May 2003

ON TARGET

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY • A DEPARTMENT OF ENERGY FACILITY

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Supercomputing at JLab

Info Office staff develop powerful, lower-cost capabilities through SciDAC

by James Schultz

Science may be catching up with video gaming. Physicists are hoping to adapt some of the most potent computer components developed by companies to capitalize on growing consumer demands for realistic simulations that play out across personal computer screens. For researchers, that means more power, less cost, and much faster and more accurate calculations of some of Nature's most basic, if complex, processes.

Jefferson Lab is entering the second phase of a three-year effort to create an off-the-shelf supercomputer using the next generation of relatively inexpensive, easily available microprocessors. Thus far, scientists and engineers from JLab's Chief Information Office have created a "cluster supercomputer" that, at peak operation, can process 250 billion calculations per second. Such a 250 "gigaflops" machine — the term marries the nickname for billion to the abbreviation for "floating-point operations" — will be scaled up to 800 gigaflops by June, just shy of one trillion operations, or one teraflop. The world's fastest computer, the Earth Simulator in Japan, currently runs at roughly 35 teraflops; the next four most powerful machines, all in the United States, operate in the 5.6 to 7.7 teraflops range.

The Lab cluster-supercomputer effort is part of a broader collaboration between JLab, Brookhaven and Fermi National Laboratories and their university partners, in a venture known as the Scientific

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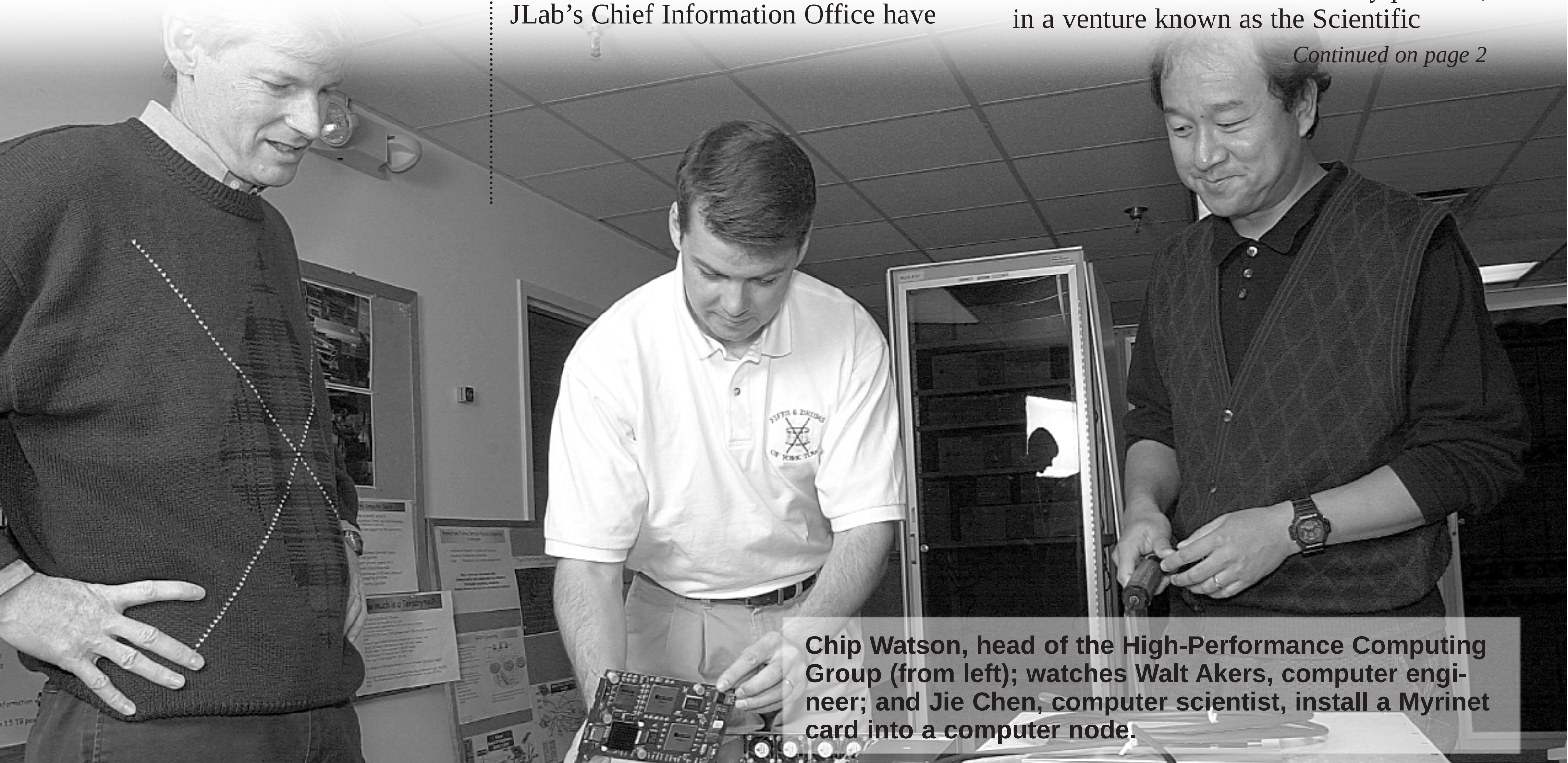

Chip Watson, head of the High-Performance Computing Group (from left); watches Walt Akers, computer engineer; and Jie Chen, computer scientist, install a Myrinet card into a computer node.

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JLab develops supercomputing capabilities...

Discovery through Advanced Computing project, or SciDAC, administered by the Department of Energy's Office of Science. SciDAC's aim is to routinely make available to scientists terascale computational capability. Such powerful machines are essential to "lattice quantum chromodynamics," or LQCD, a theory that requires physicists to conduct rigorous calculations related to the description of the strong-force interactions in the atomic nucleus between quarks, the particles that many scientists believe are one of the basic building blocks of all matter.

"The big computational initiative at JLab will be the culmination of the lattice work we're doing now," says Chip Watson, head of the Lab's High-Performance Computer Group. "We're prototyping these off-the-shelf computer nodes so we can build a supercomputer. That's setting the stage for both hardware and software. "

The Lab is also participating in the Particle Physics Data Grid, an application that will run on a high-speed, high-capacity telecommunications network to be deployed within the next three years that is 1,000 times faster than current systems. Planners intend that the Grid will give researchers across the globe instant access to large amounts of data routinely shared among far-flung groups of scientific collaborators.

Computational grids integrate networking, communication, computation and information to provide a virtual platform for computation and data management in the same way that the Internet permits users to access a wide variety of information. Whether users access the Grid to use one resource such as a single computer or data archive, or to use several resources in aggregate as a coordinated, virtual computer, in theory all Grid users will be able to "see" and make use of data in predictable ways. To that end, software engineers are in the process of developing a common set of computational, programmatic and telecommunications standards.

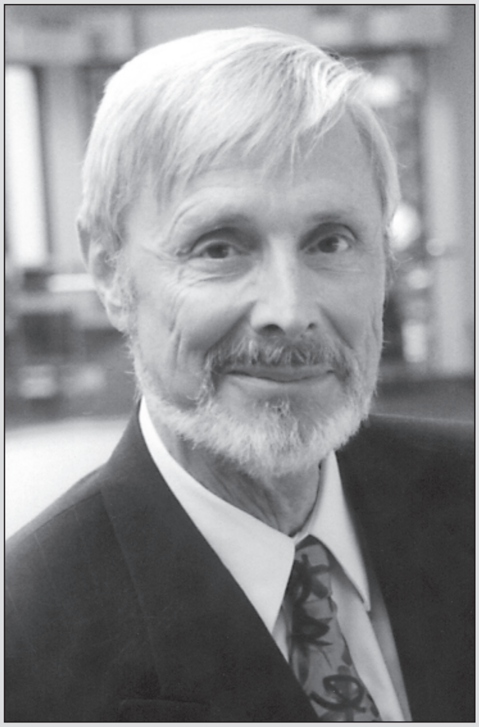
"Data grid technology will tie together major data centers and make them accessible to the scientific community," Watson says. "That's why we're optimizing cluster-supercomputer design: a lot of computational clock-speed, a lot of memory bandwidth and very fast communications."

Computational nodes are key to the success of the Lab's cluster supercomputer approach: stripped-down versions of the circuit boards found in home computers. The boards are placed in slim metal boxes, stacked together and interconnected to form a cluster. Currently the Lab is operating a 128-node cluster, and is in the process of procuring a 256-node cluster. As the project develops, new clusters will be added each year, and in 2005 a single cluster may have as many as 1,024 nodes. The Lab's goal is to get to several teraflops by 2005, and reach 100 teraflops by 2010 if additional funding is available.

"[Our cluster supercomputer] is architecturally different from machines built today," Watson says. "We're wiring all the computer nodes together, to get the equivalent of three-dimensional computing."

That can happen because of continuing increases in microprocessor power and decreases in cost. The Lab's approach, Watson explains, is to upgrade continuously at the lowest cost feasible, replacing the oldest third of the system each year. Already, he points out, the Lab's prototype supercomputer is five times cheaper than a comparable stand-alone machine, and by next year it will be 10 times less expensive. Each year as developers innovate, creating more efficient methods of interconnecting the clusters and creating better software to run LQCD calculations, the Lab will have at its disposal a less expensive but more capable supercomputer.

"We're always hungry for more power and speed. The calculations need it," Watson says. "We will grow and move on. The physics doesn't stop until we get to 100 petaflops [100,000 teraflops], maybe by 2020. That's up to one million times greater than our capability today. Then we can calculate reality at a fine enough resolution to extract from theory everything we think it could tell us. After that, who knows what comes next?"



Christoph Leemann
Jefferson Lab Director

Thank you for making Open House a success and for your volunteer spirit

From the Director

Dear Colleagues:

I want to take this opportunity to thank all of you who volunteered to make the Open House a success. An event as large as the Open House could not take place without the time and dedication of the many volunteers who served in many different capacities, making our community feel welcome at Jefferson Lab. On the heels of this event, now seems an opportune time to recognize all of our employees and users who regularly volunteer not only here at Jefferson Lab but in the community as well. Here at the Lab, we see the spirit of volunteerism every day, from your participation in events like the Open House and State Fair, to our successful BEAMS (Becoming Enthusiastic About Math & Science) and other education programs.

In addition, a number of us reach out into the community as well, by serving on committees and boards, becoming involved in service organizations, donating at blood drives, and supporting the United Way through the Day of Caring and its annual campaign. The community surrounding Jefferson Lab has been an excellent host and partner to Jefferson Lab; supporting our community's many initiatives and volunteering is another way that we can give back to the community that has been so welcoming to us. Your involvement in the community contributes in large measure to the excellent relations we have with the City of Newport News officials and our regional partners. By being involved in the communities in which you live, you represent Jefferson Lab and are accessible to friends and neighbors. Often, at other national labs, citizen committees are formed to provide feedback to the lab on concerns and issues. Here at Jefferson Lab, this has not been necessary since we interact with our community in a number of ways that provide a forum for questions to be formally and informally addressed.

For those of you who are serving as volunteers, I salute you and thank you for contributing to the quality of life in our community and to the positive public image that Jefferson Lab enjoys through your involvement. I encourage all of you to become engaged in community organizations and to volunteer to assist those causes that you believe in. Whether it is in our schools, helping the homeless or aged, being a Big Brother or Sister to a young person, there is much we can all do to improve the quality of life for all of the citizens in this region. The most valuable gift we have is our time and by giving our time and resources we each do our part to make this a great community.

Nearly 4,500 people attended Jefferson Lab's Open House on April 26. The event featured displays, exhibits, scientists and technicians to answer questions, and most major areas of the Lab open for visitors. Close to 1,000 people attended Liquid Nitrogen Demonstrations under the Big Top tent set up in the CEBAF Center parking lot.

Hall C update

G-Zero experiment completes first engineering run

by James Schultz

Proposed more than a decade ago to precisely quantify the contribution of the strange quark — one of the "lightest" of the six varieties of quarks known to exist — the G-Zero, or G0, experiment is set for a second engineering run in Hall C later this year. Accelerator Division specialists — have spent 25 person-years in preparation for the experiment's run this fall, along with several years of work contributed by roughly 100 researchers from around the world who are part of the G0 collaboration. Participants have addressed an array of technical requirements, including a made-to-order detector, a 50-ton superconducting magnet, a precision electron injector and a uniquely calibrated electron beam.

"G0 is a huge undertaking and Jefferson Lab, with its one-of-a-kind accelerator capabilities, is on the verge of bringing this experiment to reality," says Andrew Hutton, deputy director of the Accelerator Division. "In the process of providing G0 with the unique beam it requires, the Accelerator Division has confronted a variety of challenges. Skills and knowledge from across the Division's areas of expertise were called upon to meet the beam-run parameters."

Standing in the CEBAF Injector are members of the Accelerator Division's Polarized Source Group: (foreground left to right) John Hansknecht, Joe Grames, Group Leader Matt Poelker, and Reza Kazimi are flanked by (background, l. to r.) Tony Day, Phil Adderley, Marcy Stutzman, Clyde Mounts, John Musson and Jim Clark.

"It has been a huge team effort," he adds. "There are a few bugs we are addressing, but we anticipate a fruitful run when the experiment starts [up again] in October. We're all looking forward to giving our G0 collaborators the beam they need."

Because G0 researchers require an exact electron-pulse size and rate, extensive modifications were made both to the devices that create and then direct the accelerator beam to Hall C. Those changes were evaluated in the first G0 engineering run that concluded in late January. Technicians repositioned steering magnets, adjusted beam apertures, changed out certain pieces of hardware and made refinements to existing software systems. To adjust for specialized beam-injector requirements, new diagnostic equipment in Hall C was also installed.

"This [engineering] run was intended to shake things down; we wanted to get everything in place," says Jay Benesch, with Jefferson Lab's Center for Advanced Studies of Accelerators (CASA). "The run did expose problems in the machine and in configuration management that need to be addressed, but we did meet most of the requirements. My expectation is that we'll get everything addressed before October. The Accelerator Division believes the experiment will be a successful one."

G0 design necessitates a modification of the normal beam delivery system usually employed to meet Hall C's demands. Key to the experiment's success will be the accelerator's capability to precisely change the orientation of the spin of the electrons in the beam — a parameter known as helicity — relative to their direction of motion, without changing any other beam properties, such as energy, position and direction.

In addition, the electron-pulse repetition rate must be reduced to 31 megahertz, 16 times smaller than what researchers normally expect. But despite the lowered rate, average Hall C beam current needs to remain relatively high. Like water pulsing in bursts from an ultra-high-speed, off-and-on faucet, the accelerator's injector "drip" of electrons must come less frequently but in the form of larger droplets.

"You've got to squeeze many more electrons into the individual bunches," says Matt Poelker, head of the Polarized

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Accelerator Division staff in the Machine Control Center troubleshoot beam application software early in 2002, during G0 beam development. Mike Spata, Operations Group leader (sitting, front to back); confers with Ken Surles-Law, shift supervisor; and Roger Housman, on-duty operator; as Jay Benesch, accelerator physicist (standing front to back); and Joan Sage, computer scientist, assist.

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Source Group, part of Jefferson Lab's Accelerator Operations Department. "G0 users need many more electrons — a factor of 16 more — per bunch. Because electrons naturally repel each other, it was a big challenge."

Although Lab scientists would have preferred to use a JLab-designed and built laser in the Injector, attempts to make such a device locally didn't pan out. Three lasers were tried in successive attempts to obtain the required bunch structure. The third, a device made by Time Bandwidth Inc., and delivered to the Lab in August 2002, functioned adequately but needs further tweaking to provide optimum beam quality.

The laser boasts a dedicated titanium-sapphire drive able to create the kind of electron density required for the G0 experiment by precisely setting the frequency of optical pulses. The laser pulses in turn excite electrons present in a connected gallium-arsenide photocathode. The electrons bunch together and can be emitted in denser packets, traveling from the photocathode, into the accelerator "racetrack" and on to Hall C.

Because other experiments will be conducted in Hall C during the early- and mid-part of 2003, the G0 laser was moved out of the injector area during scheduled down time in February to a temporary stand in Building 58. There it will be used to conduct further tests to enhance beam quality and electron-bunch delivery prior to reinstallation in the fall.

"It's a technical challenge to create a laser like this," Poelker points out. "You need feedback electronics and precision engineering. The cavity length has to be constant, within a few microns of the 4.6-meter length."

"We all hoped it would go more easily than it did," he continues. "The beam-quality requirements were hard to meet. Beam current, position and energy in the two different states of polarization that users needed had to be identical. That places strict demands on the laser. We came pretty close to meeting the requirements; when the users return, we'll do even better."

Historically, the measurements that G0 scientists seek to make have been extremely difficult to conduct because the sought-after effects are quite small. Even using the G0 approach — looking for changes in the scattered proton when the orientation of the spin of the colliding electron changes — particle involvements remain rare. To collect a statistically significant sample, scientists must be assured that large numbers of polarized electrons will be available. Their generation and collection mandates sustained and inventive engineering.

The G0 experiment will be reinstalled in Hall C in September; G0 equipment was placed on rails and slid out of the way for other scheduled Hall C experiments underway this spring and summer. A second G0 engineering run should begin in October, with the first experiment measurements slated for early 2004.

"We've accomplished a lot in a relatively short period of time," Poelker says. "We're learning how to deliver the beam G0 users want. We're improving our ability, thanks to a group effort that involves a lot of people who have worked and are working really hard on the beam. Given everything we had to do, and the tight schedules, I think it's been a big success."

In their own words

With new Hall B leader Volker Burkert

as told to Melanie O'Byrne
contributing writer

I was born in Germany in a city that I never experienced. My parents moved to a very conservative small town with a population of 12,000, in the south of Germany, when I was just one year of age. We stayed there with my two sisters and older brother until I graduated from high school (called Gymnasium).

My high-school physics teacher was probably responsible for fostering my interest in science. He was enthusiastic about physics and possessed the skills to convey it to students. I think the German system puts a lot of emphasis on a broad, thorough education. Knowledge of basic science is important and teachers are much more appreciated in Germany than they seem to be here.

Neither of my parents were scientists or engineers. My father ran a store with hundreds of exotic spices while my mother took care of the house and the kids. I was the only family member who went to university. So, naturally, my parents were very proud of me.

I got my Ph.D. in 1975 from the University of Bonn. There was, and still is, a 2.5-GeV electron accelerator in operation. While there, I worked on designing and building a focussing magnetic spectrometer and did a measurement on inclusive electron scattering in the nucleon resonance region. Some things never change!

There is a lot of history at Bonn University. Heinrich Hertz experimented there with electromagnetic waves with instruments that are still being used for demonstrations to students, and his student, Philipp Lenard, experimented with electron beam tubes there. Bonn is also the town where Ludwig van Beethoven was born. There is a little museum there called Beethoven-Haus, or Beethoven House in English.

> *"Volker Burkert has been one of the leaders in the Hall B community since its inception. He played a major role in the conception, design, construction and commissioning of the CEBAF Large Acceptance Spectrometer (CLAS). His leadership, familiarity with all aspects of CLAS and stature in the community make him uniquely qualified to take over from Bernhard Mecking."*
>
> Larry Cardman
> Physics Division Associate Director

I stayed at Bonn for several years after completing my Ph.D., then went to CERN in Geneva in 1980/82 to do physics at the Intersecting Storage rings with a calorimeter experiment. The Pope [John Paul II] came to CERN and visited our experiment once! I was part of the first observation of quark jets in hard-scattering proton-proton collisions. We also did the first direct measurement of the proton's gluon structure function.

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The first time I came to the United States was for a workshop in the summer of 1985. That was when Franz Gross offered me a position as a staff scientist. (Hermann Grunder, former Jefferson Lab director, was there, too.) I accepted the offer and arrived on 21 November 1985 in Newport News. A few days after that, I had my first Thanksgiving in the U.S. — a wonderful tradition. Although, at the time, I didn't really appreciate the history of it.

I was involved in many stages of the CEBAF Large Acceptance Spectrometer's (CLAS) development — from design, construction and commissioning to operation — and helped shape the physics program, especially in the area of nucleon structure studies through resonance excitations and measurement of spin observables. On 1 February 2003, I stepped in as the leader of Hall B, when Bernhard Mecking decided to return to full-time research. I think the most important thing for CLAS in Hall B is to get the most fundamental physics out of it. The study of nucleon structure is still the most important program with CLAS. However, new and exciting avenues have opened up more recently that promise a bright future for CLAS beyond the current limitations in beam energy.

Doing experiments is one thing, but getting the most out of the internal dynamics of nucleons and nuclei requires the highest level of analysis. I want to help establish a center of higher level physics analysis here. Measuring cross-sections is important but only part of the job. In many cases the interesting physics is buried much deeper. Digging it out is the exciting part of it. I hope JLab theorists will take an important role in this as well.

My goal is to keep the staff — scientific and technical — excited about the science we are doing and the technical challenges that go along with it. And I will continue to spend time speaking with students about their work. I continue to place high importance on presentation skills. I think presentations are very important to convey the physics content of experimental data. The public has a right to be informed so they can appreciate what we are trying to do. Albert Einstein, one of the greatest physicists of all time, gave public lectures about general relativity to factory workers!

I try to stay fit by running on my treadmill once in a while, maybe two or three times a week. On some cold, clear winter nights you may find me in my backyard behind my amateur telescope, taking photographic exposures of distant celestial objects like nebulae or nearby galaxies. One has to be patient and hold the camera steady; one exposure may take up to 45 minutes! I already have quite a collection of pictures hanging in my living room. Photography is another hobby I enjoy from time to time. I also like the arts, music and books. In Germany there is a rock guitarist who shares my name, but that's not me! I always wanted to play the guitar but it never became so pressing that I seriously started learning to play the instrument. I like folk songs but also more serious classical music. Beethoven is one of my favorites.

Volker Burkert
Hall B Leader

Cluster Supercomputing at JLab

Computer scientists, engineers tackle software, speed issues

Computer engineer Walt Akers fits the back panel on a computer node after finishing assembly work.

by James Schultz

In terms of sheer computational power, a human brain isn't much to brag about. But the brain's ability to parcel out tasks, be situationally flexible, handle ambiguity and otherwise deal with the unexpected attests to a powerful kind of architecture that has so far eluded its would-be electronic rivals. Until, that is, the advent of parallel processing.

In a primitive approximation of what occurs in the brain, programmers at Jefferson Lab and elsewhere are figuring out how to divvy up computational tasks. Unlike conventional computation, where instructions are executed one by one, or serially, parallel programming identifies the crucial components of a given task, assigns those tasks to particular processors — called "nodes" by insiders — and then insures that, although the processors are working independently, they are sufficiently interconnected to be able to communicate the results of their labors with every other node.

That approach is crucial as physicists attempt to simulate and then describe the interactions of quarks — thought by many scientists to be one of the basic building blocks of matter — within particles like protons and neutrons. Advanced calculations such as those required by "lattice quantum chromodynamics," or LQCD, theorists simply can't run effectively on the serial processors found on run-of-the-mill personal computers.

"Even if you have a dozen processors in one computer, your job, your software, will still only use one processor," says Walt Akers, a computer engineer with JLab's Chief Information Office, High-Performance Computing Group. "Most run from the top to the bottom [of a task]. It's one long stream of operations, with each one depending on the one before. Going to a parallel computing system potentially offers vast increases in performance capabilities."

As part of its participation in the Scientific Discovery through Advanced Computing project, or SciDAC, administered by the Department of Energy's Office of Science, the Lab's computer engineers are developing hardware and software innovations that will allow the developing generation of "cluster supercomputers" to operate at maximum potential. Aside from continuing to solve basic deployment issues — such as the interconnections and communi-

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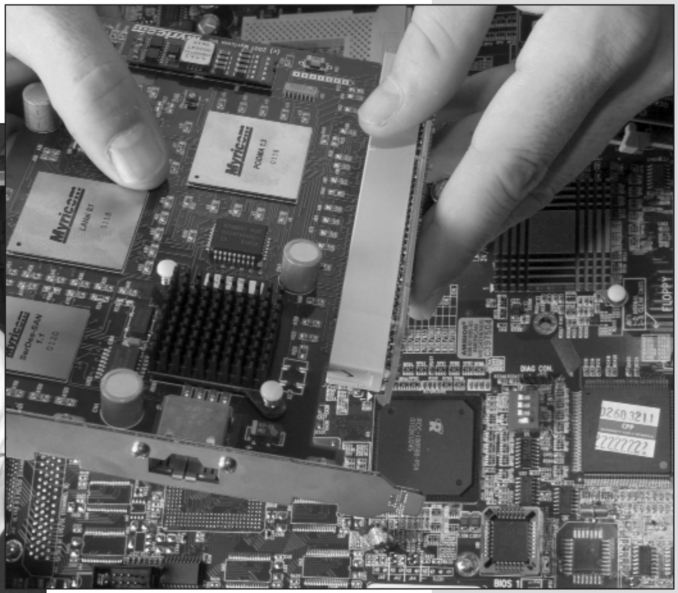
cation among the computer nodes that comprise each cluster — JLab specialists have also developed or refined several collaborative software packages that monitor node performance and insure speedy replacement of defective components. In particular, the Lab-developed "Cluster in a Can" program has been posted to the World Wide Web for anytime-anywhere use by software developers.

"We're in a national collaboration to make LQCD a reality," says Akers' colleague Jie Chen, a computer scientist in JLab's High-Performance Computing Group. "It's a big job. Parallel programming is more difficult than serial programming code. Coordination and communication are the big issues. Each node has to 'talk' to its neighboring node, even while the nodes are calculating."

Chen, Akers and others in the Group continue to wrestle with "latency," the speed with which the nodes exchange data with one another. In building 128-node clusters, latency speeds were manageable thanks to the installation of dedicated Myrinet hardware interconnects. But these devices remain expensive, and so are not realistic options for the 256-node cluster, which will use billion-bit, or gigabit, Ethernet interconnects the group is now preparing to build. By nature, these gigabit interconnects operate more slowly, from a barely acceptable 20 microseconds latency up to as much as an unworkable 60. Latency speeds must improve dramatically if successor, bigger clusters are to work effectively, on the order of 5 to 10 microseconds.

These problems can be solved, the Group believes. The solution likely lies with a combination of the next generation of cheaper hardware and custom-designed software, perhaps written at the Lab. "As long as the problems are large and ugly, there will be bigger computers to solve them," Akers says. "But the bandwidth and latency issues will remain the biggest obstacles. Those are major issues that aren't going away."

Computer scientist Jie Chen installs a Myrinet card in a computer node.



(Above) A close-up look at a Myrinet card prior to installation in a computer node.

(Left) Jie Chen, computer scientist (left), and Walt Akers, computer engineer, examine a Myrinet card before installation.

The Accelerator Division's Kelly Mahoney (left) and Sandy Prior pause for a photo in front of the safety systems console in the Machine Control Center.

JLab staff develop, teach safety class at Particle Accelerator School

by John Anderson
Public Affairs intern

Kelly Mahoney and Sandra Prior, of JLab's Accelerator Division, were selected to design and teach System Safety and Safety Systems for Accelerators at the January 2003 U.S. Particle Accelerator School (USPAS), held in Baton Rouge, La.

Attendees from across the Department of Energy complex, the Department of Defense, Rutherford Lab in the UK, and CERN in Switzerland attended this first-of-its-kind class offered by the school. The program was well received, both by the national and international students, as well as by school director, Helmut Wiedemann.

Mahoney, leader of the Safety Systems Group in the Accelerator Operations department, has over 20 years of experience in high assurance system design such as radars, satellite transceivers, RF controls, JLab's personnel and machine protection systems, and the beam envelope limit system (BELS). He also contributes to the development of international standards used in the design of high reliability equipment. Mahoney provided the technical base for the USPAS safety class, covering subjects such as safety system design, risk and reliability analysis techniques, system architectures, and basic accelerator theory.

Prior, of the recently formed Accelerator Division EH&S Department, provided a different, but equally important aspect of the program. She has more than 25 years of experience in the field of Health and Safety and is very familiar with the federal, state, and international requirements that form the basis for accelerator regulation. She presented sections of the class covering national and international regulatory and statutory requirements for accelerator safety as well as hazard analysis and life-cycle management practices for system safety programs.

Prior gained her knowledge of international health and safety requirements during the mid-80s, while serving in the U.S. Army at its Medical Command Headquarters in Heidelberg, Germany, where she was responsible for setting up an occupational health and safety program for the military and civilian people working for U.S. Army European Command. In 1996, she served on a committee for JLab's "Necessary and Sufficient Review" of applicable federal and state requirements which received the Al Gore Hammer award from the then vice president. Her experiences set the context wherein safety systems are developed.

Mahoney and Prior were pleased with the outcome of the program. Fourteen students attended the class — nearly doubling the expected number — and gave them an outstanding rating on their surveys. USPAS Director Helmut Wiedemann has already contacted the two about presenting the class again. At present it is scheduled for mid-2004. In the future, in addition to university credits, credit toward professional certifications may be earned by attending the course.

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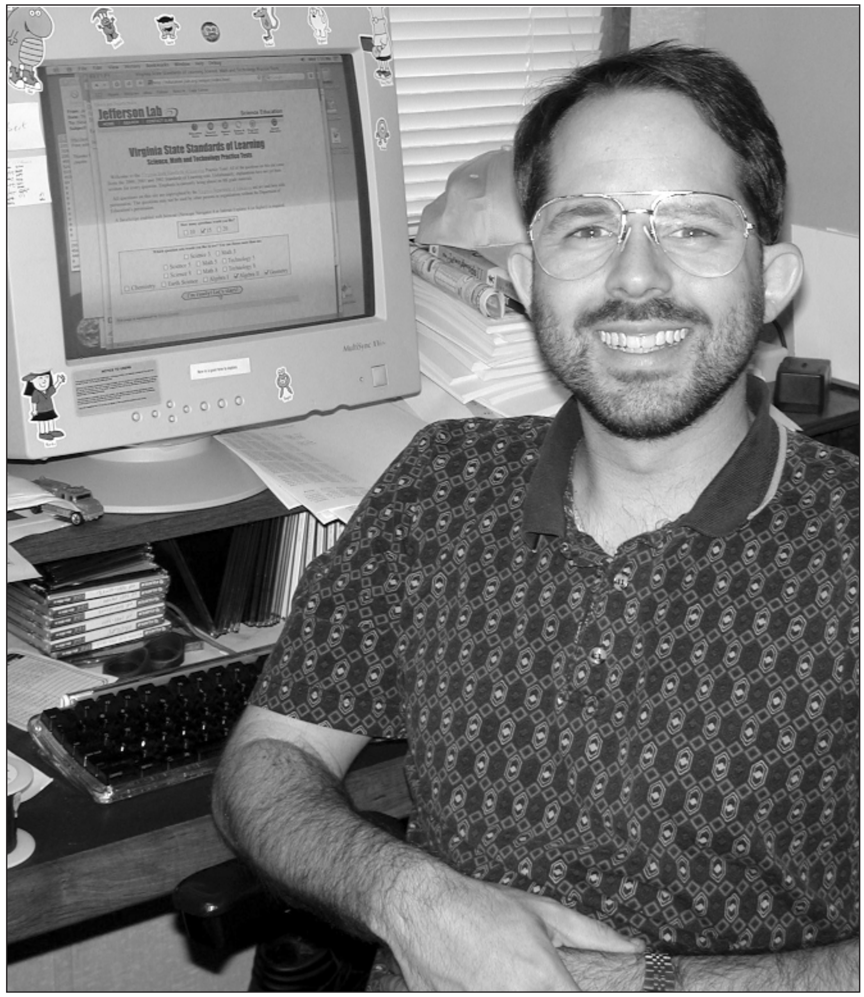
Science Ed web site sets new high-use record as students prep for SOLs



Steve Gagnon, Science Education webmaster, takes a break from updating the Science Education SOL web page.

Since hitting a new high-use record in mid-April of nearly 212,000 pages accessed during one day on Jefferson Lab's Science Education web site, use of the site has steadily increased.

During early May, with several regional schools on the verge of starting Standards of Learning (SOL) testing, usage numbers made a dramatic jump, topping 400,000 pages accessed on several days. Then for the first time, on May 6, the number of pages accessed on the web site topped 500,000, with a total of 573,409 pages viewed.

"It has been exciting to see the level of use our web site has gotten recently," said Steve Gagnon, JLab Science Education technician and education web master. "Most of the pages accessed were from our Virginia Standards of Learning Science, Math and Technology Practice Tests and our 'Who Wants to Win $1,000,000 Math and Science Quiz.'" (Contestants don't play for real money.)

During the May 6, 500,000-plus day, nearly 392,000 of the pages accessed were from the 2000, 2001, and 2002 Standards of Learning test questions featured on JLab's Science Education web site. Another 110,000 pages were accessed from the entertaining and educational "Who Wants to Win $1,000,000 Math and Science Quiz."

"Use of our web site cycles throughout the day," Gagnon commented. "We've been seeing heavy usage during the school day. Recently teachers must have started assigning our web site as homework because the evening numbers started going through the roof. Fridays and Saturdays will be relatively quiet, but activity on the web site kicks into gear on Sunday evenings."

The SOL tests on the web site include 3rd grade math and science questions, 5th grade math, science and technology questions, and 8th grade math, science, technology, algebra I & II, geometry, earth science and chemistry questions. "The SOL practice tests are a great resource for students, teachers, parents — or anyone interested in the information," Gagnon added. "The web site is set up so a person can request 10, 15, or 20 multiple-choice questions from a single category."

The interactive design of the site lets users select and submit their answer. They are told if their response is right or wrong. If correct, the answer page repeats the question/problem and the correct answer. If a question is answered incorrectly, the answer page provides the question with the correct answer.

The Jefferson Lab Science Education web site is at http://education.jlab.org/. To access the SOL practice tests or to play the $1,000,000 math and science quiz, click on the Games & Puzzles icon.

Knowledge and use of the site is growing steadily. Last spring the web site broke 100,000 pages accessed in one day; last week it topped 400,000. And now the web site has broken half a million pages viewed in 24-hours.

Legal update

How to handle intellectual property issues at JLab

A few years ago the Legal office wrote an article to answer a few often-asked questions regarding intellectual property issues at Jefferson Lab. Because of the many new employees at the Lab, and the many programs, projects and activities underway, it's time to re-run those questions and answers and to respond to a couple new queries.

Q. What do I have to do to find out if my idea is patentable?

A. The first step requires that an inventor make a prompt disclosure to Jefferson Lab's General Counsel — using the Invention Disclosure Form (you may get the form from the Legal office, ext. 7384, room B217 in CEBAF Center, or make a copy from the example found in the Lab's Administration Manual, Exhibit 701-2). The disclosure form asks the inventor(s) to discuss the problem that the invention is designed to solve. Referring to any similar devices, state the advantages of the invention, describe the invention and its operation and finally, list the features of the invention that are novel. An accurately completed form usually has several attachments (including a drawing if necessary), is signed and dated by the inventor(s), and includes the signature of two witnesses who have read and understand the concept presented on the form. The process of disclosure at JLab has always been user-friendly in order to encourage disclosure of inventions.

After this initial step by the inventor(s), the disclosure form undergoes processing. The Technology Review Committee (TRC), chaired by Chief Technology Officer Fred Dylla, ext. 7450, makes an initial decision to pursue a patentability review of the invention, proceed straight to prosecuting a patent application, or return the invention to the inventor. A patentability review could cost $750 to $1,200. If the patentability review is favorable, the Committee must decide whether to pursue a patent as prepared by outside counsel. Since fees for obtaining a patent range from $5,000 to $8,000, the TRC must decide not only which inventions hold the potential for obtaining a patent but also hold potential for suc-

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The Radial Wedge Flange Clamp was developed by Karl Smith, Accelerator Division. The device is patented and can be licensed for a variety of high-tech and industrial applications.

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cessful commercialization. If the invention is returned to the owner, he/she may pursue a patent, use the technology for their own business venture or seek commercial partners for further development, all subject to the Government's rights.

Q. If I disclose my idea by publishing it in a trade magazine, journal, on the Internet or by making some other public disclosure (i.e. conference, seminar), will I lose my right to a future patent?

A. Possibly. Even though you have a 1-year grace period to apply for a U.S. patent after publication, most foreign countries don't allow for this 1-year grace period. Any public disclosure prior to filing a patent application will prevent you from obtaining a patent in such foreign countries. Even though SURA/Jefferson Lab has yet to file for a foreign patent, this aspect of protection may be very valuable with the prospect of licensing to private industry and acquiring international markets. Further, once publication has occurred the idea becomes open to the world, and claiming rights to the invention may become a matter of a race to the U.S. Office of Patent and Trademark. Protecting rights to inventions is an important part of SURA/Jefferson Lab's technology transfer program. However, our desire to protect an idea does not have to conflict with your desire to publish or the Lab's desire to develop cooperative research ventures. With the proper timing of an invention disclosure form, documentation, a patentability review, and obtaining confidentiality agreements, it may be possible to achieve everyone's goals.

Q. Can employees use intellectual property developed here at the Lab for their own personal business ventures?

A. Maybe. Although an employee's request to use technology developed at the Lab can be a very complicated proposition — filled with conflict of interest issues and questions of impropriety — procedures are in place to facilitate such requests. In order to respond to these concerns, as well as to make sure the general public has a fair opportunity to obtain the technology, the Lab's Technology Review Committee puts such employee requests through a rigorous process to insure that the technology has been properly exploited and that private industry has a fair opportunity to compete for the same technology. Such requests also require DOE approval. (See the Conflicts of Interest provision under the Patent & Copyright Section of the Admin. Manual, Section 701.C) Staff members who have properly disclosed their outside business activities to the Lab via an Outside Business Activities Request Form (see Admin. Manual Exhibit 208.03-1), may compete for a license or other form of technology transfer mechanism to obtain intellectual property developed on site — just as any other company would. Regardless of whether an employee-inventor is licensed under this process, he/she is eligible to share in any royalties resulting from the licensing process.

Q. How does the Lab protect drawings, designs and computer software?

A. These forms of intellectual property are usually protected by a copyright although they may also be protected under a patent or trademark if necessary. Technically, a copyright exists when a work is created. Registration with the U.S. Patent and Trademark Office is now optional. However, registration is usually highly recommended if the work is the subject of a license or has commercial viability. Additionally, since employees of the Lab work for a government owned and contractor operated facility, SURA must seek DOE's approval in order to perfect copyrights in works created by its employees.

Most of the drawings, diagrams and software developed at Jefferson Lab are not proprietary and do not have commercial value. Those works belong in the public domain and are accessible by the public for non-commercial purposes. (A release statement incorporating the "non-commercial" use of such works should accompany their publication and transfer.)

JLab's Technology Review Committee

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Chief Technology Officer and Committee Chair

Rhonda Scales
Legal Counsel

Will Brooks
Physics Division Representative

Dick Lusk
Administration Division Representative

Jim Boyce
Accelerator Division Representative

Linda Ware
Director's Office Representative

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Southeastern Universities Research Association (SURA)

Non-voting Members

Kathleen Duff
Recorder

Teresa Danforth
Administration Division

Milestones

for February 2003

Hello

Christopher J. Graves, SNS Assembly Tech-SRF, Accelerator Division

Michael Haddox-Schatz, Programmer, Physics Div.

Goodbye

Scott. O. Schwahn, Operational Health Physicist, Accel. Div.

for March 2003

Hello

Johan A. Bengtsson, Staff Scientist, Accel. Div.

Mary C. Erwin, Chief Financial Officer, CFO

John G. Kennedy, Fire Protection & Security Technician, Admin. Div.

Tony Madany, Hall B Instrumentation Technician, Phy. Div.

Dennis L. Merritt, Locksmith/Carpenter, Admin. Div.

Viktor I. Mokeev, Hall B Staff Scientist, Phy. Div.

Pamela L. Morrison, SNS Assembly Technician, Accel. Div.

Armenak Stepanyan, Hall B Instrumentation Technician, Phy. Div.

Stepan Stepanyan, Hall B Staff Physicist, Phy. Div.

for April 2003

Hello

Joshua M. Brittian, Electronics Technician, Accel. Div.

Bridget E. Carter, Housekeeper, SURA

Tanest Chinwanawich, Hall B Instrumentation Engineer, Phy. Div.

David J. Deveau, Systems Accountant, CFO

Rustam A. Niyazov, Hall B Post Doctoral Associate, Phy. Div.

Suzanne H. Roseberry, U/ILO Administrative Support, Phy. Div.

Maximo S. Tan, DC Power System Technologist, Accel. Div.

Ned W. Walker, Safety Coach/Technician, Accel. Div.

Shannah M. Whithaus, Documentation Coordinator, Accel. Div.

Goodbye

Bobbie L. George, Travel Auditor, CFO

Samuel T. Hicks, Jr., Mechanical Technician, Phy. Div.

Ulrike Thoma, Hall B Post Doctoral Researcher, Phy. Div.

Congratulations to…

Dennis Dobbins, Admin. Div., for qualifying to run in the April 19, 2004, Boston Marathon. Dobbins qualified for Boston while running the Myrtle Beach Marathon on Feb. 22, 2003; the qualification deadline for the 2003 running was Feb. 2. Dobbins completed the 26.2-mile course in 3:48:35. Best of luck running Boston in 2004!

Alex Dzierba, JLab GlueX/Hall D spokesperson and Indiana University physics professor, on being named IU's Distinguished Faculty Research Lecturer for 2004. As part of this honor, Dzierba will be giving a public lecture next year, which of course will be on GlueX physics!

George Neil, Accel. Div., on running in the 107th Boston Marathon (April 21). Neil finished the race in 3:07:30, finishing 1,049 in a field of 20,260 runners! The temperature was near 70° F for the noon start. Temperatures increased slightly then plummeted to 58 by the time the first runners crossed the finish line.

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.

On-site driving safety reminder from Facilities Management

Personal responsibility for obeying traffic-control and speed limit signs is very important. Jefferson Lab uses normal supervisory oversight to ensure accountability for the proper operation of motor vehicles on site. Everyone on site is expected to operate vehicles safely, courteously, and in accordance with the laws of the Commonwealth of Virginia.

In addition to pedestrians, bikes, golf carts, personal vehicles, and large and small delivery vehicles, Jefferson Lab has industrial and utility vehicles on site that are used for transport or lifting of equipment and personnel. These have special operational requirements and limitations, and they require extra attention from others sharing the road.

In the event of dangerous operation of motor vehicles, the Security officer will contact the supervisor/sponsor or SOTR (Subcontracting Officer's Technical Representative) of the vehicle owner and give him or her the following information: the date, time, place, nature of incident, and the vehicle owner's name. The Jefferson Lab supervisor/sponsor/SOTR is responsible for discussing the matter promptly with the vehicle owner and reaffirming JLab's expectation for safe driving on site. Repeat offenses should be handled in accordance with Jefferson Lab's Corrective Action Policy, found in section 208.02 of the Administrative Manual.

TJ High School wins National Science Bowl

Thomas Jefferson High School for Science & Technology from Alexandria, Va., won the Department of Energy sponsored, 2003 National Science Bowl competition held May 1-5 in Washington, D.C. On Feb. 8 they won the Virginia Regional Science Bowl held at Jefferson Lab. This year marked the high school's third straight regional win and second consecutive win at nationals.

JLab staff gives class at Accelerator School...

Continued from page 10

USPAS is a DOE sponsored program designed to teach basic and advanced accelerator engineering and physics subjects in an intense two-week curriculum. The school is based at Fermilab in Chicago. Classes are offered semiannually with the next set planned for Santa Barbara, Calif., in June 2003. The January 2004 school will be hosted by JLab and the College of William & Mary. Attendees may take the classes for credit through Indiana University and apply them towards IU's graduate program in accelerator physics. Learn more about the school and its graduate program, online at http://uspas.fnal.gov/.

A great day for a bike ride

Left to right: Hiroyuki Toyakawa, Matt Bickley, Dave Kashy, Doug Kieper, Steve Suhring, Will Oren, Cindy Hall, Jim Parkinson, Mary Jo Bailey, and Arne Freyberger posed for a JLab Bike Club photo in early April wearing their new, bright orange jerseys. Lori Powell, Electronic Media, designed the jersey. The Bike Club, active since May 1995, promotes regular, physical exercise as a group. Members include novice cyclists, dedicated road racers and triathletes. They meet in the parking lot in front of the ARC, Monday through Friday, and ride from noon to 1 p.m. Helmets are required, and road or racing bike are recommended. Check with a Bike Club member to find out about Summer Wind Sprint Wednesdays and the club's fall awards ceremony and luncheon. Bailey, Hall and Parkinson will participate in the Multiple Sclerosis 150-Mile Bike Tour, May 31-June 1. The MS150 Bike Tour raises money to support medical research into this devastating disease.

TOCTWD

Close to 90 youth participated in JLab's Take Our Children to Work Day on April 24. This year's event "Take Flight" featured a discussion with JLab physicist Michelle Shinn and watching the feature film "October Sky" in the CEBAF Center auditorium, as well as launching model rockets outdoors. The elementary school group made and launched film canister rockets while the middle school students built Estes model rockets and launched them from the Residence Facility field.

ON TARGET

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