

Ice slurry technology can save heart attack victims, surgery patients



Argonne researchers have created a bio-compatible saline ice slurry that could save lives by preventing ischemic damage to organs during surgery or certain types of medical crises.

By Jared Sagoff

When treating cardiac arrest victims, doctors can't call a time-out. Without the ability to obtain fresh oxygen from blood pumped through the body, brain cells start to die in just minutes. Within 10 to 20 minutes after the heart stops beating, the clock has run out. Even if doctors can get the heart ticking again, the brain has died.

Recently, however, researchers have begun to develop a new technique that can reduce the brain and other organs' demand for oxygen, giving doctors precious extra time to diagnose and treat critical patients in emergencies while also protecting the heart, brain, kidneys and spinal cord in planned surgeries.

Scientists in Argonne's Nuclear Engineering Division have created an ice slurry — a slushy substance that somewhat resembles a 7-11 Slurpee®. This slurry can be pumped easily into the body through a small intravenous catheter directly into a patient's bloodstream.

Argonne is working with several different groups of University of Chicago surgeons to develop procedures for cooling and protecting vital organs. This research is being conducted under the newly formed University of Chicago-Argonne Bioengineering Institute for Advanced Surgery and Endoscopy (BIASE).

Argonne researchers designed and patented the equipment used to produce the slurry. Doctors can quickly chill the targeted organ by choosing one of several possible routes for the slurry, based on the condition to be treated. This cooling reduces an organ's need for oxygen, slowing the rate at which cells asphyxi-

ate and providing doctors more time for treatment.

In the case of a victim who suffered cardiac arrest out of a hospital, the slurry would be delivered to the lungs through an endotracheal tube. Paramedics would then administer chest compressions, which would force blood through the cold lungs. From there, the chilled blood would pass through the carotid arteries and into the brain, cooling it rapidly.

For several decades, doctors have recognized the benefits of protective cooling for certain classes of patients. In the past, however, doctors relied on external cooling approaches — ice baths and cooling jackets, for example — to induce protective hypothermia. However, external cooling acts slowly, greatly hampering its effectiveness.

"Current medical guidance says that if you want to save the brain, you have to lower its temperature by four or five degrees Celsius within five to 10 minutes of cardiac arrest if paramedics can't restart the heart," said Argonne engineer Ken Kasza, who led the development of the slurry production and delivery technology. "For the first time, we have a means of attaining the necessary temperature in that short span of time." The technology also reduces the risk of secondary adverse effects, including shivering and possible arrhythmia.

Kasza originally started to develop ice slurries for industrial cooling. Under a joint Argonne-University of Chicago Emergency Resuscitation Center collaboration funded by a National Institutes of Health grant, Kasza further developed the

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All have roles and responsibilities for safety

Steve Richardson, Deputy Laboratory Director for Operations

One of the issues we are focusing on in the Laboratory Management System process is clearly defining the roles and responsibilities that we each have as part of our assigned positions at the laboratory.

In the safety area, some of us may have more specific roles due to our position — for example, approving safety analyses — but all of us have some safety responsibility. The following describes some overall roles that we should ensure are satisfied every day.

• For all of us:

1. Work safely. Perform each activity in a manner that does cause undue risk to us or our coworkers.
2. Seek out hazards. Identify those things that could cause a safety incident if left uncorrected, and bring the situation to the attention of the appropriate individual.
3. Stop activities when unsure. If there is any aspect of your activity that causes a question, you have an obligation to stop the activity until that question is resolved to your satisfaction.

4. Be persistent. Our safety concerns are the result of long-term issues and likely will not be corrected quickly. Be prepared to call attention to safety deficiencies repeatedly until the situation is resolved.

• For laboratory leadership — in addition to the above:

1. Set the example as a safety advocate. Make safety personal as a leadership trait.
2. Explain expectations and set the appropriate standards. Seek input from employees who will have to meet these expectations and standards.
3. Pursue aggressive corrective actions. Apply sufficient resources to ensure that safety issues are being fixed on a priority basis.
4. Build and sustain an environment in which safety is a priority and employees are encouraged and rewarded for correcting safety problems. Constructive candor and openness are the norms.
5. Be accountable for effective self-assessment efforts to measure progress and to know your weaknesses. Make sure that your weaknesses are being corrected. ▀

Argonne teams with Chicago universities to form Illinois Center for Advanced Tribology

By Angela Hardin

Argonne has teamed with the University of Illinois at Urbana-Champaign (UIUC), the University of Illinois at Chicago (UIC) and Northwestern University to form the Illinois Center for Advanced Tribology (ICAT), which will develop solutions to technical issues related to transportation, health and systems that operate in extreme environments.

Tribology is the science and technology of friction, lubrication and interactive surfaces in relative motion that are evident in virtually everything that moves, including human beings.

"ICAT members bring together complementary, and in some cases unique capabilities to resolve critical wear and lubrication issues in the development of advanced alternative energy technologies and biomedical implants and improve functionality and longevity of systems that operate in extreme environments," said George Fenske, manager of the tribology section at Argonne. "Through the center we plan to develop new materials,

coatings, surface texturing and lubricants that when integrated together make robust tribological systems that provide reliable and durable performance under extreme conditions."

The push for alternative transportation fuels like ethanol, biofuels and hydrogen, for example, come with very different sets of friction, wear and lubrication challenges that aren't encountered with conventional vehicles and fuels, said Jane Wang, a professor of mechanical engineering at Northwestern. "Biofuels, even E-85, can cause corrosion and wear to surfaces they come into contact with," Wang said. "In the case of hydrogen-powered vehicles, new lubricant formulas are needed for the smooth operation of moving parts since hydrogen fuel cells, which require a pure environment, prohibit the use of oil-based lubricants."

ICAT also plans to play a significant role in improving the durability and long-term health risks of

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UChicago
Argonne LLC



21st Century detective work reveals how ancient rock got off to a hot start

By Brock Cooper

Researchers have used a new X-ray technique at Argonne's Advanced Photon Source to solve a debate about the origins of a three-billion-year-old rock fragment.

In the study, recently published in the journal *Nature*, a scientist describes the new technique and shows how it can analyze tiny samples of rock, yielding important clues about the Earth's early history. An Imperial College London researcher performed the analysis in conjunction with Australian and U.S. scientists.

The team used its X-rays to investigate the chemistry of a rare type of magmatic rock called a komatiite, which was preserved for billions of years in crystals. Komatiites are formed from super hot molten rock. It has previously been difficult to discover how komatiites formed because earlier analytical techniques lacked the power to provide key information. Now, thanks to the new technique, the team found that komatiites were formed more than 2.7 billion years ago in the Earth's mantle, a region between the crust and the core, at temperatures of around 1,700 degrees Celsius.

These findings dispel a long-held alternative theory, which suggested that komatiites were formed at much cooler temperatures, and also yield an important clue about the mantle's early history. They found that the mantle has cooled by 300 degrees Celsius over the

2.7 billion years.

Lead researcher Andrew Berry from Imperial College London's Department of Earth Science and Engineering says more research needs to be done to understand fully the implications of this finding. However, he believes this new technique will enable scientists to uncover more details about the Earth's early history.

"It has long been a 'holy grail' in geology to find a technique that analyses the chemical state of tiny rock fragments," Berry said, "because they provide important geological evidence to explain conditions inside the early Earth. This research resolves the controversy about the origin of komatiites and opens the door to the possibility of new discoveries about our planet's past."

In particular, Berry believes this technique can now be used to explain Earth's internal processes, such as the rate at which its interior has been cooling, how the forces affecting the Earth's crust have changed over time, and the distribution of radioactive elements that internally heat the planet.

He believes this information could then be used to build new detailed models to explain the evolution of the planet.

"It is amazing," he said, "that we can look at a fragment of magma only a fraction of a millimeter in size and use it to determine the temperature of rocks tens of kilometers below the surface billions of years ago. How's that for a piece of detective work?"

Argonne scientist receives DHS Performance Management Award

Ronald Fisher (DIS) has received the 2008 Performance Management Award from the U.S. Department of Homeland Security's National Protection and Programs Directorate. The award, typically reserved only for federal employees, recognizes Argonne's work on the Enhanced Critical Infrastructure Protection (ECIP) project. Fisher accepted the award on behalf of an Argonne support team that developed a methodology, working tool, and decision support system, completing the project in an unprecedented effort to meet changing deadlines.

The ECIP project was created for use by DHS Protective Security Advisors (PSAs), who are closely affiliated with DHS, but whose primary function is to work alongside facilities and organizations in the local community. ECIP helps identify critical infrastructure and key resources (CI/KR) and provides

tools and reports to aid CI/KR owners in determining where best to spend investment dollars. The data collection tool was designed to help DHS demonstrate how efforts in protection and prevention reduce risk while improving physical and operational security. The ECIP tool allows analysts, for the first time, to use information about a facility's vulnerability and physical security consistently and with measurable results. The initial process started in April 2008, and the developmental tool was operational by May.

Other contributors to this nationally recognized effort include Andy Huttenga (EVS), whose outstanding work in programming the tool significantly helped in meeting the deadline. Kudos also go to Mary Klett, Dave Dickenson, Dave Brannegan, Becca Haffenden, Bill Buehring, and Ron Whitfield (all DIS).

IMPACT welcomes ideas for safety, productivity, savings

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.

Argonne's online open enrollment ends Wednesday, Nov. 26

There are only a few days left to change medical plans, verify student status or enroll in the health care and dependent care flexible spending accounts for 2009. Open enrollment ends Wednesday, Nov. 26, and 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 without access to computers can use ones available in HR-Employee Benefits, Building 201, Room 1K-03 (located to the right of the elevators). Benefit representatives will be available for assistance.

Student Verification for medical plans must be made during open enrollment

During open enrollment, employees with dependent children turning ages 19, 20, 21, 22 or 23 in 2009 must go online to verify student status. Any employee whose dependent child will turn one of the ages listed who doesn't verify student status will not have medical, dental, and prescription drug benefits for that child as of January 1, 2009.

Online student verification is required even for employees who do not change medical plan options.

HR-Employee Benefits will no longer send reminders for employees who do not verify the status of their dependents online.

To complete student verification:

- Go to Inside Argonne
- Under "My Argonne," log in using your Argonne domain name and pass-

word. For assistance, call the CIS help desk at ext. 2-9999, option 2.

- Click "Benefits" on the left navigation menu.
- Click "Open Enrollment" menu item on left navigation menu.
- Select "Health Benefits" from the left menu.
- Select "Verify Full-time Student Status" and complete requested information.
- Click "Save."

Any questions on student verification should go to Employee Benefits, ext. 2-2989. Employees without computer access may use computers available in Human Resources, Building 201, Room 1K-03.

inside.anl.gov

Tribology

replacement joints, especially with more active older people requiring and an increasing number of younger people getting them, said Michael McNallan, a professor and associate dean in UIC's College of Engineering. The goal is to help develop "joints for life."

Meanwhile, mechanical systems that operate under extreme loads, temperatures and speeds, like those found in military field operations in the Middle East, face premature failure as a result of poor lubrication, said Andreas Polycarpou, a professor in UIUC's Department of Mechanical Science and Engineering. One of the many areas under development will be self-healing surfaces for

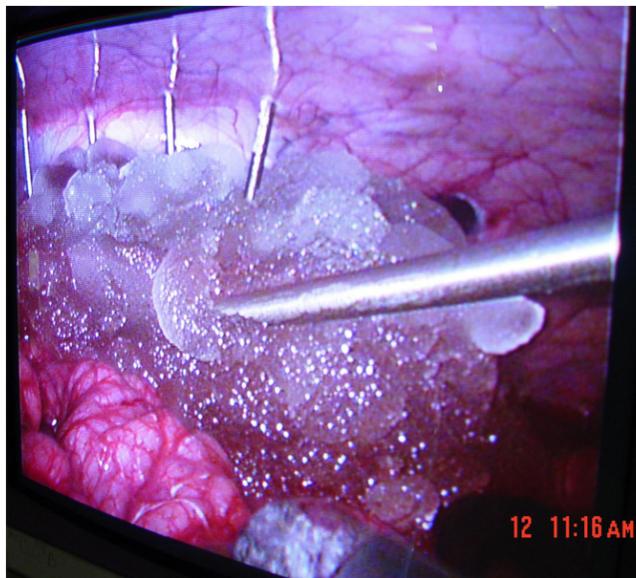
extreme-condition applications.

ICAT will allow its partner organizations to respond more quickly to requests for research proposals because they will not have to develop a work agreement for each request they want to respond to, Fenske explained. The center will also solicit research funds from their parent organizations and private and industrial sources, as well as respond to proposals from the State of Illinois and federal agencies such as the U.S. Department of Energy, the Department of Defense, the National Science Foundation, the National Institutes of Health and the Department of Agriculture, Fenske said.



Glenn Keller (ES) section leader for vehicle systems (right), takes Kentucky Governor Steve Beshear on a tour of Argonne's Advanced Powertrain Research Facility. Beshear and other Kentucky officials visited Argonne Nov. 5 and met with Argonne senior management to discuss potential areas for collaboration. Photo by George Joch.

Ice slurry



Doctors use an endoscope to see the application of the slurry during a laparoscopic kidney surgery on a pig.

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slurries for cooling and protecting cardiac arrest victims.

More recently, Kasza and his Argonne colleagues Yue Wu, Chuck Vulyak, Adrian Tentner and Paul Fischer have teamed up with surgeons at the University of Chicago under BIASE to further develop and demonstrate the use of ice slurries for protective cooling during several types of surgery. The three surgical applications for ice slurry cooling focus on minimally invasive laparoscopic kidney surgery, cardiovascular surgery and surgeries that would otherwise risk neurological damage to the brain and spine. Because this type of operation almost completely cuts off the blood flow to the kidney, rapid cooling could give doctors the precious

extra time they need to perform the operation without risking damage.

Kasza and University of Chicago surgeon Arieh Shalhav have already explored the use of ice slurry cooling in kidney surgeries on large animals with promising results, and they plan to seek FDA approval for human trials.

If researchers can prove that the slurry can protect an array of organs during a variety of surgical procedures, they might

eventually be able to use it to stabilize soldiers who sustain severe injuries on the battlefield.

In order to more efficiently and safely introduce the slurry into a patient's body for a given application, Kasza, Tentner and Fischer have begun to use three-dimensional models and computer simulation to analyze the thermal interaction between slurry and tissue. These models give scientists the ability to simulate and visualize the heat exchange and blood flow within target organs and calculate how quickly and uniformly they are cooled to protective levels.

The paper is available online at www.ne.anl.gov/capabilities/sinde/biomed/. ▀

'Great Climate Debate' to be held at Argonne Nov. 24

"The Great Climate Debate" will be held at Argonne Monday, Nov. 24.

Fred Singer and Michael Schlesinger will debate whether climate change is caused predominately by nature (Singer) or human activity (Schlesinger). The audience will be invited to ask questions of the speakers after the debate.

Fred Singer is professor emeritus

of environmental science at the University of Virginia. Michael Schlesinger is professor of atmospheric sciences and director of the Climate Research Group at the University of Illinois at Urbana-Champaign.

The discussion will begin at 2 p.m. in the Building 402 Auditorium. It is sponsored by Argonne's Transportation Technology R&D Center. ▀

GetThere system to be required for all domestic travel

Argonne employees are now required to use the GetThere online travel reservation system to arrange their domestic business travel.

GetThere provides travelers flexibility when arranging travel and a larger number of economical flight options to help control travel costs.

When travelers use GetThere to book travel, the laboratory pays a reduced transaction fee of \$9 to the travel agency versus the full service charge of \$33. Best practices in the industry show online adoption at over 70 percent of eligible travel with a 15 percent savings per air ticket purchased. The laboratory is currently at 30 percent. By mandating the use of GetThere, Argonne can take advantage of opportunities to reduce costs.

Due to certain regulatory or policy

related requirements, certain travel requests must be reserved through an Omega agent:

- Travel to or from foreign destinations including Canada and Mexico
- Trips involving non-business related (personal) travel such as extended weekends
- Special seating due to medical necessity as approved by the Medical Department.

Recent enhancements to GetThere also provide more conveniences to travelers and their travel arrangers such as traveler tracking and new discounts on limousine, sedans and taxis.

For more information, contact Rich Crowley at rcrowley@anl.gov.

wcp.getthere.net/anltravel

Emilio Bunel appointed Chemical Sciences and Engineering division director



Bunel

Emilio Bunel has been appointed the new Chemical Sciences and Engineering Division Director.

Bunel received his Ph.D. in chemistry from the California Institute of Technology in 1988. He began his professional career at DuPont Central Research as a member of the Catalysis Group. He was responsible for the discovery and subsequent development of new processes for the synthesis of nylon intermediates required in the manufacture of nylon-6,6 and nylon-6.

In 2001, Bunel was hired by Eli Lilly to establish the Catalysis Group within the Discovery Research Organization. This group was responsible for the preparation of organic compounds using transition metal catalyzed reactions. The molecules prepared spanned all the aspects of the pharmaceutical endeavor from early lead optimization to process development.

In 2003, he became an associate director at Amgen, Inc. His work included the establishment of the Catalysis Group in support of route selection/process development efforts to manufacture active pharmaceutical ingredients for clinical testing. Most recently, Emilio was employed as the director of research at Pfizer, Inc., where he directed the Catalysis Group in support of medicinal chemistry and process development. ▀

New snow-clearing plan will save money, get much-used roads and lots cleared faster

A new snow-clearing plan for the site's roadways and parking lots may save the laboratory up to \$150,000 per season and should be faster and more efficient.

Under the new Snow Priority Plan, lesser-used roads and parking lots would be closed and barricaded when a snowfall of two inches or more is expected or under way, allowing high-priority roads and lots to be cleared more effectively. The lesser-used roads and lots would remain closed for the duration of the snow emergency; they would be cleared and reopened as soon as possible afterward.

"This plan may come into effect six to 12 times per year, depending on Mother Nature," said Facilities Management and Services Director Gail Stine. "Given the increases in fuel and salt costs, combined with a reduction in staff, we had to find a way to do a better job with less."

Some employees would find

themselves taking a slightly longer route to their buildings; perhaps the biggest impact of the plan would be the closure of Kearney Road, which sees less than 10 percent of the vehicle traffic on site each day. Some employees will find their usual parking lots closed, and will have to use an alternate. Eastwood Drive and the East gate will also be closed, requiring the use of Northgate to access the laboratory and the childcare center.

Going around barricades may result in a ticket or disciplinary action. Security, emergency or utility vehicles will be allowed to go around the barricades; employees who see tire tracks going around a barricade should not assume the road or parking lot is open. Barricades will be removed as soon as the road and lots have been cleared.

Maps of roadways and lots subject to the plan are online at www.anl.gov/Media_Center/Argonne_News/snow/. ▀

Normal paydays to apply during holiday break

Starting with this year's holiday shutdown payment schedule, normal paydays will be maintained. Exempt employees will receive their electronic deposits for the month of December Wednesday, Dec. 31, and non-exempt employees will receive their electronic deposits as scheduled Friday, Jan. 2, 2009.

Because almost all employees are paid electronically, there is no longer a need to pay employees on the last working day.

In past years, employees were paid on the last working day before the holiday shutdown for paydays that fell during the holiday shutdown. Paying employees on the last working day can cause undue hardship because employees are forced to wait longer than usual between paychecks.

If the practice continued during this holiday break, non-exempt employees (those paid bi-weekly) would be paid Tuesday, Dec. 23, and not again

until Friday, Jan. 16, 2009, and exempt employees (those paid monthly) would be paid on Tuesday, Dec. 23, and not again until Friday, Jan. 30, 2009.

Another complication of paying employees on the last working day before the holiday shutdown is that, for tax purposes, wages are reported based on when the wages are paid. Paying non-exempt employees Tuesday, Dec. 23, as opposed to the normal payday of Friday, Jan. 2, 2009, would shift those wages from 2009 back to 2008, which could result in negative tax consequences for non-exempt employees.

Employees who still receive paper checks will receive their checks in the mail. The paper checks will be mailed before the payday with the intention of delivery on payday. Employees who are interested in switching to direct deposit can find information on Inside Argonne. ▀

www.inside.anl.gov

Turning off lights, computers could reduce energy use by 30 percent



The CIS Division estimates that each desktop workstation and fluorescent light panel consumes about 25 cents of electricity per day — up to \$700,000 per year across

the entire laboratory.

Studies this summer by interns confirmed an industry observation that a significant portion of electric usage in office buildings — 30 percent in the Argonne test — could be saved by turn-

ing off desktop computers in evenings and on weekends, using a half-lights (two bulbs on instead of four) option and turning off office lights when leaving the office.

Computers are commonly patched during the overnight hours, so employees should check with their local information technology support staff to determine any maintenance schedules that require computers to be left on.

“As we’ve heard repeatedly in the recent election debates,” said Dane Skow (CIS), who led the energy-use study, “Energy usage is not only a financial issue, it’s a national security issue, so please do your part to help the lab, the nation and the environment. We’ll all win.” ▀

In memoriam

Theron L. Anderson, a retired senior property specialist with 27 years of service in AW, died Oct. 8. His wife, Frances, survives him.

Trudy M. Barton, a retired technical typist III with 5 years of service in EIS, died Sept. 6. Her husband, Henry, survives her.

Basil Bennett, a retired dispatcher with 25 years of service in PFS, died Oct. 14. His wife, Rose, survives him.

Lester Bohne, a retired chief technician II with 21 years of service in CT, died Dec. 21, 2007. His wife, Corrine, survives him.

William Bremmer, a retired maintenance mechanic I with 20 years of

service in PFS/BM, died May 10. His wife, Elvira, survives him.

Floyd L. Brown, a retired metallurgist with 32 years of service in ERB, died March 29. His wife, Gayle, survives him.

Warren Buck, a retired physicist with 32 years of service in CT, died May 9. His wife, Bernice, survives him.

Louis P. Burkel, a retired scientific assistant with 27 years of service in XFD, died on Sept. 21. His niece, Alice, survives him.

Henry W. Buschman, a retired associate division director with 26 years of service in ENT, died May 16. His wife, Bonnie, survives him.

Stephanie Christian, a retired administrative secretary with 15 years of service in CHM, died Jan. 23. Her daughters, Joanne Jonas and Kathryn Cohen, survive her.

Bonnie F. Clements-Decker, a retired custodian with 10 years of service in AW, died June 9. Her husband, Ted, survives her.

Josephine D. Dutemple, a retired executive assistant with 14 years of service in TD, died June 25. Her husband, Edward, survives her.

Beulah Etter, a retired administrative secretary with 29 years of service in GS, died June 16. Her sons, Steven and Stanley, survive her.

Paul Frenzen, a retired senior meteorologist with 31 years of service in BEM, died July 10. His wife, Helen, survives him.

Richard Galick, a retired maintenance mechanic I with 35 years of service in PFS/BM, died June 18. His wife, Mary, survives him.

Arnold Grunwald, a retired mechanical engineer with 17 years of service in ENG, died June 3. His daughter, Eva Dubowski, survives him.

Victor B. Hartz, a retired instrument maker with 34 years of service in CS, died Oct. 22. His children, Gary and Neal Hartz and Linda Giesecke, survive him.

Roy L. Hopla, a retired personnel specialist with 29 years of service in HR, died Sept. 12. His wife, Diane, survives him.

Robert S. Johnson, a retired metals stockroom leader with 38 years of service in CS, died June 26. His niece, Frolinda Jackson, survives him.

Kathryn R. Kirinich, a retired executive secretary with 17 years of service in SSD/PRO, died May 14. Her nieces, Sandra Davis and Patricia Rivas, survive her.

George Kirwin, a retired senior clerk with 35 years of service in SEC, died May 14. His wife, Helen, survives him.

Walter C. Kowalski, a retired painter with 23 years of service in PFS, died Sept. 17. His wife, Nancy, survives him.

John A. Lahti, a retired senior technician with 33 years of service in MST, died Sept. 13. His children, Sharon and Michael, survive him.

Wayne K. Lehto, a retired nuclear engineer with 21 years of service in IFR, died July 12. His wife, Anna, survives him.

Paul Markovich, a retired scientific associate with 30 years of service in PHY, died July 6. His wife, Marie, survives him.

Elizabeth Moretti, a retired scientific assistant with 31 years of service in CMB, died March 12. Her son, James, survives her.

Stanley Moulding, a retired instrument machinist with 24 years of service in CS, died July 15. His children, Daniel, Scott and George Moulding and Carol Meyerhost, survive him. ▀