

Blue Gene/P to address most-challenging science problems

ELEANOR TAYLOR AND JARED SAGOFF

ONE OF THE WORLD'S fastest supercomputers will soon reside at the Argonne Leadership Computing Facility (ALCF), thanks to a recently completed contract for the acquisition of a 445-teraflops IBM Blue Gene/P cluster.

The ALCF's second major acquisition, the Blue Gene/P supercomputer will boost the facility's total computing power to 556 teraflops, representing a fivefold increase in system capability. This advance will help to initiate the coming era of petascale computing and enable experts to answer questions that have confounded America's scientists for years.

"The ALCF has been a valuable contributor in the development of Blue Gene/P," said Leo Suarez, head of deep computing at IBM. "The close working relationship that we enjoy will deliver a machine that will propel scientific discovery in the most profound way since Galileo's telescope."

The ALCF Blue Gene/P system relies on technology provided by IBM, Myricom and DataDirect Networks in order to pair world-class processing speeds with advanced data management capabilities to meet the intense computational strength and data-storage demands of petascale computing. "Researchers can employ this new computing resource to attack cutting-edge problems in science and engineering at unprecedented scale and speed," said Ray Bair, Argonne's ALCF director.

The Blue Gene/P can carry out 445 trillion calculations — or flops (short for floating-point operations) — every second. If all six billion people on Earth tried to work as fast as the supercomputer, each person would need to do more than 70,000 additions or multiplications per second to keep up with it.

The new Blue Gene/P will open to researchers entire realms of scientific inquiry, from in-depth modeling of climate change to more accurate and complete representations of exploding supernovas. The complex computations needed to produce the fine resolution of these models create tremendous volumes of data, from tens to hundreds of terabytes per run.

The ALCF provides resources for the U.S. Department of Energy's Innovative and Novel Computational Impact on Theory and Experiment



Ray Bair, Director of the Argonne Leadership Computing Facility, supervises installation of a new IBM Blue Gene/P system.

(INCITE) program, which seeks computationally intensive research projects from industry, scientific researchers and research organizations. The 445-teraflops Blue Gene/P will dramatically increase ALCF resources available to INCITE.

INCITE computations will commonly produce tens to hundreds of terabytes of data in a single day. "This architecture enables our Blue Gene/P systems to support the gigantic data flows of petascale applications," Bair said, "like the time series data that come from biomolecular dynamics, climate models and astrophysics simulations, to name just a few."

Because the Blue Gene/P can execute so many computations so quickly, the ALCF also requires a state-of-the-art data-storage system. This system will take the form of a bank of more than 8,000 disk drives that will send and receive data from the Blue Gene/P's more than 100,000 processors.

Altogether, this system can deliver nearly 80 billion bytes per second to and from disk — the equivalent of transferring the content of 100 full CDs every second.

Myricom's economical, low-latency modular switches represent the heart of the ALCF's data-management system. The nine-switch complex supports up to 2,048 connections, each of which simultaneously exchanges data at around 1 billion bytes per second.

IBM will also supply 68 file servers to run Argonne's high-performance Parallel Virtual File System (PVFS2). This bank of servers will manage more than 8 petabytes of storage on 17 next-generation DataDirect Networks' massively scaleable S2A storage appliances, which can deliver more than 78 gigabytes per second of sustained throughput from the array. "Our design can enable the IBM Blue Gene/P to maximize computational time instead of waiting for I/O operations," said Alex Bouzari, CEO of DataDirect Networks. ■



When completed, the Blue Gene/P will be one of the most powerful computers in the world, able to carry out 445 trillion calculations per second.

New schedule of awards for patents and inventions announced

A NEW POLICY states that an award of \$250 may be made to any Argonne employee who develops an invention from their work that is filed for a United States patent application, with such an award given to each member of a team of co-inventors, up to a maximum of \$1,500 in awards for any one application.

This award can also be made to creators of noteworthy copyrighted material upon filing for the purpose of registration and commercialization through licensing by Argonne. An award of \$500 may be made to each such inventor upon the issuance of a U.S. patent, up to a maximum of \$3,000 (See "Awards" on page 2)

Performance appraisals due Dec. 14

THIS YEAR'S performance appraisal cycle is more than halfway through. All performance appraisals are due electronically to Human Resources by Dec. 14.

Employees

At this point in the process, performance appraisals have been approved and are ready to be released to employees. What are the next steps?

- After your performance appraisal is approved, you will receive an e-mail letting you know that you may now view and print your performance appraisal on the Web application.
- Next you will have a conversation with your supervisor on your performance appraisal.
- After the meeting, you'll receive another e-mail letting you know you

(See "Appraisals" on page 2)

ONLINE OPEN ENROLLMENT ENDS NOV. 21

There are only a few days left for employees to change their medical plans, verify student status or enroll in the health care or dependent care flexible spending accounts for 2008.

Open enrollment ends Wednesday, Nov. 21. Late enrollees and late changes will not be accepted. The open enrollment Web site can be reached at www.inside.anl.gov. An Argonne login ID and password must be used to access the site. Employees who do not have access to a computer can use computers available in Human Resources, Room 1K-03, in Building 201 (located to the right of the elevators). Benefits representatives will be available for assistance.

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Awards

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awarded for teams of co-inventors on any one patent.

More than 25 years ago, awards for inventions leading to a patent were established. These awards were created to recognize and reward creativity and the effort necessary to pursue a patented technology and to stimulate the reporting of additional inventions on a continuing basis.

Recently, the Office of Technology Transfer (OTT) reviewed the structure of the awards for inventions and patents as established in the early 80s, with the purpose of updating the awards to be consistent with the current award values and the practices of other Office of Science laboratories. As a result of the review by OTT and subsequent recommendations to the Office of the Director and DOE's Argonne Site Office, a new award structure for patents and copyrights was established effective Oct. 1.

Awards will be determined by the deliberations of the joint OTT-Legal Intellectual Property Decision Group (IPDG) in consideration of actions to be taken in its review of inventions reported to the Argonne Patent Counsel's Office. The updating of the awards for patents and inventions should serve to better recognize staff that "go the extra mile" to report an invention and to stimulate new inventions from an increasing number of creative Argonne staff.

Last fiscal year, 138 Argonne employees reported 91 new inventions to Argonne and to DOE. Developing inventions is an important result of the pursuit of science for commercial applications and is a key obligation of each Argonne employee. Both DOE and the laboratory review each reported invention to determine its patentability to protect their interests. Patenting an invention creates an asset for the laboratory and is essential for commercial use of the invention to create user benefits, new businesses, and jobs, while fulfilling Argonne's technology transfer mission. It also returns royalty income to the laboratory for additional research and education, with the funds received shared by the inventors, the inventors' divisions and the laboratory in a 25/50/25 percent split. ■

Appraisals

(Continued from page 1)

can sign your performance appraisal electronically.

Supervisors

- After division approval and associate laboratory director release, you may release the completed performance appraisal electronically to the employee to view or print.
- After you meet with the employee to discuss the performance appraisal, you must electronically document the date of the meeting. (This action attaches your electronic signature to the appraisal.) At this time, you are also able to add comments and edit the employee's Section 3 goals.
- After the employee electronically signs, the performance appraisal is complete and forwarded to HR. ■

Distant black holes may be source of high-energy cosmic rays

JARED SAGOFF

BREAKTHROUGH astrophysics research may have identified the hitherto mysterious source of exceptionally high-energy cosmic ray emissions, according to recently published research that culminates a project developed by an Argonne scientist.

This extraordinary result is a product of DOE's investment in high-energy physics research, giving scientists the resources they need to explore the interactions between matter, energy, time and space.

Argonne senior physicist Harold Spinka, in collaboration with more than 300 scientists from around the world affiliated with the Pierre Auger Observatory in western Argentina, determined a correlation between emanations of sufficiently energetic cosmic rays with a particular class of extrastellar objects, known as active galactic nuclei (AGNs). Scientists believe that AGNs are massive black holes in the center of distant galaxies that devour matter while ejecting plasma streams composed of high-energy particles.

"We have taken a big step forward in solving the mystery of the nature and origin of the highest-energy cosmic rays," said Nobel Prize winner and University of Chicago Professor Emeritus James Cronin, who founded the Pierre Auger Observatory with Alan Watson of the University of Leeds. "The age of cosmic-ray astronomy has arrived. In the next few years, our data will permit us to identify the exact sources of these cosmic rays and how they accelerate these particles."

After observing and recording approximately two years' worth of cosmic rays hitting the earth, the Pierre Auger team noticed that the cosmic rays — a misnomer for energetic atomic particles, mainly protons — with energies in excess of 60 EeV (60 exa-electron volts, or 10^{18} electron volts) tended to emanate from locations near known AGNs.

Most cosmic rays that strike the Earth originate from within our own Milky Way galaxy, where they emanate from supernovae, black holes or neutron stars. However, these cosmic rays have a substantially lower energy than those under investigation in the Pierre Auger study. Researchers knew that they could not attribute the production of those rays to any phenomenon or body within our own galaxy, and until now research to identify an extra-galactic source had yielded little more than hypotheses.

Astronomers had difficulty pinpointing the sources of especially energetic cosmic rays because they hit the Earth so infrequently, in contrast to the lower-energy cosmic radiation that continually bombards the Earth. During more than two years of observation, the Pierre Auger scientists detected only 28 cosmic rays that matched their stringent criteria. They excluded extragalactic cosmic rays with energies lower than 40 to 60 EeV, because the trajectories of these particles are so badly bent by deep-space magnetic fields that scientists cannot determine their origin; they also did not look at cosmic rays that had traveled more than 300 million light years due to concerns that interactions with cosmic background radiation during such a long journey would have significantly reduced their energy.



This artist's illustration shows a cosmic ray striking the Earth's atmosphere and creating a shower of secondary particles detectable on the surface. The image of Centaurus A digitally superposed near the top signifies one such active galaxy from which cosmic rays might originate. Image by Pierre Auger Observatory Team.

"The concern is that if you look too far back in time and space, it becomes harder to figure out a correlation," Spinka said.

Since 2004, the observatory, which contains a telescope array the size of Rhode Island, has detected only 80 cosmic rays with energies greater than 40 EeV. Of the 28 of these that had energies greater than approximately 60 EeV and originated within about 250 million light-years of Earth, 20 were located close to known AGNs. Six of the remaining eight cosmic rays come from directions where the source may be obscured by other matter in our galaxy.

According to Spinka, astronomers have worked hard to complete the catalog of all the AGNs in the observable universe, and he believes that cosmic rays may offer clues as to where others might be. "I think that many astronomers will indeed go back and look at the areas of space to which we traced the cosmic rays, because it's definitely possible we might have missed something," he said.

Cosmic ray observations provide astronomers with another way of

examining celestial features outside of the Milky Way, Spinka said. "Up until now there has been no way of doing astronomy for objects outside our galaxy except by using various wavelengths of light. This paper represents the first time that we've been able to use charged particles to observe these faraway objects."

The Pierre Auger Observatory is being built by a team of more than 370 scientists and engineers from 17 countries. "The collaboration is a true international partnership in which no country contributed more than 25 percent of the \$54 million construction cost," said Danilo Zavrtanik of the University of Nova Gorica and chair of the Auger Collaboration Board.

The paper, "Correlation of the Highest Energy Cosmic Rays with Nearby Extragalactic Objects," appears in the Nov. 9 issue of *Science*. A press release from the Auger Observatory can be found online. ■

www.auger.org/news/PRagn/AGN_correlation.html



ENGINEERING SOCIETIES VISIT

More than 90 members of the Chicago Section of the Society of Automotive Engineers and the American Society of Agricultural and Biological Engineering visited Argonne Nov. 8. Don Hillebrand, director of Argonne's Center for Transportation Research, at far left, leads a tour of the Mobile Automotive Technology Testbed at Argonne's Advanced Powertrain Research Facility. Photo by Dave Jacqué.

Hispanic-Latino Club hosts 40 eighth grade students

ABIGAIL ALLRED

IN CELEBRATION of National Hispanic Heritage Month, which ran from Sept. 15 - Oct. 15, Argonne's Hispanic-Latino Club invited 40 eighth graders to the lab Sept. 20 to participate in a day of hands-on educational tours and experiments. This was the third time the club has hosted such an event.

The children, from Unity Junior High School in Cicero, were chosen by their math and science teachers based on their interest in science. President of the Hispanic-Latino Club, Argentina Leyva (CMT), said that the children's grades were not the deciding factor for choosing the students. "We were most interested in inviting students who are active and have a genuine interest in studying math and science."

To prepare for the event, the students were assigned eight readings about the topics covered during the visit and given handouts asking the students questions about the information that will be covered. "The students had to be actively engaged and asking questions while here in order to fulfill their assignments," Leyva said.

The students were broken into groups and each participated in two tours and two experiments, all of which had hands-on components. They collected data, created

graphs and performed experiments.

During a lunchtime break, the students had a chance to see the Luna Negra Dance Theater, a group of performers who blend ballet and contemporary dance movements strongly flavored by Latin and Afro-Caribbean dance forms.

After lunch, each group was assigned a subject covered in the readings and during the visit, and they created a PowerPoint presentation answering questions presented to them. Once completed, the students had to give the presentation to the rest of their peers.

There was a great commitment of both time and funding from Argonne personnel, including Deputy Laboratory Director Donald Joyce, who showed up unexpectedly during breakfast to welcome the students with a motivational speech. Approximately 30 employees from Argonne and DOE's onsite office worked to make this event possible.

The Hispanic-Latino Club members invited the students and teachers to continue contact with them and to use them as resources and for guidance into the future.

Mariana Varotto (AES), 2007 Hispanic Educational Outreach Day coordinator, said she "was delighted to see all the enthusiasm around and felt rewarded by knowing this experience will have a positive impact on the lives of these students." She hopes this day will encourage students to take an active role in science both now and in the future, as well as expose them to successful role models. ■

EQO employee receives Pacesetter award

ANDREA CIPRIANI



MARIAN WILLIAMS (EQO) was presented with a Pacesetter Award for support she provided on a Physics Division project over the past four years.

Williams was the health physicist assigned to provide guidance and radiation safety information during a radium trap project begun in 2003. Whenever a sample was loaded or unloaded or the apparatus was opened for adjustment, Williams provided safety guidance to the experimenters. Williams monitored and performed radiation surveys throughout the whole process and went out of her way to be available on short notice or during lunch hours.

On several occasions, Williams had to extend her work day to ensure the work was done safely and to the satisfaction of the experimenters. Her consistent and above-and-beyond support throughout the four-year project made it possible for the physicists to achieve their scientific breakthrough. Williams received a Pacesetter plaque and monetary award.

The Pacesetter Award recognizes employees' specific performance efforts or achievements that significantly exceed normal requirements of an employee's position, project assignment and individual situation. Awards are given based on criteria such as innovation, discovery, extraordinary effort, program development, safety initiative, peer recognition or significant cost reduction. Nomination forms (ANL-594) are available in the forms locator, www.aim.anl.gov/forms/ or may be obtained from the division office or human resources. Any laboratory employee may submit an award nomination to their division director on the appropriate form. ■

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Argonne chemist Joe V. Michael awarded distinction of AAAS fellow



Michael

JOE V. MICHAEL, a senior chemist at Argonne, has been named a fellow of the American Association for the Advancement of Science (AAAS).

Election as a fellow is an honor bestowed upon members of the AAAS by their peers.

This year, 471 members have been awarded this honor by AAAS because of their scientifically or socially distinguished efforts to advance science or its applications.

Michael and other new AAAS fellows will be presented with an official certificate and a gold and blue rosette pin, representing science and engineering, respectively, on Feb. 19, during the 2008 AAAS annual meeting in Boston.

As part of the Section on Chemistry, Michael was elected as an AAAS Fellow for his distinguished contributions to the field of chemical kinetics, particularly for the development of the application of shock-tube techniques for high-temperature studies. ■

Applications for university/Argonne scholarships due Dec. 1

APPLICATIONS will be accepted through Dec. 1 for the University of Chicago/Argonne Scholarship Plan. Under the plan, children of full-time, regular Argonne employees are eligible to compete for full-tuition scholarships. Two students were scholarship recipients last year.

To be awarded a scholarship, the student must be accepted for freshman-level admission to the University of Chicago and must be among the most qualified applicants from Argonne families as judged by the university.

Accepting a scholarship will not preclude the possibility of additional financial assistance from the university to the recipient who needs it. It is university policy to ensure that financial need is not the controlling factor in determining whether a student can attend. To apply for additional financial aid, the financial aid PROFILE form and the Free Application for Federal Student Aid (FAFSA) must be filed with the appropriate processing agencies by Feb. 1, 2008, for regular notification.

University of Chicago application forms are available in the Division of Educational Programs (DEP) division office, Building 223, Room M-125, or by calling Carol Reynolds at ext. 2-4114. Students may also complete the Basic Information Form and apply online at uncommonapplication.uchicago.edu. Students who wish to compete for a scholarship are required to complete a verification form (available through the DEP Division Office) that must be validated by the DEP division office to be accepted by the university and should be received no later than Dec. 1. Argonne scholarship applicants may apply for early action.

This University of Chicago/Argonne Scholarship Plan will provide full tuition payment. Scholarship recipients will

continue to be eligible for annual renewal as long as they remain in good academic standing and one of their parents is a full-time employee of Argonne. The university will continue to provide one-half tuition remission to dependent children of full-time, regular Argonne employees who are admitted for study in the College or the laboratory schools of the university. For information on the tuition remission program, call Human Resources at ext. 2-3410.

For information on admissions, contact Ruth Martin, assistant director of admissions, at 773-702-7944. ■

Special seminars on Ricketts Lab to shed light, answer questions

SPECIAL SEMINARS on the Howard T. Ricketts Regional Biocontainment Laboratory that will open at Argonne have been scheduled for all Argonne, Department of Energy and University of Chicago employees. "Demystifying the Ricketts Laboratory: An Introduction to Biosafety" will be presented by Joe Kanabrocki, assistant dean for biosafety and associate professor of microbiology in the Biological Sciences Division of the University of Chicago. He also serves as the director of the biosafety program at the Ricketts Laboratory.

Three sessions will be held:

- Nov. 27, 11 a.m., Building 201, Conference Room 3A
- Nov. 27, 1 p.m., Building 203 Auditorium
- Dec. 11, 10 a.m., Building 401, Conference Room A1100

All employees whose schedules permit are invited to attend. ■

IN MEMORIAM OCTOBER 2007

Duane W. Condiff, a chemical engineer with 28 years of service in RAE, died Sept. 14. His wife, Kathleen, survives him.

David Green, a retired ACL manager with 28 years of service in CMT, died Oct. 27. His wife, Mary, survives him.

Amelia M. Hester, a laborer with 18 years of service in PFS, died Oct. 14. Her children, Mary Ann Werner, Kathleen Herighety, Patricia Hester and Colleen Erickson, survive her.

Ruth Hillard, a retired Medical Assistant with 31 years of service in HR-Medical, died Oct. 26. Her children, Edie Szudy and Dane Hillard, survive her.

Richard L. Jordan, a retired battalion chief with 42 years of service in PFS-FD, died Sept. 6. His son, Richard S., survives him.

Frederick S. Kirn, a retired senior physicist with 34 years of service in EBR, died Aug. 19. His wife, June, survives him.

William Kline, a retired chemical engineer with 35 years of service in PFS, died Sept. 11. His wife, Eileen, survives him.

Annette Korjenek, a staff assistant with 29 years of service in OTD, died Sept. 28. Her daughter, Elizabeth, survives her.

Mary Ann Moore, an administrative secretary with 21 years of service in OCF, died Sept. 30. Her children, Mary Jo Cronen, Chris Moore and Jeff Moore, survive her.

Franklin Mrazek, a scientific associate with 30 years of service in CMT, died Sept. 22. His wife, Hazel, survives him.

George Murrow, a retired carpenter with 33 years of service in PS, died Sept. 13. His wife, Josephine, survives him.

Carl M. Putness, a retired plant engineer with 22 years of service in PO, died Aug. 24. His niece, Shirley Klingall, survives him.

Donald Schmitt, a retired chief technician II with 41 years of service in MCT, died Aug. 17. His wife, Trudy, survives him.

Jack D. Shannon, a retired meteorologist with 23 years of service in EVS, died Oct. 31. Thomas and Kelly Shannon survive him.

Vernon Tantillo, an electrical engineer with 34 years of service in CTD, died Sept. 13. His son, Steven, survives him.

Earl VanHorn, a retired maintenance mechanic with 22 years of service in PFS, died Aug. 15. His wife, Etta, survives him.

Irvin D. Winsch, a retired chemical engineer with 25 years of service in CEN, died in July. His sister, Barbara Long, survives him.

Argonne "...for a brighter future"



NATION'S VETERANS HONORED

Thursday, Nov. 8, Argonne and the U.S. Department of Energy hosted a veteran recognition ceremony to mark Veteran's Day. Saxophonist Tim Branch and guitarist Jim Corsolini began and ended the program with a selection of patriotic music, and the Argonne Choral Group, conducted by Katie Weber, honored the nation's veterans in song. The 416th Engineer Command of the US Army Reserve posted the colors, and bugler Edward Crobie, corporal with the Marine Corps, performed "Taps." Argonne Director Robert Rosner spoke at the event, along with Keynote speaker Sergio Estrada, assistant director of the Illinois Veteran's Association, and Cory Upmeyer, a staff sergeant in the Air Force. *Photos by George Joch*

HOURS FOR THE GUEST HOUSE RESTAURANT AND 401 GRILL TO BE SHORTENED FOR THANKSGIVING HOLIDAY

Below are the shortened holiday hours for the Guest House Restaurant and the 401 Grill.

- The Guest House Restaurant will be closed Thursday, Nov. 22, through Sunday, Nov. 25.
- The 401 Grill will be closed Thursday, Nov. 22, and open from 11:30 a.m. to 5 p.m. Friday, Nov. 23, through Sunday, Nov. 25. Regular hours for both establishments will resume Monday, Nov. 26.

ARGONNE TOASTMASTERS MEET TWICE A MONTH

The Argonne Toastmasters Club meets the second and fourth Wednesday of each month from noon to 1 p.m. in Building 201, Conference Room 190. For more information, contact Sue Benson at ext. 2-3720 or visit the club's Web site at www.argonneclub.anl.gov/toastmasters.

One of the most important skills for success in life is the ability to communicate effectively. Argonne Toastmasters Club provides the tools that enable people to improve their communication skills. In a Toastmasters club, you learn by actually speaking to groups.

MAKE AN IMPACT

Argonne's IMPACT program gives employees an opportunity to report suggestions, problems or concerns about safety, health, productivity and ideas for cost savings.

Suggestions, problems and concerns are handled directly by the IMPACT coordinator. The member of the Argonne team most experienced with the issue will be asked to provide an appropriate and prompt response or take necessary action.

Submissions to the IMPACT program can be anonymous.

IMPACT forms with more information are available at all bulletin boards.

MEDICAL DEPARTMENT TO OFFER PROSTATE SCREENING

Laurence Levine, a board-certified urologist and professor of medicine at Rush Medical School, will be on site Wednesday, Nov. 28, from 8 a.m. - noon offering prostate screenings.

The screenings cost \$40 and checks should be made out to Laurence Levine, M.D.

Call ext. 2-2803 for an appointment.

LYRIC OPERA OF CHICAGO TO PRESENT DR. ATOMIC

From Dec. 14 through Jan. 19, the Lyric Opera of Chicago will be showing "Doctor Atomic," an opera based on the events surrounding the first detonation of the atomic bomb that took place in Los Alamos, N.M., in 1945.

The critically acclaimed opera, created in 2005 by composer John Adams and librettist Peter Sellars, puts visionary historical figures such as brilliant and conflicted physicist J. Robert Oppenheimer and the first director of Fermilab, Robert Wilson, on the stage.

The Associated Press raved about the opera, calling it "a brilliant fusion of music and theater that captures the inner struggle of the men who raised the curtain on the nuclear age."

Tickets range from \$31 - \$187 and can be purchased by phone at (312) 332-2244 ext. 5600 or online at www.lyricopera.org.