September/October 2001

ON TARGET

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY • A DEPARTMENT OF ENERGY FACILITY

Lab heightens security after Sept. 11 terrorist attacks on U.S.

Jefferson Lab went into a heightened state of security immediately after the Sept. 11 terrorist attacks upon the nation. In the weeks after the attacks, security remained high.

All public events at the Lab were cancelled and access to the Lab was restricted. The Lab is resuming public events, with special arrangements in place. Anyone wishing to schedule a public event, or an event including public attendance, at the Lab (including in the ARC) is reminded to contact Linda Ware, Public Affairs manager, ext. 7689 before actually proceeding with the event. Events will be reviewed and approved on a case-by-case basis.

All Lab employees, contractors and users are requested to carry their Jefferson Lab identification badges with them at all times while they are on campus. Senior leadership also reminds everyone to regularly read the All Staff security-update e-mails to stay abreast of evolving security procedures.

Staff and users are encouraged to help ensure the integrity of security on site. Follow all posted and All Staff e-mail security procedures. Know the people who should be in your work area. Lock your vehicle. Watch for abandoned vehicles and unattended packages and suitcases. Watch for individuals asking about site operations, procedures or security measures. Report suspicious personnel or unusual activities to ext. 4444.

The Department of Energy requests that staff and users not wear clothing that could identify them as a DOE contractor, and to remove their badges when off site.

Individuals wishing to make contributions to help those impacted by the terrorist attacks upon the nation, may contact Jacqueline Bacon, Director's Office, to make a donation to the Red Cross Disaster Relief Fund; or Christine Hummel, Human Resources & Services, to make a donation to the United Way's September 11th Fund. Bacon may be reached at ext. 5117, e-mail jbacon@jlab.org and Hummel may be contacted at ext. 7502, e-mail chummel@jlab.org.

Congratulations!

UVA hosts Cardman as Governor's Distinguished CEBAF Professor

Larry Cardman, Associate Director of the Physics Division, was recently named a Governor's Distinguished CEBAF Professor.

Larry Cardman, Associate Director for Physics, is Jefferson Lab's newest Governor's Distinguished CEBAF Professor (GDCP).

Five Virginia research universities, acting upon the endorsement of the host institution, the University of Virginia, unanimously approved his nomination. The GDCP and the Governor's Distinguished CEBAF Scientist (GDCS) programs were established in the mid-1980s by the Governor and General Assembly of the Commonwealth of Virginia to attract the most distinguished scientists to the Lab. The community and the Commonwealth developed the program as a visible sign of their support for the Laboratory.

The Southeastern Universities Research Association Council and Board has affirmed the nomination. In late June, SURA President Jerry Draayer sent a letter to Cardman complimenting his significant accomplishments and service to the Lab. In part, he wrote: On behalf of the SURA Council and Board, I congratulate you on this honor. We look forward to the continued contributions you will make in your association with Jefferson Lab, the University of Virginia, and the Commonwealth of Virginia."

The professorship will permit Cardman to develop a special working relationship with the University of Virginia and to become a member of UVA's faculty. "This is a most deserved honor for Dr. Cardman," notes interim Lab Director Christoph Leemann. "A close link to universities such as UVA is critical to the long-term health of Jefferson Lab and Larry's appointment as a GDCP will strengthen that vital link."

"I am honored to be appointed as a Governor's Distinguished Professor in the Department of Physics at the University of Virginia," says Cardman. "The university has a long and distinguished record of accomplishments in physics, and, in particular, played a pivotal role in the creation of Jefferson Lab. I look forward to working with faculty, staff and students from UVA involved in research at the Lab."

Jefferson Lab's Governor's Distinguished CEBAF Professors

Larry Cardman

Nathan Isgur*

Christoph Leemann

Ron Sundelin

Jefferson Lab's Governor's Distinguished CEBAF Scientists

Peter Kneisel

Claus Rode

**Nathan held a Governor's Distinguished CEBAF Professorship up until his death on July 24, 2001.*

Basic research

FEL program to help answer fundamental questions

by James Schultz

Gwyn Williams has questions, a lot of questions. Such as: Why don't plastics conduct electricity? How does sunscreen work at the atomic level? What's really going on with superconducting materials that allows them to lose all resistance to the flow of electrons? How can scientists better understand the chemistry of flames? Why, exactly, are windows transparent? How do proteins work?

These are not idle questions, says Williams, basic research program manager for Jefferson Lab's Free-Electron Laser (FEL), but essential to the understanding of our physical world. Learn more about fundamental processes, and that knowledge can be and will be practically applied. That's why researchers are interested in intensively exploiting the FEL, one of the primary spin-offs of JLab's nuclear physics research.

"[JLab's] FEL is the world's best-in-class, by a factor of 100. That's the bottom line," Williams asserts. "It was built by the world's best team and its capabilities are way beyond anything that's ever existed. It's such a new machine, so far ahead of any other, that it will take five years to learn how to fully utilize it. We're still figuring out how — with the help of our partners at other labs and institutions. They've been a vital element throughout."

Although an FEL upgrade is imminent, an aggressive program of research continues. Thus far 18 experiments have been approved; of those, 10 have already gained new, fundamental knowledge about our everyday world and the others are close, according to Williams. Research falls into three broad categories: photo-induced chemistry, biology, and understanding the behavior of everyday materials. In the first category, FEL experiments include studies (in concert with NASA Langley Research Center) of how graphite, under intense light beams, converts economically into an extremely strong material called carbon nanotubes. These nanotubes are stronger — for their weight — than steel and could potentially revolutionize the manufacture of next-generation airplane structures. The biological work in collaboration with Princeton University and the University of Virginia is aimed at deeper understanding of the human genome by learning both the structure and function of proteins.

FEL studies also include evaluating the kinds of new materials produced when metals bathed in nitrogen are exposed to FEL light, forming new surface compounds; investigations of the niceties of "spintronics," novel semiconductor designs that would employ atomic properties for optimum performance; and experiments assessing the nature and extent of the human health risk arising from increased ultraviolet light.

Gwyn Williams, Jefferson Lab FEL Basic Research Program Manager.

"Life is getting complicated faster than we can understand it," Williams says. "Unless we understand how things really work at the microscopic level, we have little hope of advancing. With photonics, using the FEL, we feel we're working in an emerging field that will really push technology to improve our lives."

With the exception of density, a property of matter constrained and described by the nucleus within atoms, the physical properties of all materials are primarily determined by the way electrons act. Everyday technology, from lamps to laptops, is controlled by the behavior and flow of electrons, and is manifested in such properties as hardness, conductivity and materials energy flow.

Observing specific electron behavior is, however, difficult. Scientists who conduct such observations need an intense light source — and now have one, in the form of the FEL. "We still don't understand how most materials work the way they do," Williams points out. "But if you run across something like a violin, without any understanding of what it does, you can pluck a string on it and hear music. You discover what it does. The same is true for copper or glass. We need to pluck the electrons within materials to learn how those materials function."

Because the FEL can be tuned to different wavelengths, it is capable of "seeing" into realms that otherwise would be obscured or remain invisible. In one ongoing study, for instance, researchers from the College of William and Mary and Vanderbilt University are examining the interplay of hydrogen atoms buried in silicon crystal that affect and often degrade silicon performance. As computing devices become even smaller, even one hydrogen atom may have a deleterious effect. Using the FEL to tune to specific hydrogen vibrational modes should allow scientists far greater insight as they work to devise purer grades of silicon to enhance microprocessor manufacture and performance.

"Ours is not the grand science of the large accelerator. Nor is it the minor science of the applied laboratory," Williams says. "What we're addressing are fundamental atomic issues. It's not easy, because you're covering new ground. You're constantly pushing into new frontiers."

continued on page 6

Making improvements

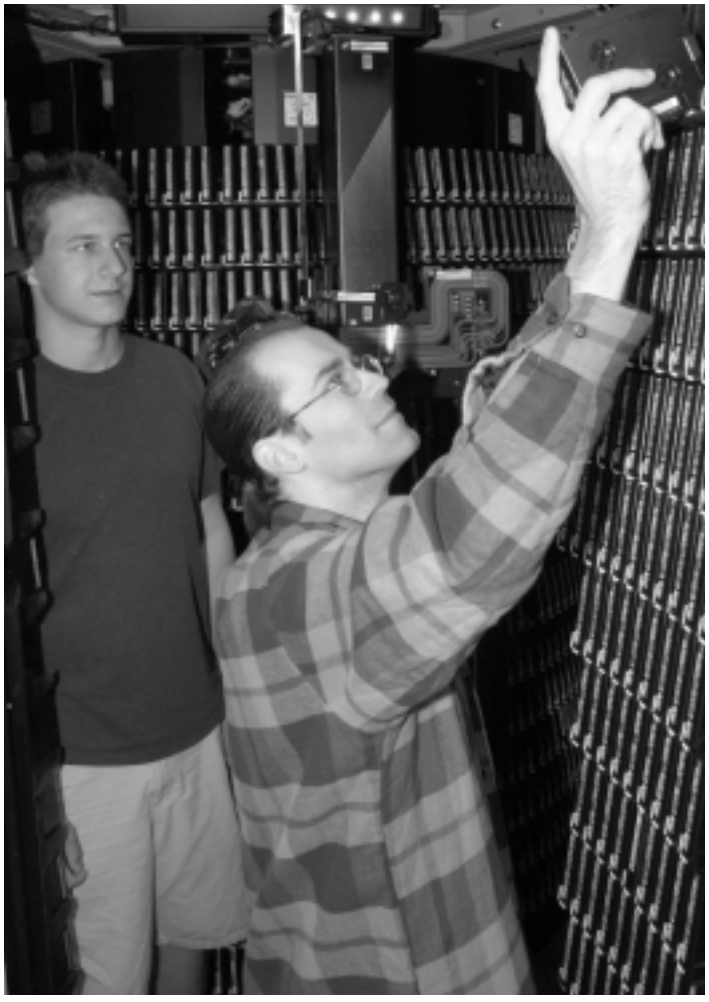
Computer Center upgrades boost data handling capability

by James Schultz

Folk wisdom holds that one can never have enough money or vacation time. An Information Age embellishment might be that Jefferson Lab researchers can never have computers that are too powerful or Internet connections that are too fast. For JLab users, however, powerful and fast can't come too soon. A just-completed, $300,000 Computer Center upgrade promises to put an end to recent bottlenecks frustrating users and staff.

"Access time to data on tape has always been an issue with researchers," says Ian Bird, head of JLab computing. "Given the evolution of what's expected, and the growth of the demand, for most it's essentially been like pulling data through a pinhole. We're trying to make the opening a lot bigger."

A second data silo and additional tape drives have been installed during this latest upgrade, augmenting archival abilities. Researchers have been frustrated because a single silo couldn't handle growing storage demands; many tapes documenting runs in the Lab's three experimental halls had to be removed to make way for others, then located and reinserted when research teams requested access. Given competing requests, and the press of current experiments generating their own archival demands, accessing tapes remotely from a user's university, institution or facility could prove a laborious process.



Bryan Hess (right), Physics Division, loads blank tapes into the new robotic tape silo recently installed in the Computer Center as student intern Mike Pohl watches.

New data-handling, dual-processor computers that are physically thinner than their predecessors are also being purchased for installation in the Center. Their slender size enables more to be mounted in vertical racks, taking up less space. Since each individual machine features enhanced computing capacity — on certain models, up to one gigahertz, or one billion computational cycles per second for each of the twin processors inside — the net result will be a considerable increase in overall capability. (To make room for the ceaselessly running, rack-mounted CPUs, former offices have been emptied out, displacing the few remaining chairs and desks.)

Designers originally intended that centralized JLab computer systems would handle the initial phases of data acquisition. The later stages, including sophisticated data analysis, would be handled offsite, by the institutions and universities actually conducting experiments. The need for additional computational prowess derives from the first-rate performance by the Lab's accelerator, which has allowed experimenters to digitally collect and store many more "clean" subatomic events than even the most optimistic forecasts had originally anticipated. Researchers are therefore increasingly turning to the JLab system to make possible all phases of data access and study.

"We're reaching steady-state," Bird contends. "Although our computer needs are growing, that growth isn't exponential. The increase is because the experimenters are moving into more heavy-duty analysis. That's why we're starting to replace the old machines."

Data demands are expected to swell even more when a fourth experimental hall, Hall D, comes online in several years, along with a planned accelerator-energy doubling, from six billion electron volts, or 6 GeV, to 12 GeV. The JLab-wide upgrade should lead to a 10-fold increase in data, with up to 10 trillion bytes, or 10 terabytes, of information that must be daily stored on either silo tapes or hard-disk arrays. Annually, total storage requirements are expected to exceed several petabytes (one petabyte equals 1,000 terabytes).

Although the current CPU racks can accommodate more of the thinner machines, there is a physical limit beyond which the Center cannot expand. By the time the 12 GeV upgrade occurs, a separate, stand-alone building may be required to house the next generation of mass-storage devices, high-speed computers and peripheral equipment. Eventually, it might become feasible to replace both silos by a series of hard-disk arrays, which would essentially provide instant availability. For now, cost and capacity preclude such an option.

In their own words

Winston Roberts, Theory Group, reflects upon his life, career

as told to Judi Tull

I was born in Trinidad, a middle child with an older sister and younger brother. My intention as a young man was to go into medicine, so I specialized in studying the sciences early. My coursework at my high school, the Queens Royal College, included zoology but I found that I didn't like it much. "That's it," I thought. "Can't do medicine."

So I turned my attention to chemistry and physics.

Although I had a scholarship to do my undergraduate work in Nova Scotia, I stayed in Trinidad for two years to teach high school physics. It was especially interesting since I had just graduated from high school myself and I was essentially teaching my peers. Truth was, I was stalling for time, trying to make up my mind whether to pursue physics or chemistry.

Physics won. By then I also knew that I would pursue work in theory, rather than experimentation, because actually doing experiments was not my strong suit.

I left Trinidad in 1979, and haven't been back since. My mother and brother live in Canada, and my sister is in New York City, so I really have no ties there anymore. I attended the University of Guelph, outside of Toronto, for my postgraduate work and spent a year with my advisor at Oxford. After I finished my Ph.D. in 1988, I landed a one-year postdoc assignment in Grenoble. I had to learn French the hard way: being dumped right into it. I spent a year there in research as a theorist, pushing equations around.

By then I was working in heavy quark effective theory, and spent the next two years at Harvard. I published about a dozen papers while I was there. Then it was time to look for a "real job." I came to Jefferson Lab as a member of the Theory Group in 1991, as part of a joint appointment with Old Dominion University, where I am a tenured associate professor of physics.

One of the projects I was interested in at the time was a key factor in getting me hired, as it tied in very closely with the proposed experimental program of the Lab. The project explored one aspect of how quarks behave in a "quark atom" or hadron, and how those hadrons interact with other hadrons. That work is still continuing.

Winston Roberts, Theory Group, takes a break to show off one of his woodworking projects.

Since that time I have taught a number of graduate and undergraduate courses, including a graduate course on the introduction to particle physics.

I've certainly seen a lot of changes during my decade here. When I arrived, the Lab was just being built and the accelerator wasn't running yet. Newport News has changed a lot, as well. At that time, there were still cows in the Yoder barn on the site of Patrick Henry Mall. Now, the only place you see a cow is on a Gateway computer box. I remember when the Kiln Creek development was first being built; people complained that the new traffic light on Jefferson Avenue would slow them down. Now, Jefferson looks like a Christmas tree at night, with traffic lights all the way along it!

My wife and I initially lived in a condo in Kiln Creek, but five years ago we had a house built in Portsmouth. We chose that area because my wife works in career counseling at Old Dominion University and we wanted a place that would be convenient for both of us. We probably drove our contractor crazy: "do this, do that, change this, change that." But we got what we wanted and our new house led me to what has become my primary hobby — woodworking. We have a loft in the house and we originally thought we wanted to have desks and bookcases built-in there. And I thought, "Well, I can do that myself."

That was how it started. Now, there are no cars in our garage because all my woodworking equipment is there. I've built some tables. I'm particularly fond of one I made with a mahogany body and a top of padouk, a hardwood from Africa that has a lustrous, deep red color. The loft, however, remains empty.

I was fortunate enough in 1994 to receive a grant through ODU from the National Science Foundation's National Young Investigator Program. That funding allowed me to do some research related traveling, support a number of graduate and undergraduate students doing research with me, and purchase some of the computer equipment I use in my research.

And from 1998 through last October, I was on loan to the National Science Foundation, where I reviewed grant proposals in nuclear theory and mathematical physics. This was a real challenge; there were so many worthy requests and never enough money to make everyone (or indeed, anyone) completely happy.

Editor's note: Check out some of Winston Roberts' woodworking projects at www.angelfire.com/la3/winstonwoodworking.

Briefs

JAG needs you to support committee

The Jefferson Lab Activities Group (JAG) needs you. The committee is looking for employees who are interested in helping to plan and organize the Lab's social functions, says Becky Nevarez, JAG chair stepping down Dec. 31.

The JAG seats a new committee every September and is currently seeking volunteers from across the Lab. A lack of volunteers last year left the JAG shorthanded this year and will leave the committee seriously understaffed next year unless enough volunteers come forward to fill out the group, according to Nevarez.

"We need an even distribution of volunteers from each division to keep the committee going," Nevarez explains. "We need at least six committee members holding specific positions and as many volunteers as we can get."

The JAG sponsors a variety of recreational events and activities, including the annual Holiday parties, team sports, the Run-A-Round, day trips and special interest clubs — for the entire Lab — employees, users and family members.

Anyone interested in joining the JAG may contact Nevarez, ext. 7236 or e-mail nevarez@jlab.org.

JAG plans Oct. 25 Fall Festival activities

JLab's annual Fall Festival is set for Thursday, Oct. 25 from 3–6 p.m. on the lawn behind the Residence Facility. All Lab employees and users are invited. The event will include the costume contest, Tug-of-War, and Pumpkin Hurling, and new this year — a Scarecrow making contest. Employees and users may enter the Scarecrow building contest; prizes will be awarded and participants may take their creations home.

Many volunteers are needed to make the event a success. Volunteers will be needed to help with the following activities: set up, some light food preparation, keeping snack tables full, staffing the beverage-bracelet and beverage-serving tents, running the contests and events, and clean up. For more information and to sign up for specific activities/work shifts, visit the JLab Web page at www.jlab.org/fallfestival. Anyone with questions about specific volunteer duties may contact Nevarez.

JLab Holiday events start to take shape

The date for the JLab adult Holiday Party has been set; mark Dec. 8 on your calendar. This year's party will be held at the Hospitality House, 415 Richmond Rd., Williamsburg. The bar will open at 6:30 p.m. and dinner will be served from 7–9 p.m. Dancing to a DJ spinning tunes will last until 1 a.m.

Anyone wishing to reserve a room at the Hospitality House for the evening may make reservations up through Nov. 8 by calling (757) 229-4020. Rooms will be $75 per night plus 9.5 percent tax. Check in is no earlier than 3 p.m. Dec. 8 and check out is 11 a.m. Dec. 9.

More information will be available next month.

'Why Files' features JLab in October

Watch for JLab optical physicist Michelle Shinn in an upcoming episode of the PBS educational series "The Why Files." In June, Shinn was filmed for a segment titled "Refraction and Reflection." Catch the segment featuring Shinn in the episode "The Case of the Mysterious Red Light," which will air on PBS, Oct. 17 from 11 a.m.– noon.

United Way sets up special Sept. 11 fund

The JLab United Way Givesmart Campaign will run from Oct. 15–26. The Lab's goal this year is to increase campaign participation.

Due to the nation's tragedy on Sept. 11, the United Way has set up a disaster relief fund called the September 11th Fund. Immediate donations may be made to this fund, by check or credit card. Contribution forms and additional information are available by contacting Christine Hummel, Administration, ext. 7502.

FEL basic research program. . .

continued from page 3

The sojourn will be helped by a pending FEL upgrade that is expected to result in greater capability and power. Engineers plan to install a new injector that will produce twice the amount of electron beam than is currently possible. A new device called a "wiggler" will double the fraction of electron-beam energy converted to laser light. Two newly constructed cryomodules will be added to the FEL linear accelerator line, effectively quadrupling system energy from the current 40 million electron volts, or MeV, to 160 MeV. Laser power will surge at least 10-fold, to 10 kilowatts, and may peak near 20 kilowatts at the end of the recommissioning process, which will start in September 2002.

Milestones

for August 2001

Hello

Jeffrey R. Faulkner, Accelerator Operator, Accelerator Division

Larry H. Harris, RF Electronic Technician, Accelerator Division

Jean T. Kelley, Jr., Division Staff Administrator, Accelerator Division

Wolody Melnitchouk, Nuclear Physics, Physics Division

Maria-Ioana Niculescu, Hall C Post Doctoral Associate, Physics Division

Marcy L. Stutzman, Injector Scientist, Accelerator Division

Mathew C. Wright, Mechanical Design Detailer, Accelerator Division

Goodbye

Rhonda F. Bell, Residence Facility Assistant, SURA

Nilanga Liyanage, Post Doctoral Fellow, Physics Division

"Milestones" highlights the achievements of JLab staff and users, full-time and term new hires, separations and retirements. To submit staff or users' promotions, special honors and awards send information to magaldi@jlab.org or call ext. 5102.

Red Cross plans Oct. 10 blood drive

The Red Cross will hold a Blood Drive in the ARC auditorium from 10 a.m.–4 p.m. on Wednesday, Oct. 10. All Lab employees, students, contractors and users are invited to participate, says Vicki Barnett, Medical Services.

In addition to individuals donating "the gift of life," volunteers are also needed to help before the blood drive with donor sign-up and putting up posters. Volunteers are needed the day of the event to help with donor registration and at the snack table.

Barnett asks that anyone planning to donate blood call her or Sharon Mortimer at ext. 6269 to set up an appointment. "The more precise number of donors we can provide the Red Cross, the better prepared they will be with staff and supplies," Barnett explains. "The spring blood drive was a huge success and we hope everyone turns out to support the fall blood drive."

Update

John Mullin retires

John Mullin, SURA Senior Vice President for Operations and General Counsel recently retired, after 15 years with the Southeastern Universities Research Association and Jefferson Lab. He was feted at a retirement party hosted by the Administration Division on Sept. 10, complete with cake, a song, and a number of humorous retirement gifts. Mullin has worked at SURA headquarters in Washington, D.C. for the last two years. During his years at JLab he headed Jefferson Lab's Human Resources section before becoming the Lab's General Counsel. Mullin plans to retire in Florida.

Poster contest

White House sponsors America Recycles event

The White House Task Force on Recycling is sponsoring an America Recycles Day poster contest again this year.

To help achieve the objective of ARD in 2001, the White House Task Force on Recycling is sponsoring the poster contest, for the second consecutive year. It is open to all students (K–12) of Federal employees and government contractors. The theme for the contest is "America Recycles Day: A Great Time to Renew Our Commitment to Recycling."

America Recycles Day, Inc., is a non-profit organization that brings together government officials, environmental organizations, and manufacturing industries with a shared objective of increasing recycling and the purchase of recycled content products in both the private and public sectors. Federal agencies have participated in this partnership since the first America Recycles Day in 1997 by conducting a federal rally and organizing training seminars on recycling and buy-recycled within the Federal government.

Poster contest winners will be honored at an awards ceremony in the White House complex during the week of America Recycles Day (Nov. 15). The winning posters will be used to create and print next year's wall calendar. All poster submissions and completed entry forms must be postmarked no later than Oct. 15, 2001.

Poster contest rules and the entry form with the mailing address are all under the JLab Web address www.jlab.org/news/postercontest/.

At a Glance

Calendar of JLab activities and events

Oct. 10: Blood Drive 10 a.m.–4 p.m. in the ARC*
Oct. 15–26: United Way Givesmart Campaign at JLab*
Oct. 17: PBS airs "Why Files" episode featuring JLab*
Oct. 22: DMV Mobile Unit Visits JLab
Oct. 25: 3–6 p.m. JLab Oktoberfest on lawn behind Residence Facility*
Oct. 26: Sinclair Symposium on Photoelectron Injectors and Applications
** Events flagged with an asterisk (*) have an accompanying story in this issue of "On Target."*

ON TARGET

On Target is published by the Thomas Jefferson National Accelerator Facility, a national nuclear physics research laboratory in Newport News, VA, operated by the Southeastern Universities Research Association for the U.S. Department of Energy. News items are published on a space-available basis and are subject to editing. Submit news items to the Jefferson Lab Public Affairs Office, MS12C, 12001 Jefferson Avenue, Newport News, VA 23606.

Editors
Linda Ware
Debbie Magaldi

Contributing Writer
James Schultz

Photographer
Greg Adams

Check Us out on the Internet
www.jlab.org

Jefferson Lab/MS 12C
12001 Jefferson Avenue
Newport News, VA 23606