Argonne NATIONAL LABORATORY

News

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Argonne teams with industry to promote plug-in hybrid R&D

JARED SAGOFF

ARGONNE HAS TEAMED UP with several industrial partners, including some of America's largest automakers, to promote research and development of plug-in hybrid electric vehicles (PHEVs). Plug-in hybrids could revolutionize the automotive industry because, unlike conventional hybrid cars, they have the potential to run largely on electricity.

Argonne's collaboration with industry on PHEV technology complements a recently announced DOE initiative that provides nearly $20 million to further development of advanced batteries for hybrid technology.

In order to assist with this mission, Argonne has assumed a leading role in PHEV vehicle systems research, said Glenn Keller (ES), vehicle systems section leader. The technical expertise and facilities that Argonne possesses have enticed both well established and up-and-coming players in the automotive industry to seek out the laboratory as a partner for PHEV research, he said.

Some of the companies that have leveraged Argonne's expertise in PHEV technology include General Motors, Ford and A123Systems. In addition, Mike Duoba, mechanical engineer in Argonne's Transportation Technology R&D Center (TTRDC), chairs a committee of the Society of Automotive Engineers (SAE) dedicated to determining test procedures for establishing mileage estimates for PHEVs.

PHEVs are hybrid electric vehicles that contain a battery that can be recharged using a standard 110-volt electrical outlet. Like conventional hybrids, PHEVs use both a battery-powered motor and a gasoline-powered engine. Unlike conventional vehicles, whose estimated mileage varies based on how aggressively the car is driven, plug-in hybrids can get dramatically better mileage with lower daily use. Under certain circumstances — usually in city driving with a full charge — a PHEV could run almost exclusively on battery power. For longer commutes or long-distance trips, a PHEV would have mileage closer to that of a traditional hybrid vehicle, Duoba explained. "We have to come up with some sort of standard yardstick with which to make comparisons."

Most car owners, of course, will drive more on some days than others, and so car companies need to calculate mileage approximations that will reflect the hybrid's average performance under actual driving conditions. In order to determine these guidelines, the SAE turned to Duoba and his colleagues in the vehicle systems section to develop a test procedure for determining advertised fuel economy.

Plug-in hybrid vehicles recharge outside Argonne's Transportation Technology R&D Center. PHEVs are hybrid electric vehicles that contain a battery that can be recharged using a standard 110-volt electrical outlet. Like conventional hybrids, PHEVs use both a battery-powered motor and a gasoline-powered engine. On short commutes, a PHEV could run exclusively on battery power.

Because the SAE includes representatives from the Environmental Protection Agency and automakers in the United States, Europe and Japan, "the chances are that the test procedures that we develop at Argonne will be adopted as the industry-wide recommended practice for determining what the labeled fuel economy is going to be," Keller said.

"I've asked a number of engineers from automakers, even people I've just met, 'what do you benchmark your results to? Whose data do you use?'" Duoba added. "I continue to be surprised as I learn that more and more engineers in the auto industry are using Argonne data."

Advanced battery system testing

Argonne's transportation researchers have not only developed fuel economy test procedure industry standards, but they have also used them to run tests on new components and vehicles manufactured by pioneering companies. One of these companies, A123Systems, enlisted Argonne's help in testing its new PHEV Toyota Prius aftermarket retro-fit module based upon their lithium-ion batteries. Researchers in the TTRDC have assessed these packs in a vehicle under various driving conditions, providing a solid performance result that the company will use to market their product and compare to any future advancements.

The access to top-of-the-line equipment and technical knowledge that the laboratory provides makes Argonne a valuable partner for industry leaders. "We have the expertise to talk to them on a formal but impartial basis," Keller said. "We can tell them what we see that's good, what we see that's bad. We can give them professional hints and suggestions, and we're a source for quality data that they can depend on and use us for their energy sources."

A123's Chief Executive Officer, David Vieau, said that Argonne offers an independent, trustworthy validation of his company's products, filling a critical need that will enable commercialization of new technology. "The work you are doing is pivotal in showing that the plug-in future is viable."

Real-time data acquisition

Plug-in hybrids aren't merely an enticing prospect; several large automakers, including GM and Ford, have already produced small fleets of prototype vehicles for testing. To assist with data collection during the experimental trials, Argonne has agreed to supply these companies with the Argonne Real-Time Data Acquisition unit (ARDAQ), which uses GPS and other sensors to take moment-by-moment measurements of vehicle performance, including driving speed, fuel consumption, frequency of charges and trip length. "These are the questions that everybody has about how these vehicles are going to be operated in the real world," said Ted Bohn (ES), Argonne electrical engineer and lead developer of ARDAQ.

The unit is "smaller, lighter, easier to install and cheaper than all the other methods for automotive data collection

(See "PHEV" on page 3)

MORE NEWS AND LATE-BREAKING UPDATES:
INSIDE ARGONNE
www.inside.anl.gov

Q&A with Chief Scientist Michael Turner: Strategic planning

Turner

ARGONNE CHIEF SCIENTIST Michael Turner is leading the laboratory's strategic planning initiative, aimed at providing the laboratory with a road map for future research directions. A Strategic Planning Group has been formed to create a strategic plan for Argonne, and it will be rolled out in spring 2008.

Turner is the Rauner Distinguished Service Professor in the Kavli Institute for Cosmological Physics at the University of Chicago. He joined Argonne last January as the chief scientist and director of strategic planning. His previous experiences include assistant director of the National Science Foundation for mathematical

(See "Turner Q&A" on page 2)

New system could provide safer, cheaper, more detailed mammograms

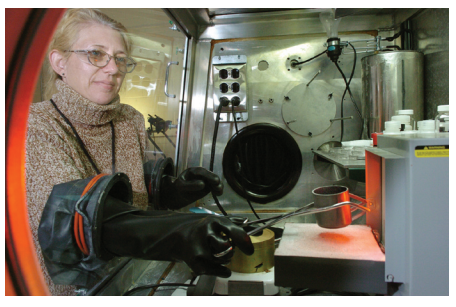
JENNY DEANGELIS

A NEW ultra-high resolution mammography system that detects cancerous tumors with higher-quality images, more efficient radiation exposures and lower cost has been developed by a team of U.S. and German scientists.

Radiography is the oldest and most frequently used method for detecting internal masses in medical imaging. It allows doctors to save lives by discovering cancerous tumors or irregularities early.

Breast cancer deaths have been declining since 1990, but the disease annually kills 40,000 women. "Better imaging technology is crucial in lowering deaths and increasing early

(See "Mammograms" on page 3)



R&D 100-award winner Jacqueline Johnson prepares a small sample of a ceramic glass that formed the basis for radiographic imaging plates that she and her colleagues developed in order to allow doctors to obtain clearer, more-detailed mammograms.

Turner Q&A

(Continued from page 1)

and physical sciences, chair of the Department of Astronomy and Astrophysics at the University of Chicago and scientific spokesperson for the Sloan Digital Sky Survey. Turner is a member of the National Academy Sciences and heads the Physics Section. He also led the influential academy study "Connecting Quarks to the Cosmos." Turner's research deals with the earliest moments of the universe; he pioneered the field of particle astrophysics and cosmology and coined the term "dark energy."

What need does the Strategic Planning Group address?

Argonne is a vibrant and exciting laboratory. But it's a very different laboratory than the one that was chartered in 1946. It's successful today because it continues to reinvent itself. Strategic planning is the formal process that makes this happen in a rational and thoughtful way. The goal of strategic planning is to make certain that the lab evolves by "intelligent design" rather than "natural selection."

As part of the recompetition, one of our new initiatives was the creation of an Office of Strategic Planning, with the chief scientist as its director. DOE responded well to our proposal to formalize the process of strategic planning, and for good reason: All successful organizations today are paying more attention to strategic planning. Further, a vibrant Argonne is essential to the Office of Science achieving its mission.

How are the strategic directions determined?

We began by engaging the lab's most important asset — its scientific and technical staff. We organized two conclaves to discuss the strategic initiatives for LDRD (laboratory-directed research and development funding). We asked the laboratory's scientific and technical staff, "What do you think our future directions should be? Where should we be investing our precious LDRD funds to ensure a bright future for Argonne?" We followed up the conclaves with a series of 10 more focused topical meetings in February and March of last year.

With this as grist for the mill, in April the senior management held a day-long retreat to come up with the strategic directions for the '08 LDRD investments. It was an extremely productive retreat. We identified six areas for investment in the future of Argonne: one, sustainable energy production and use; two, large-scale scientific user facilities; three, systems and computational biology; four, exascale computing; five, astrophysics and cosmology and six, national security. To some extent we were putting the cart before the horse, because LDRD initiatives are supposed to support the strategic directions. However, everyone at the retreat knew that we were, in essence, also determining the strategic directions for the laboratory.

In April we formalized the Strategic Planning Group; the laboratory director gave us a charter, and we moved full speed ahead with the formal process of strategic planning for the lab.

How was input gathered from the S&T staff?

Everyone at the lab has a role and a responsibility in the strategic planning process. The scientists and engineers generate the ideas and provide "core competencies" that are the foundation of the lab. The responsibility for bringing everything together and producing the strategic plan lies with the Strategic Planning Group.

The R&D staff has informed the strategic planning process in many ways: through the LDRD conclaves and topical meetings, through their interactions with their division directors and ALDs, and through their LDRD proposals. Our planning has been well informed and shaped by the scientific and technical staff.

What were some of the criteria you used to come up with the strategic directions?

We began with a series of questions: What are the national needs that can be addressed by a laboratory? Which fit within DOE's mission and our DOE business plan? Which overlap with the core competencies of Argonne? We can't do everything; we have to make sure we do the things where we can contribute the most. We also thought about partners — the local universities, other DOE laboratories and industry.

While we certainly wanted to think outside the box, this is a problem with very important boundary conditions: the nation's needs, DOE's mission, the business plan DOE has assigned us, our partners and perhaps most importantly, our core competencies.

For example, we have a core competency in running scientific user facilities. We run DOE's most successful user facility, the Advanced Photon Source. We run a nuclear physics facility, ATLAS, and we have tremendous nuclear physics expertise. So FRIB, the Facility for Rare Isotope Beams and the next big facility in nuclear science, is an example where our competencies match up nicely with a national need that is part of the DOE mission.

Let me give you an example of where we want to expand our core competency: systems and computational biology. We are strong in computation, we operate the Advanced Photon Source, and we have growing expertise in high-throughput biology. And perhaps most importantly, there are great opportunities in computational and systems biology, from personalized medicine to bio-energy.

What other core competencies did the Strategic Planning Group identify?

In addition to running user facilities, we have world-class capabilities in energy science and technology, fundamental physics, biology and the environment, applied mathematics and computer science, accelerator science, systems analysis and materials science. There's an equally important core competency that's not scientific: we know how to partner with other laboratories, users, other agencies and with universities.

What role do the laboratory's partners play in the strategic planning?

While strategic planning is a fundamentally inwardly looking process, it is also important to get input from outside the lab. We sought and received input from the Science Policy Council, the forum for the local partner universities, Northwestern, the University of Illinois at Chicago and Urbana-Champaign. We sought input from the Board of Governors. We are a planning to convene a "Futuring Group" comprising distinguished individuals who think big. This group of free thinkers will come in and make sure we haven't missed some really important opportunities where we may have a core competency or things that a lab can do that a university can't.

How do you support your strategic plan and develop new core competencies?

LDRD is the tool. It's the venture capital that we invest in the future of the laboratory. We support the strategic directions with LDRD projects; likewise, we can use LDRD to help develop new competencies.

One example of where we successfully used LDRD in the past is leadership computing. We invested a significant amount of LDRD to get us to the point where we could host a leadership-class computing facility; that facility will open soon. We continue to invest in scientific applications, an area we're not particularly strong in. We want Argonne scientists to be involved in the scientific breakthroughs that the Argonne Leadership Computing Facility will enable.

A lesson that we learned well at the APS is that it doesn't serve us or the users of the facility well if we just run the facility. We need to be involved in the science as well, and by so doing we better know how the facility should evolve.

How will you determine success in the LDRD investment?

It is crucial to measure the effectiveness of our LDRD investments, but it is not easy. We have used a number of metrics. For example, how many new DOE proposals did LDRD projects generate? The number is big — hundreds — and the success rate is pretty good. Some metrics are more anecdotal: we scored a big win for the lab, like the new leadership-class computing facility, or the APS itself.

What do you foresee as the long-term benefits of the strategic plan?

The benefits and beneficiaries are manifold. Argonne will benefit by continuing to be the vibrant laboratory and exciting place to work that it has been for 60 years. Argonne will better support the DOE mission and in turn the nation will benefit. University researchers will benefit because of the large-scale facilities that we will run. Last but least, there are important problems facing our nation (and planet) that can best probably only be addressed by national laboratories — including global climate change and energy. At a national lab, you can bring together scientists and engineering from a broad range of disciplines and places (including universities) to attack important problems. Reactor design, for example, is not something that would happen at a university.

How will you know if the strategic plan is successful?

An important part of any strategic plan is the set of metrics by which progress and success can be measured. Our plan will have goals and milestones. Take FRIB, for example. Did we get it? Did we build it on budget and schedule? Is it producing world-class science? Other metrics aren't quite as crisp. An essential part of the strategic plan is setting goals against which progress and success are measured; it's not just a feel-good document. When the plan comes out next spring, you can bet that it will have metrics.

But in the long term, the most important metric is the vibrancy of the laboratory. We'll know we've been successful if Argonne continues to be at the cutting edge of science and engineering as it has for 60 years. ■

STRATEGIC PLANNING GROUP

The Strategic Planning Group meets about three times a month. The group consists of Chief Scientist Michael Turner; Argonne Director Robert Rosner; Deputy Laboratory Director Don Joyce; Associate Laboratory Directors Al Sattelberger, Murray Gibson, Rick Stevens and Bo Arnold; Deputy to the Laboratory Director Renee Carder; Chief Financial Officer Michael Bartos; Chief Information Officer Charlie Catlett; Associate Director of Strategic Planning Liz Stefanski; and Manager for Performance Development Geralyn Becker.

The LDRD Program Manager is Cindy Sullivan. Elton Kaufmann is the associate chief scientist for LDRD.

SUBMISSIONS SOUGHT FOR NIH DIRECTOR'S NEW INNOVATOR AWARD

Submissions for the NIH Director's New Innovator Award are now being accepted.

The award was created in 2007 to support a small number of new investigators of exceptional creativity who propose bold and highly innovative new research approaches that have the potential to produce a major impact on broad, important problems in biomedical and behavioral research. The research proposed need not be in a conventional biomedical or behavioral discipline but must be relevant to the mission of NIH. The New Innovator Awards complement ongoing efforts by NIH and its institutes and centers to fund new investigators through R01 grants, which continue to be the major sources of NIH support for new investigators. Thirty awards were made in 2007.

More information can be found online.
http://grants.nih.gov/grants/guide/rfa-files/RFA-RM-08-014.html

Argonne NATIONAL LABORATORY

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PHEV

(Continued from page 1)

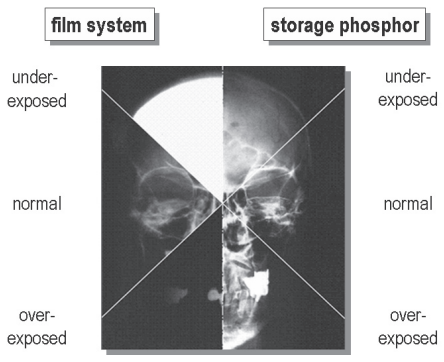
on the market today," Keller said, and it can record up to a month's worth of data on a memory stick.

"The automakers," Bohn said, "also want to evaluate how their prototypes are performing in the field outside of a lab environment so they can see how they will perform under the stresses of daily driving — our technology gives them the ability to advance their designs and tweak them."

The research was funded by DOE's Office of Energy Efficiency and Renewable Energy's Vehicle Technologies Program. ■

Mammograms

(Continued from page 1)



This image compares computer-radiography images of a skull made at various exposure levels with (left) a film-imaging system and (right) a light-sensitive phosphor-based storage medium, like that used in the new Ultra-High Resolution Mammography System. The image shows that the phosphor-based image provides better detail at all exposure levels.

diagnosis and prevention," said materials scientist Jacqueline Johnson (NE).

Johnson, in collaboration with Rick Lubinsky from New York and Stefan Schweizer from Germany, honed computer radiography technology to produce the Ultra-High Resolution Mammography System, which was recently honored with an *R&D* 100 award.

The system uses a glass-ceramic plate, which is transparent to lessen light scattering, and a readout device designed specifically to maximize the efficiency of the glass-ceramic material. The plates, made from a photostimulable phosphor, have many advantages over traditional photographic film and scintillating screens, such as reusability, wide dynamic range and direct digitization.

Although flat-panel-based digital radiography technology (DR) has started to surpass computer radiography (CR) in leading research hospitals, DR systems are much more expensive, and each individual detector in a room requires a separate DR detector. "The average hospital could still benefit greatly from a high-resolution system that enables early diagnosis of breast cancer but is affordable," said Johnson.

In general radiography, about half of the nation's facilities have converted from analog to digital technology, but it is less than 10 percent for mammography systems. However, the new system achieves as good or better resolution than screen or film, and it has the potential to greatly increase the use of CR for mammography. The technology also reduces the amount of chemicals used and the production of waste, which make the system attractive for other applications, including inspection of micro-electronic parts or X-ray diffraction analysis of biological materials. ■

Argonne scientists use unique diamond anvils to view oxide glass structures under pressure

ANGELA Y. HARDIN

A UNIQUELY-CONSTRUCTED perforated diamond cell is allowing researchers at Argonne to investigate oxide glass structures at high pressures in unprecedented detail.

Argonne physicist Chris Benmore (XSD) and postdoctoral appointee Qiang Mei (IPNS), along with Professor Jeff Yarger and Emmanuel Soignard at Arizona State University, used microscopic laser-perforated diamond anvil cells to generate pressures of up to 32 gigapascals (GPa) — roughly one-tenth the pressure at the center of the Earth. By "squashing" vitreous (glassy) arsenic oxide samples between the anvils, the researchers were able to determine the mechanism behind the structure's atypical behavior under high pressure.

This research may have far-reaching affects in the geophysical sciences, Benmore said, because oxide glasses and liquids represent a significant percentage of the materials that make up the Earth. For example, knowing the atomic structure of oxide materials at high pressures may give scientists a window on the behaviors of magma during the formation of the early Earth and moon. "We now have a technique where we can look a lot of different silicate glasses that are relevant to the Earth's process and at the complex behaviors of the melts that formed the Earth's mantle," he said.

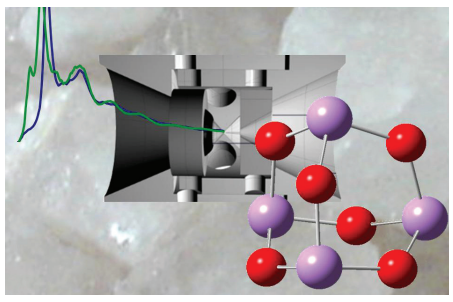
During their investigation, Benmore and Mei noticed that if arsenic oxide was subjected to high pressure the material underwent an unusual transformation at about 20 GPa, as the color of the compound changed from transparent to red. However, they did not know the atomic cause for this behavior.

By performing X-ray pair distribution function experiments at Argonne's Advanced Photon Source (APS), however, Benmore and Mei were able to see the atomic reconfiguration that produced the color change. Arsenic oxide, at normal pressures, typically exists in isolated molecular "cages" in which four arsenic atoms are surrounded by three oxygen atoms apiece — each of the six oxygen atoms is bounded to two arsenic atoms. When the pressure rose above 20 GPa, however, many of these molecular cages collapsed, creating new isomers in which each arsenic atom was bonded to six oxygen atoms.

Regular diamond anvils could not be used because they caused a great deal of background scattering that obscured the signal from the material. Previous experiments on vitreous materials had used mechanically drilled diamond anvil cells to create the high pressures, but these routinely failed at pressures above 15 GPa. This experiment involved one of the first-ever uses of laser-perforated diamond anvils combined with micro-focused high energy X-ray diffraction techniques, which have the ability to generate high pressures without also producing background noise.

Benmore hopes to extend his research to liquid oxides and silicates by heating them past their melting points. By doing so, he expects to gain a better understanding of the structural transition, which is expected to occur more abruptly and be reversible in the liquid phases of these materials.

Benmore and Mei's research was funded by the DOE Office of Basic Energy Sciences. ■



A perforated diamond cell (background) is allowing researchers at Argonne to investigate oxide glass structures at high pressures in unprecedented detail.

SPECIAL SEMINAR TO SHED LIGHT ON RICKETTS LAB

A special seminar on the Howard T. Ricketts Regional Biocontainment Laboratory, which will open at Argonne in approximately seven months, has been scheduled for all Argonne, Department of Energy and University of Chicago employees Tuesday, Dec. 11, at 10 a.m. in Building 401, Conference Room A1100. "Demystifying the Rickett's 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.

All employees whose schedules permit are invited to attend.

New CNM supercomputer makes 'Top 500'

DAVE JACQUÉ

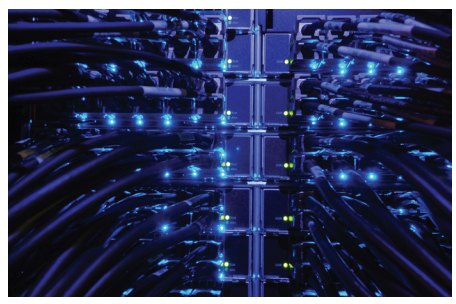
A NEW high-performance computer cluster at Argonne's Center for Nanoscale Materials is number 150 on the list of the world's 500 fastest computers. The new cluster, capable of performing up to 12 trillion floating-point operations per second, is currently the fastest computer at Argonne, at least until the planned Blue Gene/P is installed at the Argonne Leadership Computing Facility.

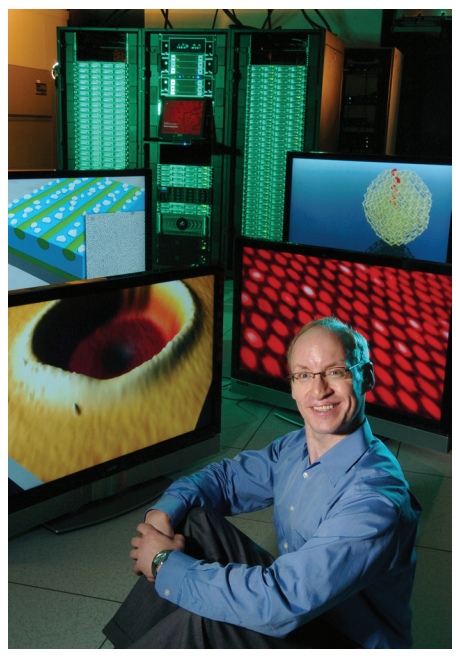
The list was released Monday, Nov. 12, at the SC07 Supercomputing Conference in Reno.

The cluster was designed from the ground up to support research at the CNM. The CNM has five experimental and one theory and modeling group, and as a user facility, will host hundreds of users, many requiring top-flight computer power and generating mountains of data. Some of this data must be processed in real time while experiments are under way, so that samples can be repositioned or instruments can be adjusted as needed for fine-tuning.

"When one tackles problems in computational nanoscience, one can no longer rely on the objects being studied having just small numbers of atoms or molecules, or being part of a periodic crystal," said Senior Scientific Associate Michael Sternberg, who helped design the machine. "Nanoscale materials are in between these two extremes, which is why this is such an exciting field. The usual simplifying assumptions are not applicable, so these problems require a very high capacity for computing and memory."

The new cluster is a black box the size of three refrigerators side by side. Inside are stacks of "compute nodes," 72 in all, each about the size and shape of a large pizza box. Every node has two motherboards, each with two dual-core Intel Xeon chips operating at 2.66 gigahertz. Each motherboard holds a generous 16 gigabytes of memory. An InfiniBand network provides rapid communications between nodes. With tuning support from Intel and by the cluster's vendor, TeamHPC, the cluster has been measured at 10 teraflops, making it Argonne's fastest computer.





Michael Sternberg, a senior scientific associate who helped design the CNM supercomputer that ranked at 150 on the list of the world's fastest computers, is surrounded by examples of what the 10-teraflop computer can do. The cluster itself is in the background. At top, a closeup of the machine.

"Of course that will be a short-lived honor," Sternberg said, "Just until the new BlueGene/P is first operational."

The setup is optimized for the kind of software that many nanoscience researchers use, such as MATLAB and Dacapo.

"These are programs that solve problems in quantum chemistry and materials science," Sternberg said. "The cluster will run them very efficiently."

The cluster will be available to all researchers via a peer-reviewed user proposal system that is open to academia, industry, government agencies and research institutes worldwide.

The cluster is currently being readied for general use by early 2008. ■

ARGONNE RUNNING CLUB TO HOST 'JINGLE BELL RUN AND WALK'

The Argonne Running Club will host a run and walk Tuesday, Dec. 11, at noon. Participants should meet in the Building 360 Lobby. There will be refreshments and a raffle at the finish.

For more information, see the Running Club's Web site or contact John Hyzer (HR) at ext. 2-3503 or Kylee Funk (MSD) at ext. 2-5483.

http://www.argonneclub.anl.gov/ARC

ARGONNE CHORAL GROUP LOOKING FOR NEW SINGERS

The Argonne Choral Group is preparing music for a holiday celebration with rehearsals on Mondays and Thursdays from 11:45 a.m. to 12:30 p.m. in the Building 362 Auditorium. New singers are welcome to participate.

Additional information can be obtained from Pat Garner at ext. 2-4872, Katie Weber at ext. 2-8101 or by sending an e-mail to *ChoralGroup@anl.gov*.

PROSTATE SCREENING RESCHEDULED

The prostate screening scheduled for Wednesday, Nov. 28, has been rescheduled to Wednesday, Jan. 9, 2008. Call ext. 2-2803 for information.

CIGNA HOSTS TELEPHONE SEMINAR

CIGNA will host a behavioral health telephone seminar titled "Balancing Work and Personal Life" Wednesday, Dec. 12, at 1 p.m. Sign up online at least 48 hours before the conference using code 4533293.

http://ww4.premconf.com/webrsvp

ARGONNE TOASTMASTERS HOST MEETING

Join the Argonne Toastmasters on Wednesday, Dec. 12, and each second and fourth Wednesday of the month from noon to 1 p.m., in Building 201, Room 190 to begin the journey to better communication and leadership skills.

Or go to the Toastmasters Web site to find another convenient club location and time. Yorkville, Plainfield, Aurora, Naperville, Lisle, Woodridge, Warrenville, St. Charles and Elgin all have Toastmasters clubs.

www.toastmasters.org

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.

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.

Through music and stagecraft "Doctor Atomic" illuminates the inner lives of the characters, their yearnings, doubts and misgivings as they introduce the ultimate destructive power into human history.

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*.

ARGONNE'S CHILD DEVELOPMENT CENTER HOLDS ART EXPO

Children from Argonne's Child Development Center, managed by Bright Horizons Family Solutions, created formal pieces of artwork and held a silent auction to raise money for the Bright Horizon Foundation for Children. Founded in 1999, the foundation's mission is to "make a difference in the lives of children and families where we live and work."

The 4th Annual Young Artists' Expo was held Nov. 15 in the Building 440 rotunda.

Image: Thomas Schikora points out some artwork to his mom and dad, Michelle and Dave.

Performance appraisals due Dec. 14

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 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. ■