February/March 2002

ON TARGET

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY • A DEPARTMENT OF ENERGY FACILITY

Look at FEL upgrade,
new research opportunities, tech. transfer possibilities

JLab technical
associate invents new type of lockout device

JLab physicist
wins American Physical Society award

The Journey Continues

World's best Free-Electron Laser about to get even better

by James Schultz

On track and on time: That's the message from Fred Dylla, Free-Electron Laser (FEL) program manager, concerning the ongoing upgrade of the most powerful device of its kind in the world. In all, some 50 staff and contractors are working 50-hour weeks to complete the FEL upgrade by this coming October. All the physical elements are slated to be connected by October 1, with recommissioning planned to take place in stages throughout 2003.

Engineers plan to install a new injector that will produce twice the amount of electron beam than is currently possible. The FEL's upgraded "wiggler" will double the fraction of electron-beam energy converted to laser light. Two additional 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 eventually peak near 20 kilowatts.

When all is said and done, nearly the entire FEL will consist of new or upgraded components. "It's basically 90 percent a new machine," Dylla says. "We're keeping the injector and one cryomodule. But the injector will be substantially modified. And the linac will be enhanced."

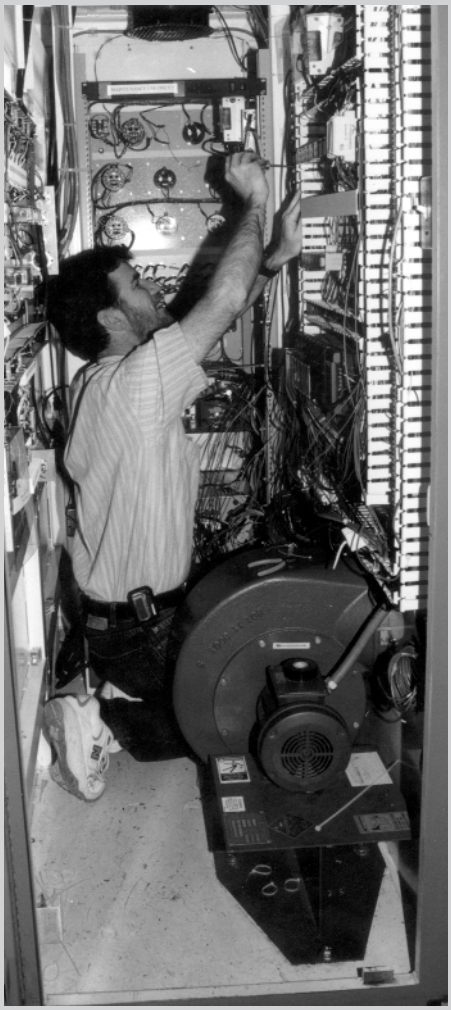
Continued on page 2

Walter Lacy, Sr. Radio-frequency technician, installs the coolant hoses on the new 100 kW klystrons.

Bob Terrell, Sr. Electronics technical associate; Walter Lacy, and Chris Kerns, rf technician, discuss design changes to the new 100 kW cathode power supplies.

The Journey Continues …

Lab begins work to make world-class FEL even better



Chris Kerns adds changes to wiring for the controls of one of the new 100 kW cathode power supplies.

Ricky Taylor (left) and Elliott Smythe, mechanical/vacuum installation technicians, disassembled the FEL 2-inch beamline in December in preparation for installing a 3-inch beamline for the upgraded machine. Here they move one of the beamline quadrupole magnets.

Continued from page 1

Perhaps most importantly, researchers will literally be able to turn a knob in order to select different frequencies of light. This "tunability" is of crucial importance for materials research, but also helps scientists better understand the behavior of particles at the atomic level and below.

"Tunability for exploration is what people want," says Gwyn Williams, FEL basic research program manager. "It's about finding out how materials behave at different wavelengths of light. Because atoms are joined by chemical bonds, they act like springs. Now we can make those springs bounce up and down. In effect, we can hit any note and then watch what happens when we do."

A variety of companies are interested in the FEL's commercial potential. Thus far, FEL proof-of-concept experiments have included investigations of chemical-vapor deposition, a technique used to produce high-quality coatings and thin films for electronics and metals, as well as the effects of FEL processing on nylon, polyester and a class of materials known as polyimides. The Lab's FEL has also been able to create in bulk ultrasmall but very strong structures known as carbon nanotubes, which could eventually be the heart of minuscule next-generation computers, as well as structural components for aircraft and automobiles. The FEL can also be used to change the surface properties of food packaging, making it more resistant to microbes and food spoilage.

These and other possibilities for the FEL were discussed in mid-January at the FEL Users and Laser Processing Consortium (LPC) Workshop, held at the Lab. In attendance were 122 users from 30 different research groups worldwide, in addition to LPC representatives from SURA (the Southeastern Universities Research Association), DuPont, Dominion Power, 3M, Aerospace Corporation, Siemens Automotive and Northrop Grumman. Attendees were briefed as to upgrade specifics and encouraged to consider how to exploit the FEL's enhancements.

Another key enhancement will be the addition of an ultraviolet "sidetrack": a portion that will be capable of producing UV light for experiments. When complete, the sidetrack will enable the production of one kilowatt of UV light — 1,000 times the capability of the one-watt devices commonly in use at other laboratories.

The bulk of the FEL upgrade funding is coming from the U.S. Navy — $13.5 million — and the U.S. Air Force — $4.9 million. Additional monies have been provided by the state of Virginia and NASA. Once fully operational, the FEL is expected to be supported by research grants from the federal and state governments and by projects commissioned by industrial interests.

Journey into the heart of FEL science

What questions will it answer; what opportunities will it offer?

by James Schultz

History doesn't record the moment when fully conscious humans asked the first question. The incessant push of human curiosity has nevertheless changed the world. Even so, despite the seemingly inexorable march of science and technology into the current century, questions don't seem in short supply. Gwyn Williams, basic research program manager for Jefferson Lab's Free-Electron Laser (FEL), suspects some important answers may be forthcoming as a result of the pending FEL upgrade.

"The FEL is such a powerful light source that it induces completely new phenomena in materials," Williams says. "All kinds of unexpected properties emerge. Creating carbon nanotubes [for electronics and superstrong structures] comes as a result of exciting graphite, for instance. This upgrade gives us a window with a whole new view. We're beginning to truly understand how the world works at the level of a single atom."

Should such an enhanced understanding emerge, scientists and engineers could custom-design materials atom by atom. This prospect, embraced by those in the field known as nanotechnology, could begin a large-scale products revolution unprecedented in human history. First, however, researchers must significantly deepen their understanding of the submicroscopic. Williams points out that because of its power and precision, FEL light can help do just that, illuminating these smallest of realms: a kind of ultra-fast camera that will freeze-frame even the most complex physical or chemical reactions.

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, however, is difficult. Scientists who conduct such observations need an intense light source — and now have one, in the form of the FEL.

FEL research falls into three broad categories: photo-induced chemistry, biology and materials. Before beginning the upgrade, some 20 formal proposals had been made for FEL-focused research. Seventeen of these proposals were given FEL beam time before the FEL shutdown in November. These will be prioritized and will carry forward once the upgrade is complete.

Among the areas under investigation will be the function of protein molecules within human cells as well as the mechanisms that determine and degrade materials purity, such as the silicon that comprises many computer components. Scientists will also study the effects of new surface compounds, produced when metals bathed in nitrogen are exposed to FEL light, and explore novel areas such as "spintronics," which concerns the properties of next generation semiconductor designs that optimize performance using newly discovered properties of electrons.

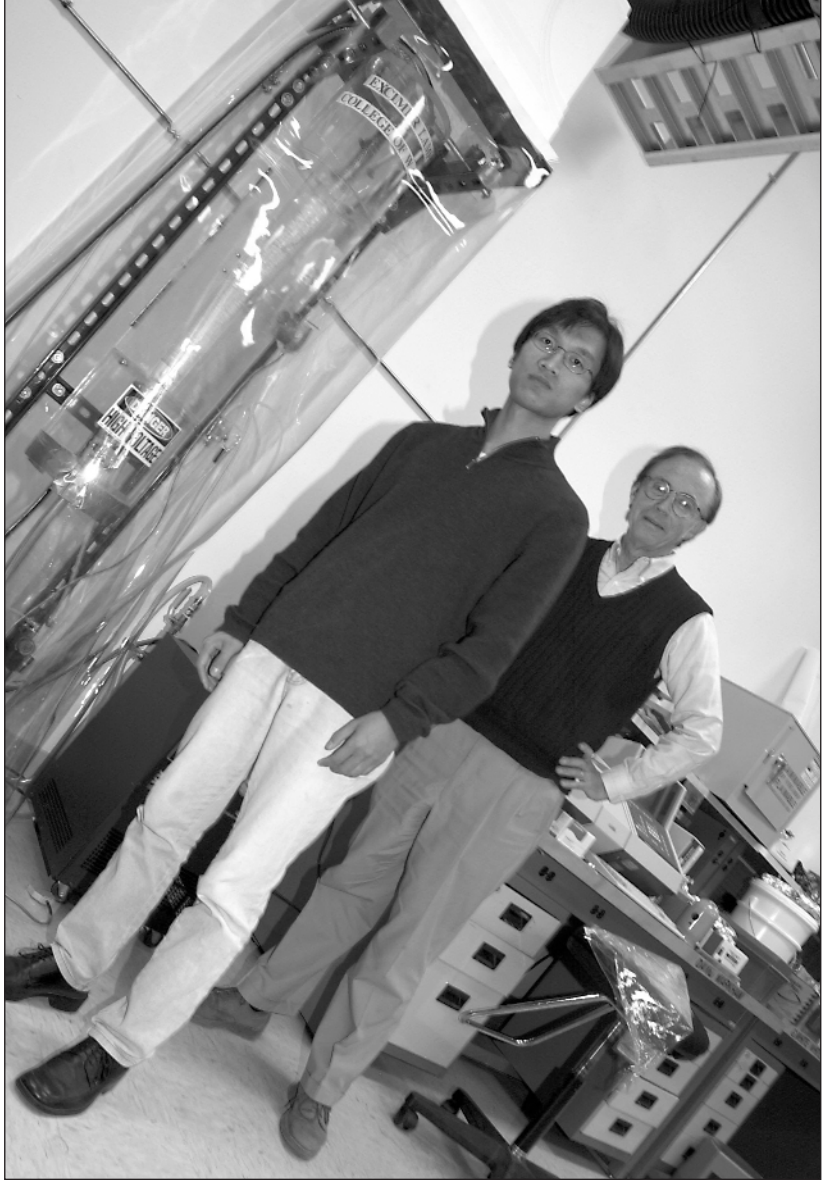
The addition of ultraviolet-light (UV) capability will further augment the FEL's utility by enabling experiments that assess the nature and extent of the human health risk arising from increased ultraviolet light. Further, because of the nature of its construction and operation, the FEL accelerator's electron beam can produce light with a frequency in the range of thousands of trillions of cycles per second. This "terahertz" capacity could conceivably lead to imagers that could quickly detect biological agents, such as anthrax, and hunt for concealed land mines.

"As scientists and as people, we want to improve the quality of life," Williams says. "This machine, already the most powerful in the world, is getting even better. It should enable us to make important progress in the next several years."

Webs of nanotubes form on collector plates during William & Mary professor Brian Holloway's FEL experiment. (Photo of collector near-actual size).

The Journey Continues …

Applied research program seeks new uses for upgraded FEL



William and Mary graduate student Zhengmao Zhu (left) and Michael Kelley, FEL applied research program manager, in the lab.

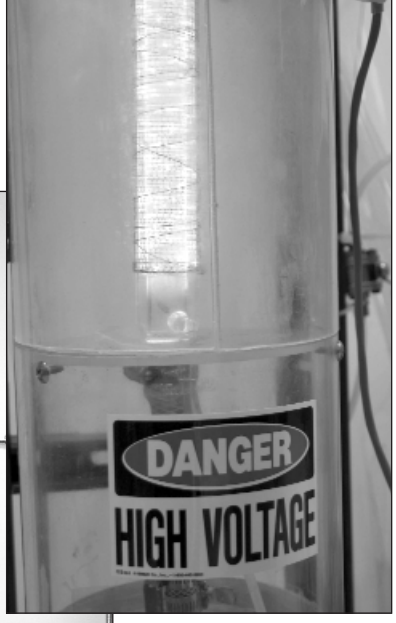
by James Schultz

Put a small casserole in the microwave, and your attention most likely won't turn to large, whirring blades. Without those blades, though, spinning in an electricity-generating turbine somewhere, you wouldn't have the option of pushing a button or two to cook a meal. Yet both companies that package the food and provide the power to the microwave could benefit from the Lab's Free-Electron Laser (FEL) upgrade.

In particular, the FEL's brand of intense, focused laser light could create a new kind of food packaging that would minimize preparation fuss by not requiring a special container or removal from the usual plastic pouch. Likewise, steam-generator turbine blades, worn down by the incessant pounding of water droplets, would get their own new lease on life. The FEL could create a specialized vapor that, once deposited upon the blade's surface, would create a very tough coating that would dramatically increase operational longevity and cut down or eliminate altogether the need for blade resurfacing.

"The FEL upgrade will give us the ability to process large demonstration articles, like the turbine blades," says Michael Kelley, the FEL's applied research program manager. "The FEL is probably the only way to do such things on a large scale at a low per-unit cost. With a kilowatt or two of light, you can achieve some of your goals. With 10 kilowatts, you're able to put all the pieces together for real."

Companies like energy producer Dominion Power, automotive manufacturer Siemens Automotive and materials/textile maker DuPont are interested in a beefed-up FEL because



The UV lamp pictured was built to test processes that could ultimately be scaled up for manufacturing purposes when the FEL begins to deliver ultraviolet light.

Michael Kelley (left) and Zhengmao Zhu make adjustments to their UV Excimer Lamp, which they are using to make antimicrobial nylon.

of its ability to modify surfaces inexpensively and effectively. The FEL's laser light can vaporize a target material that then will deposit upon a given substance evenly and without much contamination by small particles emanating from the target. Because the coatings are purer, they are more durable, reducing overall costs because of increased longevity.

The upgraded FEL should also be able to produce larger quantities of carbon nanotubes, lightweight molecule-sized structures many times stronger than steel. Should the expected manufacturing efficiencies emerge, significant amounts could be made far less expensively than is now the case.

Researchers in other fields believe the upgraded, tunable FEL could be a means of inexpensively and safely removing tattoos, cleaning damaged or begrimed art, and be a significant research addition to geoscience as it literally plumbs high temperatures and pressures deep within the Earth's crust and mantle.

In February, JLab began a partnership with Virginia Tech and with NASA to request funding for an FEL research project that would create the small, complex structures known as fullerenes. These sphere-like objects, which can encapsulate and slowly release medication in the bloodstream, show great promise for medication delivery within the body. High per-unit costs and limited availability have thus far limited their use.

The Lab is also partnering with the College of William and Mary's Virginia Institute of Marine Science to use the FEL to examine the physics and structure of marine sediments. Discovering how the sediments mediate absorption, mobility and transport of pollutants will likely lead to more effective means of cleaning contamination in and around streams, rivers, bays and the near-shore ocean.

"At the end of this entire process we should have the kind of economic drive to move forward and build an FEL for commercial purposes," Kelley says. "To get innovative technology etched into the marketplace you need something that's totally new and very dramatic: a knockout. It's displacive technology versus replacive technology. That could be the ultimate outcome of putting such a powerful machine like the FEL to use."

For safety's sake: Lock it out

JLab tech associate invents lockout device for equipment with removable power cords

It was the early 1990s and building the Continuous Electron Beam Accelerator was in high gear. The Accelerator Division was busy installing some 30 vacuum ion pumps down in the tunnel. Simultaneously, above ground in the long, low service buildings sitting over the tunnel, workers were installing and wiring the 7 kV, high-voltage power supplies for those ion pumps.

"With the procedures we had in place we were never in danger," recalled Rick Gonzales, Accelerator Electronics Support (AES) technical associate, "but we didn't want to take any unnecessary chances while we were working on the pumps, with the power supplies remotely mounted. We searched catalogues and asked vendors for a good lockout device we could use on the pumps, but nothing existed for equipment with removable power cords."

"So we made do with duct tape and a magic marker," Gonzales continued. "We would cover a pump's power-cord connector with tape so the cord couldn't be plugged in. And with the marker we wrote 'don't plug in' across the tape. It was our added safety measure while we did the work. This way no one could power up the supply while we were working on the pump."

Trying to find a better way to deal with this safety concern, Gonzales came up with an idea for a lockout device, but it just didn't work out. Then about seven years later — just before the Christmas break — Gonzales was on a bike ride when another design idea hit him. "This one was it. I just knew it," Gonzales said. "I hurried in to work and carved a prototype out of a piece of plastic. I was really excited. After the break, I came in and showed it to Dick Lusk, Procurement and member of the JLab Tech Transfer team. Then I worked with Rhonda Scales, the Lab's Legal counsel, and the Technology Transfer office to patent the device."

SURA was awarded the patent on the lockout device in October 1999. During the year and a half it took for the patent to be awarded, Gonzales and the Lab became interested in seeing a manufacturer bring the device to the commercial market. "A lockout device for an electronic component with a removable power cord could be used for both safety and security purposes on so many different types of equipment," he explained.

He talked with several companies that sell electronic instrumentation and safety equipment; but no one was interested in commercializing the lockout mechanism. He also talked with several companies that produce plastic and rubber molded parts (needed to build the device) to determine what it would take and how much it would cost to commercially produce the device.

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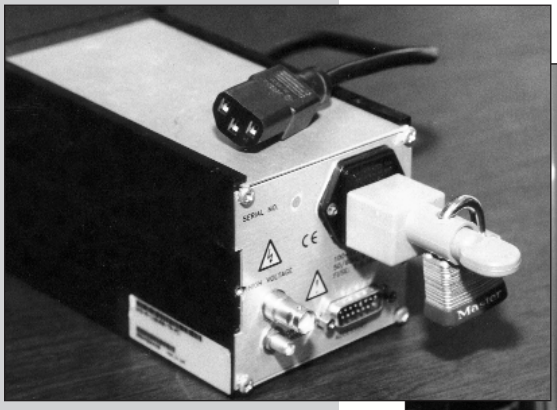


Rick Gonzales' lockout device in place and preventing its power cord from being plugged in.

Gonzales demonstrates how to use the lockout device he invented.

In their own words

Kijun Park reflects on his interest in physics and coming to America

Kijun Park enjoys a quiet moment on the CEBAF Center deck. He is intent on successfully completing his Ph.D. thesis and starting his career.

as told to Judi Tull

I know it sounds funny, but my interest in physics really started when I watched the TV series MacGuyver as a kid. I'd see him do all these ingenious things, and say, "Hmmm…that was very interesting." Actually, it was a kind of magic for me and I wanted, somehow, to be part of doing things like that in science.

The next big influence for me was from a physics teacher in middle school in my hometown of Taegue, South Korea. He was a real funny guy and he made it easy to learn. Actually, math and science have always come easily to me. (They're much easier than learning English!) In fact, I finished my graduate work, except for my thesis, in four years at Kyung Pook National University. It usually takes six years, but I took more courses than usual.

My first trip to the United States was a little more than four years ago, in 1997, and I've spent my winter and summer vacations here, working part time in the Hall B group at the Lab. I worked on hardware and cabling, that sort of thing, and finally got the chance to come here to do the work that my thesis will be based on.

My particular interest is in high-energy physics, searching for the origin of mass. For me, that's an attractive topic, although it's really difficult for me. Years ago, I read a book called "Where Did Mass Come From?" that said mass is not defined. That really hooked me. I'm working here with the Time-of-Flight group and the Analysis group, with particular momentum correction.

What I find really interesting about this work is that even though you can't see anything, there's something there. This seems to me to be really some kind of magic.

I'll be here for three years, and my arrival was certainly unsettling. I got here on Sept. 10 and immediately went to bed to get some much-needed rest after traveling. When I got up the next day and came over to the Lab, people

continued on page 11

Dive into Science

Lab hosts Virginia Regional Science Bowl

Some of the brightest young minds in the state came together at Jefferson Lab on Feb. 9 to compete in the Virginia Regional Science Bowl. Twenty teams, representing high schools from across the Commonwealth, participated in the academic competition sponsored by the Department of Energy.

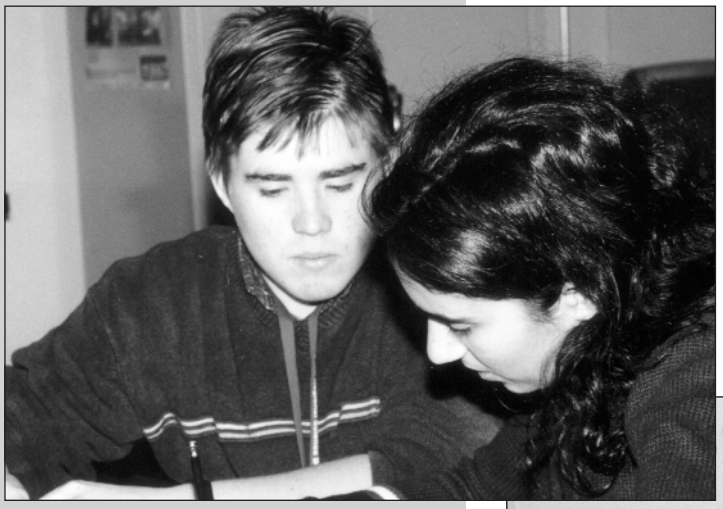
When the "dust" settled at the end of an intense day of science and math questions and answers, the winning team was Thomas Jefferson High School for Science and Technology from Alexandria. Team captain and high school senior, Gregory Price, ably led his team to victory.

The team from Woodbridge Senior High School, Woodbridge, finished in second place. Coming together for the final round of the afternoon's double-elimination playoffs, the Woodbridge team had one more win to its credit than the TJ team. The round went to TJ, creating a tie, which resulted in a final tiebreaker round. TJ stayed on its winning course and took the tiebreaker round to win the competition.

The Kempsville High School team, Virginia Beach, won third place; and Forest Park High School, from Midlothian, earned the Sportsmanship Trophy. Richmond Christian School, Chesterfield, sponsored two teams at the competition. While neither team ranked among the top eight teams that moved into the afternoon double-elimination playoffs, they were among several teams that stayed for an afternoon of math and science challenge activities. In a twist of irony, the two teams tied for the "Stay All Day" math and science challenge award.

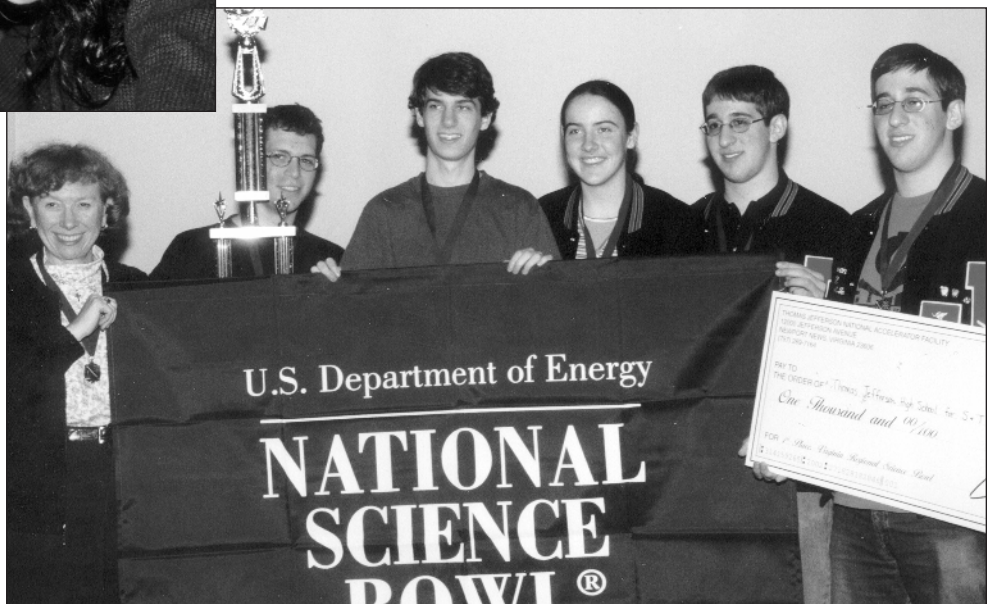
The Virginia champs and the winners from the other 60 regional Science Bowl competitions will now vie for the top honor at the Science Bowl Nationals to be held May 3–6 in Washington, D.C. The second and third runners-up received cash awards to buy science equipment for their respective schools.

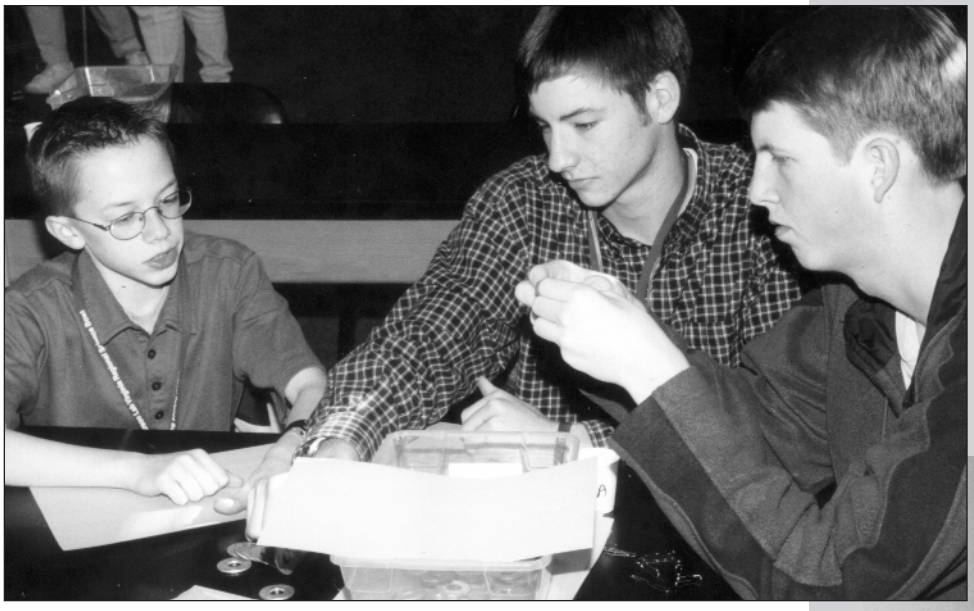
Linda Ware, Jefferson Lab public affairs manager, said she was particularly proud of the smaller schools participating in the event. "Everyone real-



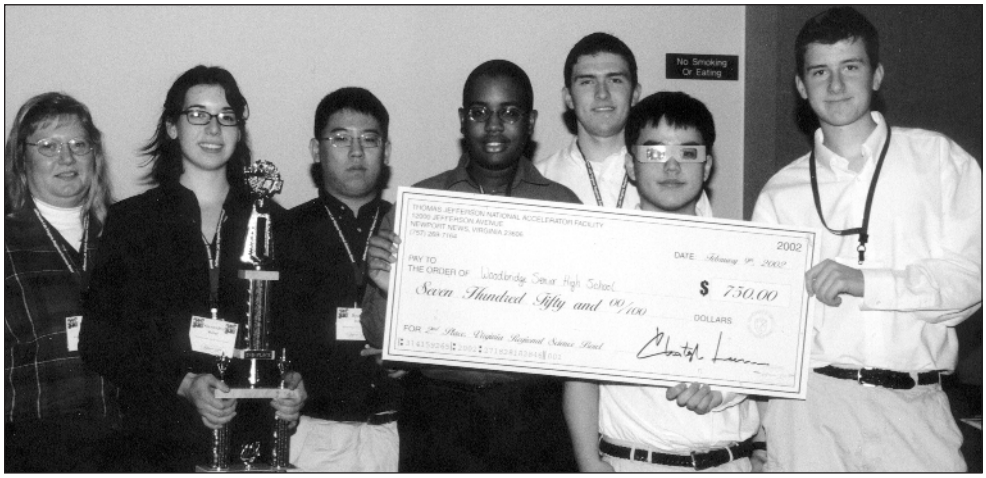
◀ Two "Stay All Day" participants tackle the challenge of calculating the height of the ARC building.

▼ The winning team from Thomas Jefferson High School for Science and Technology pose for a group photo. From left are Coach Sharon Baker, Jeffrey Cohen, Gregory Price, Kay Aull, Gary Sivek and Steven Sivek.





Three “Stay All Day” participants tackle the bridge building activity.



Taking second place in the Science Bowl was Woodbridge Senior High School. Pictured here with Coach Kathryn Voehl (from left) are Alexandria Moler, Byung Kim, Randy Williams, Chris Richbourg, Patrick Lucey and Ben Sereufert.

Richmond Christian School brought two teams to the competition. The two teams tied for first place in the “Stay All Day” challenges. Here they pose for a group photo with coach Edith Kinser.

ly enjoyed themselves,” she said. “It’s rewarding for kids who study hard and do well to be able to show off their talents at an academic competition like this.”

“The Science Bowl is a great way to promote education, academic excellence and an interest in math and science,” commented Jan Tyler, JLab Science Education manager and coordinator for the 2002 Virginia Regional Science Bowl. “Competing with their peers is a great confidence builder and a fantastic way to motivate young minds.”

“We were delighted to host this year’s competition,” Tyler continued. “It was a fantastic opportunity for the Lab to show its support for science education in Virginia. Hosting the Science Bowl gives us the chance to encourage our youth to pursue higher education and careers in science and math. Some of the young people attending this event could become future JLab scientists, engineers, technicians, or administrative or support staff.”

More than 60 Lab staff and family members volunteered their time to conduct the day-long, weekend event. “We owe each of them a huge thanks. Without so many willing, wonderful volunteers, the Lab wouldn’t have been able to host this event,” Tyler said.

Briefs

Spring Science Series events underway

The Lab's Spring Science Series kicked off at 7 p.m. on February 28. The next event is Tuesday, **March 12**, when a dramatic interpretation of science takes center stage with Dr. Rosemary Colarulli from Weiss School, Palm Beach Gardens, FL.

Watch science unfold before your eyes. Catch her dynamic, dramatic presentation "Science on Stage." Colarulli received her BA in Chemistry, Biology and Mathematics at Rhode Island College and her Masters and Doctorate degrees from Florida Atlantic University in Educational Leadership. Her expertise in gifted education keeps her much in demand as a keynote speaker and educational consultant.

On Thursday, **March 28**, the Lab plans to bring University of Illinois physicist and baseball enthusiast Alan Nathan to JLab to present "How to Hit a Home Run - How a Physicist Thinks about Baseball." Nathan is passionate about physics and baseball. His love of each brought the two together for "The Dynamics of the Baseball-Bat Collision," a paper he wrote which was published in the November 2000 issue of the American Journal of Physics. "The Physics of Baseball" grew from the Nathan's paper and the interest of several others in the science behind one of America's favorite past times. For more about physics and baseball, visit Nathan's web site: www.npl.uiuc.edu/~a-nathan/pob/. Nathan is the Lab's User Group Board of Director chair.

And on Wednesday, **May 8**, the Lab hosts Marcia Bartusiak, author of "Einstein's Unfinished Symphony" for a discussion of her latest book and a book signing. A new generation of observations, now being completed worldwide, will give astronomers not just a new window on the cosmos but a whole new sense with which to explore and experience the heavens above us. Instead of collecting light waves or radio waves, these novel instruments will allow astronomers to at last place their hands on the fabric of space-time and feel the very rhythms of the universe. These vibrations in space-time — or gravity waves — are the last prediction of Einstein's general theory of relativity yet to be observed directly. They are his unfinished symphony, waiting nearly a century to be heard. When they finally reveal themselves to astronomers, we will for the first time be able to hear the cymbal crashes from exploding stars, tune in to the periodic drumbeats from swiftly rotating pulsars, listen to the extended chirps from the merger of two black homes, and eavesdrop on the remnant echoes from the mighty jolt of the Big Bang itself. Barnes & Noble will have a table set up with Bartusiak's new book available for purchase.

All Science Series events begin at 7 p.m. in the CEBAF Center auditorium. The presentations last about 1 hour and a question & answer period ends the evening. The events are free and open to anyone interested in learning more about science. For security purposes, enter at the Lab's main entrance (Onnes Dr.). Everyone over 16 is asked to carry a photo I.D., and security guards may perform vehicle checks.

Employee tours

Now is your chance to see first hand what we do at Jefferson Lab! The Public Affairs office is offering a weekly tour of the accelerator during the Mar/April shutdown. The tour van will depart from CEBAF Center promptly at 9:30 a.m. every Tuesday from March 26 through April 16. We will make every effort to be finished by 11:15 a.m. Sign up on the JLab Insider web page.

Gonzales invents lockout device. . .

Continued from page 6

Gonzales was frustrated to find that companies just weren't interested in building the lockout. He found a few vendors interested in selling the lockout, but no one wanted to produce the simple, straightforward device. (Two pieces of molded plastic, a hunk of vulcanized rubber, a small metal plate, a nut and a screw are all that it consists of.) "The companies just didn't want to take on the risk or cost of bringing a new product to market," he said.

Then about a year ago he approached his local Chamber of Commerce Business Development Center to see if they could offer him any advice. They suggested that he sit in on their Small Business Startup class. "While I was taking the class, I realized: I knew this device inside and out. I knew how much it would cost to procure each part and how much it could be sold for. I knew which vendors could produce the needed parts," Gonzales commented. "It was right there in my face. I had done all the research someone does to set up a small business. A week later my wife and I made a licensing proposal to the Lab and after the agreement was signed we created Southside Safety, Inc. and started commercial production of the LOCKOUT 320™ — the perfect device for securing equipment that uses a removable input power cord."

All of this extra work — on Rick's own time — is now making the LOCKOUT 320™ commercially available to the public. Despite a lot of expense and discouragement, Gonzales continued believing in the potential for his lockout device, and he's persevered. For more information about the LOCKOUT 320™, visit www.southsidesafetyinc.com/.

The Technology Transfer office at Jefferson Lab encourages staff with unique ideas to consider going through the patent process. A successful product development can be financially rewarding to the inventor as well as to SURA/JLab.

Milestones
for January 2002

Hello

David J. Bianco, Systems Administrator/Programmer, Physics Division

Jane A. Worley, Accounts Payable Supervisor, Administration Division

Goodbye

Cindy J. O'Hare, Procurement Administrator, Administration Division

Ronald M. Sundelin, Associate Director for Technical Performance, retires

Congratulations

Dianne Napier, Accelerator Electronics Support (AES), completed her Bachelor of Science degree in Electrical Engineering at Old Dominion University in December 2001. She also took first place at ODU with her senior design project, "The Automation of the RF Analog Board Manual Test Procedure for Jefferson Laboratory." She then competed at the IEEE (Institute of Electrical and Electronics Engineers) Regional Presentation Contest in January and took another first place.

Tyrone Pate, graduate student intern with the RFES (Radio Frequency Electronic Support) group (formerly called EID — Electronic Instrumentation Division), took second place in the same ODU contest. His senior design project addressed the "simultaneous multiple harmonic detection device (phase locked loop circuit and lock-in amplifier) to be use in Wavelength Modulation Spectroscopy experiments". He is enrolled at ODU in the BS-MS program and completed his Bachelor's degree in Electrical Engineering, with emphasis in electronics and solid-state electronics design, in December 2001.

Copenhagen dramatizes WWII meeting of Bohr, Heisenberg

Werner Heisenberg's wartime visit to Niels Bohr, recently dramatized in Michael Frayn's play "Copenhagen," has, 60 years after the event, just taken a new turn.

In a letter recently made public for the first time, Bohr accuses Heisenberg of misleading others, in the aftermath of World War II, by claiming to have purposely undermined the German atom bomb effort.

In the letter, composed around 1957, Bohr claims that in his recollection of their encounter Heisenberg seemed less ambivalent and more knowledgeable about building a bomb than Heisenberg later implied. This letter, now made public by the Niels Bohr Archive in Denmark (www.nba.nbi.dk/), was never sent and since Bohr's death in 1962, had been sealed away.

Upcoming events surrounding the play include performances through March 24 at Kennedy Center in Washington, D.C. (call 1-800-444-1324); and a session on the subject at the April American Physical Society meeting in Albuquerque.

"Copenhagen" reenacts the 1941 visit of Heisenberg, who was then in charge of the Nazi nuclear power program, with Bohr, his mentor, and collaborator in creating quantum mechanics, complementarity, and the uncertainty principle, in German-occupied Denmark.

In their own words with Kijun Park. . .

Continued from page 7

were gathered around the television and the World Trade Center towers had been destroyed.

I'm something of an oddity at home, really. Not that many Korean people like physics or understand it. Young people like myself can't understand why I enjoy studying it. Even my parents think I'm a little bit crazy because I'm so unique in this way. I have one brother, who is educated in architecture but works in management. He seems much more normal to my family than I do.

If I were not doing physics, I would be an artist. I tried to pursue that when I was younger, but finances were a problem. Art school is expensive, and then you have to buy paint and papers. It all cost too much. I have no hobbies right now and I don't play sports. I do enjoy doing things with the computer, but not games. What I like to do is make programs. And I spend a lot of my time working on physics.

I've found American culture to be very interesting, and certainly very different from Korea. In one particular experience, I had a question about my job and the person I asked answered in a very specific way. In Korea, the explanation would have been larger, more philosophical.

On the other hand, it's been impressive to see how kind Americans are to foreigners. It's been surprising how kind and helpful people here have been. My supervisor, Dr. Volker Burkert, helped find me an apartment and he also supports my financial grant. I've also received a lot of help from my professor, Wooyoung Kim, at Kyung Pook National University. I am very grateful to both of them; I would not be here if it weren't for them.

American food has been an interesting experience, too. Koreans eat mostly rice, vegetables, kim chee, that sort of thing, where American people eat beef and pork. I have no problem with the food. In fact, I'm beginning to love hamburger steak — it's very delicious!

The newest thing in my personal life is that I went home over Christmas, got married, and my wife has come back with me. This is definitely a good thing, and along with the opportunities I have here at the Lab, my life in America is very, very good.

APS recognizes Lab physicist

Baker wins Bouchet Award for his innovative research

Keith Baker, JLab/Hampton University joint appointee, was recently awarded the American Physical Society's 2002 Edward A. Bouchet Award for his innovative research.

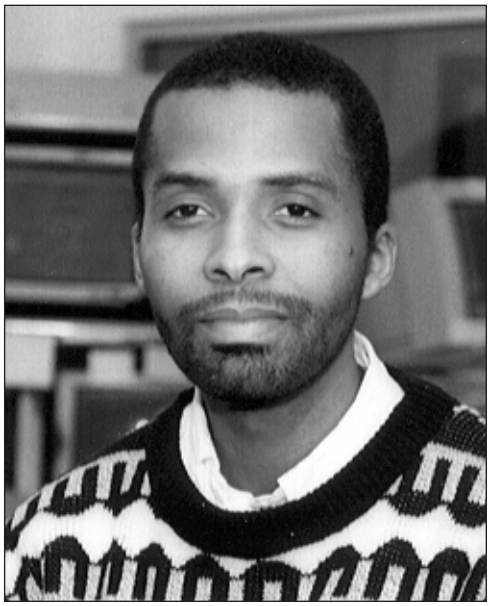
Baker, a JLab experimental physicist, was Hampton University's dean of the school of science, and currently has an endowed university professorship (an endowed chair) at HU.

The APS award recognizes Baker for his contribution to nuclear and particle physics research, his development of ways to conduct complex measurements of subatomic particles, and for being active in local and national outreach activities.

In addition, Baker has played a major role in bringing highly visible physics projects and programs to Hampton University.

The purpose of the award is to promote the participation of underrepresented minorities in physics by identifying and recognizing a distinguished minority physicist who has made significant contributions to physics research, according to the APS. The award was established in 1994 and made possible by a grant from the Research Corporation, a foundation for the advancement of science.

More about the award is available at www.aps.org/praw/bouchet/index.html.



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