs in an X-ray spectrometer would enable scientists to "see" plasma emission in much greater detail than has previously been possible. Such an instrument would be particularly attractive in experiments where the cost of each

plasma shot is high, since it would greatly increase the quantity and quality of experimental data obtained."

He adds, "Knowing the level of CCD sensitivity in advance will provide us with a sound basis for the development of soft X-ray imaging instruments and spectrometers. This equipment would also have important applications in such scientific fields as materials analysis, X-ray microscopy, and X-ray astronomy."

Skinner observes, "One of the most important tasks facing the national laboratories in this country is to make sure that new technology is put to work in the United States economy. Besides benefitting the research programs at PPPL, this project is a very cost-effective opportunity to create a new market for commercially available CCDs, as well as for new instrumentation for scientific and computational uses." ♦



PPPL staff listen as Paul-Henri Rebut, newly named Director of the International Thermonuclear Experimental Reactor (ITER) Engineering Design Activity, presents his talk "Towards ITER" on October 9. Dr. Rebut discussed ITER and the critical scientific issues facing a fusion reactor, as well as the managerial and political challenges facing a project involving four countries as co-partners and a worldwide complement of scientists and supporting staff at four sites.

Photo: D. Krause

Saving Gasoline, Reducing Pollution

Natural Gas Vehicles Come to PPPL

Need to take the shuttle from B-Site to C-Site or vice versa? If so you'll be riding in a van powered by natural gas! The Lab's two shuttle vans plus seven of the pick-up trucks are part of a pilot program testing the use of natural gas vehicles at the Lab, according to Chris Gillars, Head of the Materiel Control Division.

Says Gillars, "The program is being supported by the General Services Administration (GSA), which supplies the vehicles, and by Public Service Electric and Gas (PSE&G), which installed a gas line and natural gas dispensers. Project planning and support is being provided by PPPL's Facilities Engineering Division."

The program was instituted in part, as a response to a Presidential Executive Order which mandated that by 1995 all government agencies and contractors reduce gasoline consumption by ten percent



Photo: D. Applewhite

Two natural gas compressors are attached to a Lab pick-up truck and a van for overnight fill-up at the nearly completed site near the outside storage yard.

compared to 1991 levels. Notes Gillars. "The use of natural gas vans and trucks is an innovative method to meet this goal. If the program proves viable, we plan to convert as much of our fleet as possible to natural gas."

"We're beginning to see the results of our gasoline conservation efforts."

Trevor Bayes, Branch Manager for Property Management, is evaluating the effectiveness of natural gas compared to gasoline vehicles. He observes, "So far, we're getting the equivalent of about 12 miles per gallon with the vans—approximately the same as we get with gasoline."

He adds, "Natural gas vehicles have several advantages. For example, they run 50 percent cleaner,

significantly reducing the problem of emissions. In addition, they require about half the maintenance compared to an equivalent gasoline powered vehicle."

One drawback to natural gas fuel is the lack of locations that dispense it. Fortunately, the Lab now has two dispensers (located behind Receiving 3 next to the outside storage yard). Because the natural gas compressors are small, it takes about eight hours to fill up a vehicle. (Refilling operations are generally conducted overnight.) Other "local" dispensers are at PSE&G facilities in New Brunswick and in Newark.

About 1100 cubic feet of natural gas—equivalent to about 8.5 gallons of gasoline—will fill a vehicle. The fuel is carried in three storage cylinders underneath the vehicle. Since a vehicle can run for approximately 100 miles of local driving on a fill-up, natural gas vehicles cannot be taken on long trips. However, since the shuttle vans and pick-

continued on page 5



Photo: D. Applewhite

Transportation Coordinator Pat Zeedyk connects a natural gas compressor line to one of the shuttle vans for fill up.

Rutherford to Head ITER Technical Advisory Committee

Paul H. Rutherford, Associate Director for Research at PPPL, will head the Technical Advisory Committee for the International Thermonuclear Experimental Reactor (ITER). He was previously a member of the ITER Advisory Committee during the Conceptual Design Phase. (See story in July 31, 1992 *HOTLINE*.) The Committee is one of two reporting directly to the ITER Council. Explains Rutherford, "The Technical Advisory Committee will include four members representing

each partner. Our mandate is to advise the ITER Council on technical aspects of the design as well as on the research and development (R&D) program, responding specifically to charges given by the Council."

He adds, "The Management Advisory Committee, chaired by M. Yoshikawa of Japan, will advise the Council on issues of management of the design activity and equitable sharing within the R&D program."

continued on page 8

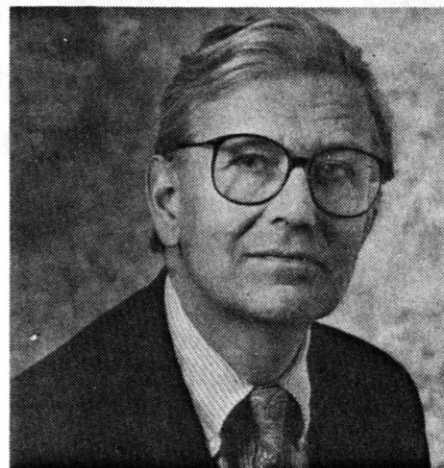


Photo: D. Applewhite

Paul H. Rutherford

Natural Gas Vehicles

continued from page 4

up trucks are meant for use here at the Lab, this is not a major drawback.

Other Gasoline-Reduction Strategies

According to Gillars, in addition to the use of natural gas vehicles, two other approaches to gasoline reduction are being used. One is to pare down the actual size of the fleet at the Lab, and this has successfully

been done. Says Gillars, "Since 1985, we have reduced the number of vehicles from 81 to 43."

He adds, "The other strategy is to replace gasoline-powered pick-up trucks with small, electrically powered "mini-trucks," similar in size and power to golf carts. Four of these are in use now, and we look forward to the arrival of five more in November. They are proving to be an excellent choice, because they

are very fuel-efficient, maneuverable, and good for the many short trips made around the Lab."

According to Gillars and Bayes, "We're beginning to see the results of our gasoline conservation efforts. With the continued support and cooperation of Lab vehicle operators in minimizing trips and fuel consumption, we can achieve our fuel-reduction goal with minimal impact on Laboratory operations." ♦



This electrically powered "minitruck" is similar to the five that will soon arrive at PPPL.

HOTLINE

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United Way Day of Caring

PPPL Volunteers Give of Their Time

In September, through a United Way *Day of Caring*, over 200 volunteers representing 30 area companies lent a hand at 30 health and human care agencies. According to PPPL United Way Chairman Angelo Candelori, among them were six Laboratory employees. "We were very pleased that several PPPL staff members volunteered and each of them reported that their time was well-spent."

Julian Cummings, Rush Holt, and Dianne Intoccia spent time telling stories and doing arts and crafts with young children at "Better Beginnings" Day Care Center in Hightstown.

Says Intoccia, "I enjoyed being with the children and watching them progress through the day. After the bad publicity United Way has gotten nationally, participating in the



Julian Cummings participates in an art project with children as a United Way Day of Caring volunteer.

good work they do locally erased any doubts I had about giving. I found volunteering was a great way

to experience one of the services we support with our donations."

Rush Holt describes his time by saying, "I worked with the children making hand prints and building with blocks. It was very satisfying because it's easy to see how much they thrive on the attention—even a few hours of a volunteer's time can make a real difference to a child." Added Holt, "The director of the center emphasized how much they depend on United Way, especially now that federal and state funding has been reduced."

Julian Cummings explained why he volunteered, saying, "As a graduate student, I sometimes feel very isolated from the wider community, and I wanted to get involved. Participating in the *Day of Caring* was a lot of fun—from singing songs to finger painting with the kids. I'd recommend volunteering to anyone!"



Angelo Candelori, PPPL's 1992 United Way Chairman (left) discusses Day of Caring plans with volunteers Rod Templon, Julian Cummings (rear right) and Harry Mynick.

Photo: D. Krause

continued on page 7



United Way—Give Generously on December 3rd



Harry Mynick volunteered at the Family Counseling Service in Bound Brook, NJ doing data entry. He says, "I enjoyed meeting the other volunteers and talking with the agency's director. I'd be interested in doing something like this again next year."

Pat Terlitz became painter-for-a-day at CYO Day Camp in Yardville where she worked with other volunteers beautifying the front of their building. She says, "God gave me three healthy children, and anything I can give back in a small way or a big way, I'm happy to do. I want to encourage others to volunteer too, because it gives you a great feeling about yourself when you know you're helping someone else."

Rod Templon spent a busy four hours at the Greenwood Avenue Home in Trenton, a facility of the Mercer County Association of Retarded Citizens. There he helped residents dress, played games with them, and helped prepare a picnic



Dianne Intoccia enjoys a moment with a child as they discuss the letter "A" at the Better Beginnings Day Care Center in Hightstown.

lunch. Says Templon, "It's good to give money to a cause, but it's much more interesting and rewarding to get involved in hands-on community service. Working at Greenwood gave me a real sense of the problems agencies deal with

every day and how we as volunteers can help."

To Volunteer

If you're interested in volunteering for just a few hours or on a regular basis, please call the United Way Volunteer Action Center at 896-1912. Brochures about the services of the Center are available through Angelo Candelori, ext. 2813. ♦



Pat Terlitz (left) proudly lines up with other volunteers in front of a wall they just painted at the CYO Day Camp in Yardville, NJ.

United Way Gift Incentives Needed



**See Mary Ann Brown
LOB-354**

Rutherford

continued from page 5

The two committees will report to the ITER Council throughout the six year Engineering Design Activity (EDA). The EDA will produce a detailed final engineering design that will be used as a basis for the possible construction of ITER.

November Meeting

The first meeting of the Technical Advisory Committee is scheduled for November 11 to 13 at the San Diego ITER Co-Center. Meetings will be held about four times a year and will rotate among the co-centers of the four ITER partners—the United States, the European Community, Japan, and the Russian Federation.

Says Rutherford, "During our initial meeting in November, the Committee will address "urgent" R&D

issues that must be addressed before next spring, when the full ITER program is defined. This is necessary so that this R&D can be initiated almost immediately."

The Chair and committee members representing the United States were nominated by the Department of Energy (DOE) and approved by the ITER Council. Other American members of the ITER Technical Advisory Committee include: Dr. John Sheffield of Oak Ridge National Laboratory, Dr. John Clarke, former Director of the DOE Office of Fusion Energy and now at Battelle Pacific Northwest Laboratory, and Edson (Tip) Brolin, former PPPL Deputy Director and presently Deputy Assistant Secretary for Civilian Reactor Development at DOE. ♦

TRANSITIONS

October Retirements

Dirck Dimock, Principal Research Physicist in Plasma Diagnostics, retired from PPPL after 35 years at the Laboratory.

Dan Huttar, Manager of BPX/TPX Power Systems, retired from PPPL after 20 years of service to the Lab.

Louise Schaufler, TFTR Administrator, retired after having worked at PPPL since 1955.

In Memory

Francis Dodd, formerly in the MG Section of Engineering, died on August 29, 1992.

Francis Lawn, who was a Power Electronics Engineer at the Laboratory when he retired in 1989, died on September 25, 1992. ♦

Holiday Closings

The laboratory will be closed from Thursday, December 24 through Friday, January 1, so get out your calendar and make those holiday plans!

Thur Dec 24 — University Holiday
Fri Dec 25 — University Holiday
Mon Dec 28 — Laboratory Closing
Tue Dec 29 — Laboratory Closing
Wed Dec 30 — Laboratory Closing
Thur Dec 31 — University Holiday
Fri Jan 1 — University Holiday

You may charge three days (Dec. 28, 29, and 30) as vacation days, or you may choose to use your two optional holidays and one vacation day. If you anticipate special problems, discuss them with your supervisor or contact Human Resources.

Paychecks

Exempt staff will receive December paychecks on Friday, December 18. Hourly staff may pick up paychecks in the Payroll Office, Module II, on Wednesday, December 23, between 8:30 am and 12 noon. Bi-weekly staff may pick up paychecks in the Payroll Office on Wednesday, December 30, between 8:30 am and 12 noon. ♦

Retirees' Ceremony



Fourteen PPPL employees who retired during fiscal year 1992 were honored during an awards ceremony and reception held October 26. Attending were (left to right) Donald Harnsberger, Richard Rossi, Joseph Davenport, Louise Schaufler, John Peoples, William Warrack, Kenneth Hobson, Dirck Dimock, Frances Dimmick, Daniel Huttar, and Joseph Baker. Also retired are Joseph File, Edmund Kaminsky, and Daniel Klinger.

Photo: D. Applewhite