

Ice's dream

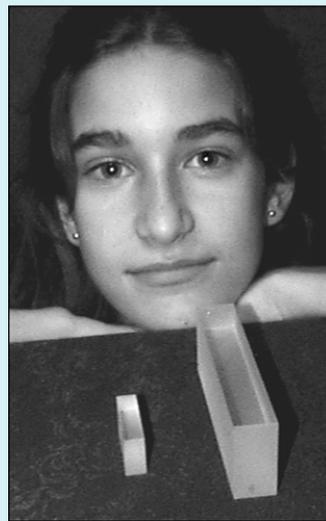
Gene Ice's award-winning X-ray mirrors enhance how we see modern materials

It began as a dream, received early support as a seed money project, and very well could revolutionize X-ray analysis of materials. An R&D 100 award may just be the beginning for ORNL's new X-ray diffraction microscopy technique.

The new technology is an example of how different groups in a national laboratory—in this case the Metals and Ceramics and Solid State divisions—can come together to produce a breakthrough technology. The story also includes a key contribution by a historically black university.

"This project gives us a totally new approach to our understanding of the properties of materials," says the Metals and Ceramics Division's Gene Ice. "It gives us a way to use powerful new X-ray sources such as the Advanced Photon Source to see inside materials in a way we've never been able to until now."

Gene says the X-ray crystallography technique will offer researchers an unprecedented, three-dimensional view into the structure of polycrystalline materials, which he says includes just about every material except silicon. A media release from earlier this year gives the example of the integrated circuits in your personal computer's microprocessor. When it goes on the blink, the cause is likely a breakdown in one or some of the



Gene Ice

Kelsey Ice poses with two X-ray diffraction mirrors made of ultra-low-expansion glass that her dad, M&C Division's Gene Ice, developed.

countless tiny metal wires that establish connectivity within the chip's silicon base.

When those connections are disrupted—through metal fatigue or some other types of stresses—you get that awful sinking feeling as your PC fails to boot up. That's just one instance where enhancing the ability to analyze the grain structures of polycrystalline materials, such as the little metal wires, can give us more insight into making better materials.

"Those fine wires that connect the integrated circuits' elements together represent a quality-control challenge to manufacturers and users," Gene notes. "As IC chips become more dense, with finer wires layered closer together, the potential for failures increases as well."

In fact, as materials become more advanced, industries will need more advanced ways of looking into them, at a submicron scale between the atomic level and the microscopic level—at a scale of tens of microns, or the "mesoscale."

Gene's pursuit of 3-D mesoscale X-ray diffraction images of polycrystalline grains began in the early 1980s. He received an IR 100 award (the R&D 100's forerunner) in 1983 for an optical device he helped develop with fellow researcher Cullie Sparks for

(See MIRRORS, page 4)

Transportation researchers packing for new NTRC

The paint is dry and the carpet is down at the new National Transportation Research Center, which will be home to a number of ORNL transportation research projects and groups. One thing's for sure: This isn't your typical plain-brown-wrapper government research facility.

The NTRC is nearly 85,000 square feet of a researcher's paradise that includes high-bay areas, numerous labs and about 150 offices that will house ORNL and University of Tennessee researchers involved in aspects of transportation from policymaking to packaging.

NTRC Director Bob Honea, who has nursed the center through its conceptual and construction phases, says the new center is the culmination of an idea that arose a scant seven years ago.

"The NTRC was born on Sept. 10, 1993, at three o'clock in the afternoon, at a transportation off-site on Tellico Lake," Bob recalls.

"Amazing ideas come up when the right group of people get together. A lot of other people told me it would never get done."

It is done, however, and the way it's been accomplished is pretty close to the "creative"

plans for upgrading aging facilities at ORNL.

"The NTRC has been built with private developer funding. ORNL and UT are leasing this space," Bob says. "There are no federal funds involved."

"We plowed new ground on everything," he says. "I could not have done it without the help of, first, Ralph McGill, and more recently, Keith Kahl. They helped me keep the vision alive."

The NTRC will be home to a number of groups currently working at ORNL. A large section of tenants will be from Engineering Technology Division projects currently housed at Y-12, including McGill's and Kahl's. Other researchers will come from the Energy, Chemical Technology and Computational Physics and Mathematics divisions at ORNL. They'll join UT research-

The new National Transportation Research Center represents prime R&D real estate on the Technology Corridor.

ers working on transportation-related projects.

The facilities have been "built to the future," Bob says, "overwired" for fiber optics, which he says greatly pleased a group of computational researchers who were moving in.

Jeff Muhs, an Engineering Technology Division researcher currently housed at Y-12 but bound for the NTRC, says the new facility

(See NTRC, page 5)



Curtis Boles

Lab, ombudsman plan to survey staff on 'quality of work life' issues

Steve Stow has a new task to go along with his ombudsman duties. Steve has been assigned to institute a "Quality of Work Life" program for the Lab. Staff input will figure highly in the process.

"Quality of Work Life" encompasses many aspects of working conditions at ORNL—from management communications to the condition of the facilities to cultural diversity to job satisfaction. Toward that end, Steve has proposed a couple of staff surveys, one soon and the other when the new management team has had time to become familiar with ORNL.

"The Leadership Team wants to conduct a survey after they've gotten a real feel for ORNL—probably in about a year. In the meantime, during the next few months, I'd like to survey staff members, asking them to prioritize specific initiatives to improve the quality of work life here," Steve says.

Lab staff members got a preview of the surveys in July when the ORNL Committee for Women conducted a Web-based survey, through *ORNL Today*, on proposed child care facilities. The survey sought information ranging from demand for such a facility to the type of service one would offer.

Steve cautions that simply because something gets tagged with a "high priority" doesn't necessarily mean it will happen. "Other factors will have to be weighed before decisions are made on where to place limited resources," he says.

Over the next several months, employees will be asked to prioritize ideas in categories including "family friendly" ones such as child care, health-care initiatives such as an on-site fitness center, professional initiatives such as more training opportunities and sabbaticals, financial initiatives such as cafeteria-style election of investment options, vacation and

timekeeping initiatives such as the ability to sell vacation back to the company, communications initiatives such as increased contact with managers and business travel initiatives such as increased flexibility in booking.

Later, a more comprehensive survey will be designed to understand a broader range of issues related to quality of work life. It will probably resemble the ethics surveys of past years or the communications surveys that preceded the ethics surveys.

But first, prioritizing the choices will be an important step in the process.

"There are simply too many good ideas around to be able to do them all," Steve says. "The surveys will give us some targets. These initiatives will help us retain the staff we have but also recruit new staff, such as by providing more vacation time for new hires.

Steve says the initial surveys should commence soon; the more comprehensive survey probably won't begin until possibly next spring or summer. It will be administered by a professional organization with a nationwide data base for comparison of ORNL against other, similar institutions.

"Conducting an employee survey at a time so near the transition would probably limit its effectiveness," Steve says. "However, we can start planning now and we can start prioritizing with a series of internal surveys. This will not only allow everyone to have a say, but it will be the first time ORNL staff have actually been asked to provide their opinions on major initiatives in this fashion."

Steve will continue his duties as ORNL's ombudsman in the meantime. Call 576-7802 to express concerns or seek advice about workplace issues.—B.C. [ornl](http://ornl.gov)



This year's new UW event—a jewelry fair—was a big hit with the lunch crowd.

Lab gives top United Way goal

ORNL's United Way Campaign 2000 exceeded its goal of \$566,569 by more than \$25,000. At the last tally before press time, contributions by Lab staff members were at 104.5 percent of the goal. The campaign closed out on August 17.

This year's campaign included a stopover and pep talk by Lady Vols coach Pat Summitt, a book fair and a new event, a jewelry fair. Part of the proceeds from the book and jewelry fairs went to the United Way. Building 4500-North's Flagpole Lobby, where the fairs were held, was frequently crowded during lunch time. The book fair raised \$2,325; the jewelry fair raised \$1,700. Another jewelry fair planned for November will count on next year's drive.

"Everyone who has been involved in the campaign this year should feel very proud of this effort—the campaign cabinet, the division coordinators, the solicitors and especially to every individual who contributed made this success possible," says campaign chair Lou Dunlap. "Sixty-seven percent of the employees participated. It has been a pleasure to be associated with this enthusiastic, motivated group. The ORNL contributions will make a big difference to many United Way groups throughout our region."

This year's campaign co-chair was Harvey Gray. Betty Jo Jones served as treasurer and Jama Norris was assistant treasurer.

Blood drive turnout good

ORNL staff members came through again for a special one-day blood drive to help alleviate Medic's supply shortfall. Volunteer organizers reported a "better than expected" turnout of 85 donations for the Friday, August 4, drive.

Report your concerns

Employees should report directly to the DOE Office of Inspector General any information concerning wrongdoing by DOE employees, contractors, subcontractors, grantees or other recipients of DOE financial assistance, or their employees.

The inspector general hotline number—1-800-541-1625—appears on this page each issue.



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Bill Del Cul does research in the Chemical Technology Division's Chemical and Energy Research section. He is originally from Argentina.

Curtis Boles

Lab Notes

Two protons at a time

Researchers at the Holifield Radioactive Ion Beam Facility recently chalked up a physics “first”: the simultaneous emission of two protons from an atom’s decaying nucleus. The finding, based on preliminary experiments with the Holifield Facility’s unique fluorine-17 beam, also represents a new type of radioactivity.

The discovery could help physicists better understand the strong nuclear forces that hold protons and neutrons together—a force that overcomes the Coulomb force, which drives the like-charged protons apart, similar to the like poles on two magnets.

“The nucleus is sending us a message about how it is put together,” says Holifield Facility Director Jim Beene.

An ORNL group led by Jorge Gomez del Campo bombarded a polypropylene target rich in hydrogen atoms with fluorine-17 beams, which mostly scattered protons. Once in a billion encounters, however, a fluorine ion captured a proton to form neon-18. One in 3,000 of the very unstable neon-18s emitted two protons simultaneously to form oxygen-16+2p. The rest formed fluorine-17 by emitting only one proton.

Researchers are trying to determine if the protons leave the nucleus bound together or if they exit simultaneously but separately. Knowing which is true could also shed new light on the forces that bind atoms together.

Whiter whites, shrunken utility bills

ORNL is currently in the process of its second washing machine field test with the Maytag folks, this time in the Boston, Mass., suburb of Reading. Similar to the Bern, Kansas, field test in 1997, residents of a Reading apartment complex are replacing their conventional washers and dryers, which have been monitored for energy use since June, with new high-efficiency Maytag Neptunes.

Energy Division’s John Tomlinson is heading up ORNL’s part in the effort, which is to crunch the data the residents provide.

“Boston is just one of the cities nationwide experiencing growth,” John told *PR Newswire*. “Continuous economic growth and, in turn, depletion of our natural re-

sources, could make our current energy and water problems even worse in the near future. That’s why teaching people how to conserve simply and early could significantly help us today and tomorrow.”

Reading is one of those booming areas. Bern, in contrast, was a small town in an arid locale. The Bern residents’ results showed that Maytag’s front-loading models (shown) use up to 60 percent less energy and saved nearly 2 million gallons of water. For their troubles, the Bern and Reading participants get to keep their new models and enjoy the savings on their energy and water bills.

And, just as important, the Neptune’s state of the art washing system “eliminates tough stains,” according to Maytag’s Website.



Teamwork beats the backhoe blues

Remember when the main antenna on the Galileo spacecraft failed and the Jupiter-orbiting satellite had to trickle its amazing pictures back to Earth through a very small backup antenna? That’s what August 18 was like, in a way, for communications technicians when a backhoe severed a main fiber-optic line between ORNL and Y-12. Things went slower, but most messages were received.

Road construction workers cut the line, which has 144 fibers for data networks and 12 fibers for phones, early that day. Employees of the Computing, Information and Networking and Instrumentation and Controls divisions, along with workers with Qwest, the service provider, and ETPP and Y-12 scrambled to reroute information for crucial systems.

CIND’s Mike Turpin explains that communications lines serving the three plants form a triangle, with the largest—the one that was cut—between ORNL and Y-12. Workers managed to reroute info around the two thinner sides of the triangle. Except for a few systems, most services stayed up, with users just noticing that things were a little slow.

“This was a case where you had Qwest doing their work and bargaining unit people and CIND staff pulling together to restore service,” Turpin says.

Because many of the ETPP links have been disconnected to

hook up service for the new ED-1 industrial park, technicians only had a few available lines to work with. Turpin says if the cut had occurred a few hours later, they may have had no lines to work with.

“When I finally got home my wife asked if I had a frustrating day,” says Turpin. “Actually, it was fun. Everything we tried worked and everybody pulled in same direction.”

Cool, clear water

If you’ve ever wondered about the water coming from the faucets at the Lab, take heart that a lot of folks look after the quality of that water, all the time.

When it was alleged at a recent public meeting that process water backflow may have contaminated drinking water at the East Tennessee Technological Park, ORNL mounted a management review of its own water system, including samples and a document check for past instances.

Results of water samples mirror a similar check of a number of distributed sampling points in 1995: ORNL’s drinking-water supply, which comes from the city of Oak Ridge system, falls far below set limits for radioactive contamination. For instance, where regulatory limits are set at 15 picocuries per liter, ORNL readings rarely exceed 2 picocuries per liter.

Radiation Protection’s Steve Sims says ORNL has historically watched the water and has a continuously maintained triple-safe system of backflow preventers installed throughout the system. None has ever failed to prevent a backflow.

“Water systems are designed to leak out of the system; never in. They are under pressure,” Sims says, noting that even samples from sites within contaminated groundwater plumes are indistinguishable from background contamination.

“ORNL has recognized the importance of assuring the potable water at the site since the 1940s and has maintained a policy of separate potable and process water systems since the 1950s,” he says.

Reported by Bill Cabage and Carolyn Krause



The new ORNL Visitor Services Center opened last month. Staffing the desk are Debbie Moore, Jean Bray and Barbara Swails. Drop by for a visit.

Mirrors

Continued from page 1

focusing X-rays at Brookhaven National Laboratory.

"The Dynamically Bent Sagittal Focusing Monochromator is a powerful technology that's now used all over the world," he says. "During a five-year off-site assignment to run Oak Ridge's first X-ray synchrotron beamline, I became convinced that microdiffraction was the next step in materials characterization. I pushed for it. I received seed money funding in 1993 and went around the country talking to industries and other labs about their needs for such an instrument."

In the meantime, Solid State Division's Jim Roberto and Ben Larson became interested in partnering.

"Jim was looking at new directions in materials science, and there weren't any tools for analyzing materials at the mesoscale," says Gene. "Ben recognized how important the X-ray microprobe would be and added the considerable expertise of his solid-state X-ray group to the project."

With a larger LDRD grant to prove the principle, Gene and Ben revived the oldest technique for X-ray microscopy, called the Laue method. Laue diffraction uses a beam with many wavelengths. As Gene explains, using one wavelength on highly disordered materials drastically reduces the chances of obtaining information from each grain as the X-ray beam "scatters" off of structures. A polychromatic technique increases the information 10,000 times. It also, however, increases manyfold the complexity of the data.

In addition to the development of the R&D 100 Award-winning microfocusing mirrors, which are fabricated using thin-film deposition techniques championed by ORNL, Gene and Ben needed a new kind of X-ray monochromator that could either select a single wavelength or pass a polychromate beam.

They also needed sophisticated computer codes to crunch the volumes of data.

M&C and Solid State, with Ben Larson leveraging his considerable reputation as an expert, entered into a collaboration with professor Walter Lowe at Howard University in Washington, D.C., to design and build a monochromator to select wavelengths from the polychromatic diffraction imaging. "It's the first major scientific instrument that was built at Howard," Gene says, "and it's a fantastic instrument."

Gene and Ben started putting things together in 1997, just in time to compete for and win a "two-percent grant" from DOE's Basic Energy Sciences, a fund that consists of two percent of BES program funding. Only a few recipients are selected each year through a stiff proposal competition.

Gene and Ben have also partnered with Solid State's John Budai to analyze the RABiTS superconducting film developed by ORNL's Superconductivity program, assessing how the structure in the underlying layers affect the grain structure, and thus the performance, of the deposited layers. The process can be applied to many materials—metal and ceramic—used for chips, gears, car bodies or even bridges.

Gene is also working on a proposal to apply the technique to groundwater-flow research. By studying the crystalline structures of radioactive and heavy-metal contaminated metals, much can be learned about how they are transported in groundwater.

"We can now look deep into a sample," Gene says. "There have been many theories on how grains affect the performance of thin films, or how the wires in ICs evolve toward

failure. Internal stresses are the forces, and up until now they have been totally invisible."

Gene lists three innovations from the long-running project: the microfocusing mirrors that focus the X-ray beams, which won the R&D 100 Award; the monochromator that Howard University built, installed at Argonne's Advanced Photon Source; and the automatic indexing software that separates the complicated Laue patterns, allowing them to characterize the grains.

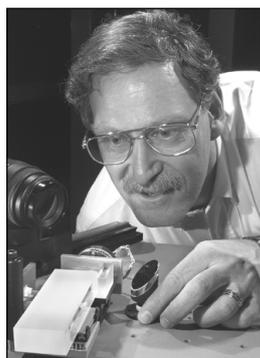
"We would like to involve ORNL's computational groups in adapting that software to massively parallel processing," Gene says. "The data from the microscope are so complex that it takes days to interpret an experiment. Applying the codes to a supercomputer would allow us to make the analysis in real time!"

Researchers can finally determine what's happening to specific grains in a material instead of averaging the results. "It's a far more direct—and accurate—approach," he says.

"People have been studying materials with X-rays for a long time," Gene states. "We've brought back one of the oldest techniques—Laue diffraction—and applied innovative approaches and new technologies.

"In fact, this project has involved some of the best aspects of a national lab—interdivisional collaborations between M&C, Solid State and eventually the parallel computing groups; partnering with a university, particularly a historically black university; and the use of seed money and LDRD funding to nurture a visionary concept."

Says Gene, "This project has put together the very strengths of this Laboratory. By being the first to develop this new technology, ORNL has the potential to make significant progress in a number of fields that touch on many divisions within ORNL."—B.C. 



Gene Ice

ORNL people

Michelle Buchanan will succeed retiring Marv Poutsma as director of the Chemical and Analytical Sciences Division. Michelle has been associate director of the Life Sciences Division and will remain director of the Center for Structural Molecular Biology, which is a collaboration of the Life Sciences, Solid State and Chemical and Analytical Sciences divisions.



Buchanan

Gov. Don Sundquist has appointed Lab Director **Bill Madia** to the Tennessee Technology Development Corporation board

of directors. The corporation was established by the governor and the Tennessee General Assembly in 1998 to strengthen the state's economy through the development of science and technology and to support the transfer of science, technology and quality improvement methods to Tennessee businesses.

The Metals and Ceramics Division's **Linda Horton** was a winner at the Oak Ridge YWCA Night of Tribute in the category of Science, Health and Technology.

The Health Physics Society has elected **Craig Little** to a three-year term on its board of directors. Craig leads the Life Sciences Division's Environmental Technology group, which is located in Grand Junction, Colo. He has been an associate editor for the *Health Physics Journal* for the past seven years, as well as serving on numerous committees.

Corporate Fellow **Lynn Boatner** of the Solid State Division has been appointed a topical editor for *Crystal Growth and Design*, a new journal published by the American Chemical Society. He'll edit papers on nanostructured phase development.

Two Spallation Neutron Source project interns won top awards at the Sixth Annual Science & Engineering Research Conference, held at the University of South Carolina. In the fields of computer science and math, the two South Carolina State University students won first and second place awards. **Bryan Davis'** presentation was titled "Error Analysis of the SNS Drift Tube Linac" (John Galambos, mentor); **Christopher Allen's** presentation was titled "Java Network Programming Query System" (Dan Ciarlette, mentor).

NTRC

Continued from page 1

is likely to boost his fiber-optic technology based projects, such as ORNL's weigh-in-motion scales.

"We expect to have heightened visibility and exposure by being able to bring sponsors in more easily to show them our work," he says. "We expect to enjoy enhanced teaming opportunities with other divisions who come here. We're also looking forward to having more proximity to test equipment located at the Knox County Weigh Station and McGhee Tyson Air Base."

Other tenants will be performing research on intelligent vehicle systems, power electronics, composite materials, aviation and air traffic safety, emission controls, crash modeling and driving simulation—in other words, just about every area a research that has to do with moving from one place to another.

Facilities include brand new laboratory space, a pad for drop tests, commercial truck scales, several two-wheel dynamometers and possibly a rare four-wheel dynamometer, which Bob says may be the only one in the Southeast. The facility is large enough to accommodate big trucks. "Truck safety and operation is going to be a big part of this facility," says Bob.

The NTRC, in fact, could become a magnet for transportation industries as word gets out about the quality and availability of the facilities, including its 8,000 square feet of lab space. Bob says several companies that move hazardous materials are already interested in the packaging research facilities, a spin off



The NTRC includes labs, offices and a large conference area (left). Below, Sonya Brooks, the building contractor's project coordinator, peers over the lobby's banister.

NTRC labs and capabilities

- Composites lab
- Infrastructure materials testing lab
- Human factors lab
- Geographic information systems lab
- Materials packaging lab
- Transportation policy analysis lab
- Vehicle/engine test lab
- Commercial vehicle operations lab
- Intelligent transportation systems/traffic control lab
- Military transportation vehicle simulation lab
- Power electronics lab
- Materials modeling and characterization lab

Curtis Boles



Oak Ridge's expertise in packaging nuclear materials.

The NTRC's activities, however, will span the whole range of transportation research. It's not hard to imagine that, in the future, the

drivers that go whizzing down the Pellissippi Parkway toward Oak Ridge will be able to credit the big facility on the right for how efficiently and safely they are getting from that one place to another.—B.C. [ornl](#)

CFW leads Lab team for breast cancer event

The Committee for Women has taken the lead to form the first ORNL team for the Susan G. Komen Breast Cancer Foundation "Race for the Cure" at the Knoxville World's Fair Park on Saturday, October 7. ORNL employees, families and friends are encouraged to join the team in the fight against the leading cause of death among women between ages 40 and 59.

Every ORNL employee who joins the team gets an ORNL T-shirt in addition to the T-shirts provided by the foundation. The registration fee is \$15; the deadline to register for the ORNL Team is September 14. Contact your division office for registration and pledge forms, or sign up at the main cafeteria between 11 a.m. and 12:30 p.m. on Wednesday, September 6 or Thursday, September 14.

Questions may be directed to Stacy M. Smith (241-5190, smithsm@ornl.gov) or Paula Wright (574-2822, wrightpf@ornl.gov).

New safety awards campaign hails, rewards working safely 'on the spot'

ORNL is taking a different approach to safety awards this year. Whereas in the past awards have been distributed pretty much uniformly, the Environment, Safety, Health and Quality directorate has put into place a plan that puts award money at the individual directorate's discretion. The object, says Operational Safety Services Director Carol Scott, is to instantly reward outstanding safety performance.

"In the past, every ORNL employee received a safety award. It did not matter if the employees had good or poor safety performance; everyone received an award. That has changed," says Carol.

Under the new plan, each directorate has received an amount of safety award program money, allotted on a per capita basis. Line management will use the money to distribute, on the spot, awards to those employees they deem as having performed outstandingly in the area of safety.

Awards could be as much as \$500 to \$1,000.

Carol says that line management will now have a tool to motivate staff to consider integrated safety management as part of the job process.

"The benefits of this safety award program are that it gives line management the authority and ability to instantly recognize safety performance, and it puts motivation back into the safety award process by encouraging positive safety performance behavior," Carol says.

Adds Associate Lab Director for ESH&Q Kelly Beierschmitt, "We want to see people working safely, and incentives reinforce that behavior."

The new Leadership Team-approved program, now under way, applies to non-exempt and exempt staff. ORNL hourly staff members will continue to receive a gift certificate. [ornl](#)

“Scram!”

Reactor veteran recalls account of the birth of a key word in the nuclear vernacular

Editor’s note: Edwin Blackburn, a millwright in the Research Reactor Division’s HFIR Shop, for a time worked alongside the late Wallace Koehler. Koehler, a renowned physicist who designed and built ORNL’s Small Angle Neutron Scattering Facility, was one of three technicians assigned to man one of the buckets on top of the Stagg Field pile reactor when it first went critical on Dec. 2, 1942. He worked on the Manhattan Project until September 1948 and was a researcher in ORNL’s Solid State Division from 1949 until he died in 1986.

Edwin was working on the Small Angle Neutron Scattering Facility when he asked Koehler how he became a physicist.

“He told me he guessed it just happened due to his college days and I inquired just where he attended college. He said the University of Chicago. I said, ‘Isn’t that where they first split the atom?’ He said, ‘Yes, as a matter of fact I was there. As a matter of fact, I was standing directly on top of the pile when it first went critical.’

“I asked then, excitedly, ‘You mean you met Fermi?’ He explained that he was a technician for Fermi. He then immediately asked me, ‘Do you know what scram means?’ I said no, and I guessed two or three things. He told me this story; I’ve never forgotten it.”

BY EDWIN BLACKBURN

Webster defines Scram as “A rapid emergency shutdown of a nuclear reactor.” To most of us in the nuclear business this term means “to place the reactor in a safe condition.”

Scrams are usually activated or “tripped” by electronic means through some of the hundreds of safety sensors and systems of modern nuclear reactors, but they still have a manual

After a few test runs, the logger complained to Enrico that his neck was getting stiff. Could he just holler out loudly, “Cut the rope”?

scram. Once this is initiated it occurs in fractions of a second. The term can always be found on any reactor control desk, adjacent to a large red button labeled “scram”.

The first sustained nuclear chain reaction was accomplished during the early days of the Manhattan Project. This event, at the University of Chicago’s squash courts under Stagg Field’s bleachers, was destined to change the world forever.

Italian physicist Enrico Fermi headed up a group of technicians, scientists and others who constructed a “pile” of his design to safely prove that splitting the atom could be accom-

plished and controlled by the critical spacing, configuration and shapes of the required uranium slugs, graphite blocks, cadmium sheets and cadmium rods. The cadmium rods or strips absorbed neutrons, which enabled them to raise or lower the activity of energy emitted during operation.

Fermi needed absolute certainty that this “test” would not go awry. The experiment was originally planned to be performed in the Argonne Forest, some 28 miles out of Chicago. Because of construction overruns and the all-out push from the administration, a decision was made to go ahead at Stagg Field as long it could be done safely. It was through Fermi’s confidence in his calculations with the earlier construction and testing of 30 other smaller “piles” that they did so.

Fermi added two more safety devices. The first was to place three technicians (history records them as physicists, one of which was Wally Koehler) always at the ready to pour buckets of cadmium sulfate down through the pile if Fermi gave them hand signals, which were pantomime motions of dumping a bucket. The other device was already in place but lacked the speed he knew it must possess. This was a centrally located cadmium strip vertically suspended by a cable with a lead weight on the bottom, which was raised and lowered by a hand-operated winch.

Fermi informed the Army’s top liaison officer that he needed the services of an expert axeman as soon as possible. A professional logger from the woods of Washington or Oregon was hurriedly whisked to the site.

To the amazement of this Northwest woodsman, the success of this top secret operation and the safety of all of them rested truly on his shoulder, upon which also rested an axe, a fireman’s type with one blade, a pointed end and a wooden handle, all painted red. With it the woodsman would cut a heavy rope placed between the cable to the winch and the cable to the pile. It was strung against a piece of railroad tie placed vertically—a chopping block.

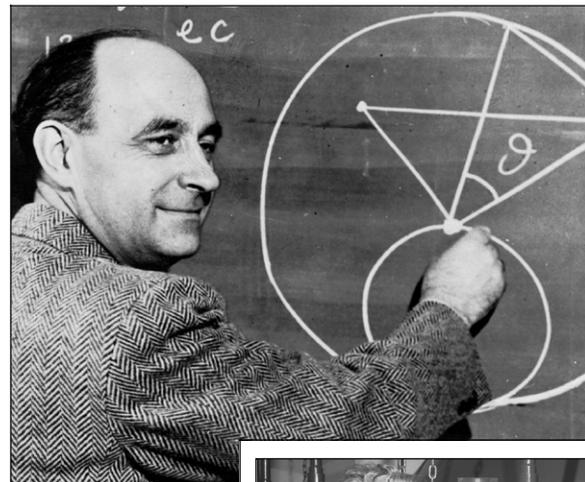
This was the first line of defense for an emergency “shutdown,” followed by, if needed, the dumping of the liquid cadmium solution into the pile.

The axeman received his hand-signalized instructions from Fermi, who stressed the speed necessary by holding one hand flat and depicting a chopping motion with the other.

After a few test runs, the logger complained to Enrico that his neck was getting stiff and that he really needed to keep a keen eye on the rope to ensure that he did not miss, and could he just holler out loudly “cut the rope” for his cue, which would result in a much faster process.

The following morning Fermi gathered the group together and informed them of the following emergency shutdown plan:

“Insert the control rod into the pile, unlatch the winch lock and reinsert the vertical



Safety was high on Enrico Fermi’s (top) agenda when he oversaw the Stagg Field experiment in 1942. The late Wallace Koehler (right) was stationed above the pile with a bucket of liquid cadmium.



cadmium back into the pile as quickly as possible. If I yell the word ‘scram,’ the axeman will swiftly cut the rope and let the heavy weight rapidly pull the poison cadmium rod into the pile by gravity until it falls into position. If all this fails to shut down the reaction, I will make the dump-the-bucket-signal and all three buckets will be poured into the pile and we will all exit the facility. Are there any questions before we proceed?”

One hand at the back slowly raised from the assembled group. Enrico Fermi was asked by the burly logger, “Sir, just what does ‘scram’ mean?”

Fermi’s reply to the assembled group was, “Safety Cut Rope Axe Man.” [ornl](#)

Open enrollments set for October

Benefit Plans will hold its annual open enrollments for the CIGNA and Healthsource point of service plans, the MetLife Dental Plan and Flexible Spending Accounts during the month of October. Employees who wish to make a change in carriers or pick up coverage for themselves or dependents may enroll during October with an effective date of January 1, 2001.

Plan briefings for employees are scheduled as follows:

October 10

8 a.m., ORNL, Building 4500-N, Weinberg Auditorium

10 a.m., ORNL, Building 1505, D.J. Nelson Auditorium

3 p.m., 104 Union Valley Road, Conference Room

6 p.m., 104 Union Valley Road, Conference Room

October 11

8 a.m. and 12 noon, Y-12 Cafeteria Conference Room

Spouses are welcome to attend the sessions hosted at the Union Valley Road office. Plan forms will be available at all the meetings or form can be mailed or faxed to you. Call the OneCall Benefits Service Center at (865) 574-1500 or 1(877)TO-1-CALL.

Retirements

To arrange for a portrait, call Deborah Barnes, 576-0470



Marv and Ceci at her party.

after 22 years of service. Ceci, who resides in Knoxville, says she worked in CASD "the whole time."

Chemical and Analytical Sciences Division Director Marv Poutsma retired at the end of August with 38 years of service. Marv lives in Oak Ridge. His secretary, Cecilia Steele, retired in July

Deaths

David Morris died on August 6. The Knoxville resident worked in the Engineering Technology Division's Engineering Science section.



Morris



Energy Systems President Bob Van Hook (left) and ORNL Director Bill Madia flank two of this year's three Lockheed Martin Foundation scholarship winners. Sanjana Ahmed (beside Bob) is the daughter of Abu B. Ahmed of the Operational Safety Services Division. Rachel McCord is the daughter of Raymond McCord of the Environmental Sciences Division. Graham Beattie, son of Kenneth L. Beattie of the Life Sciences Division, also received a scholarship, the last from the Lockheed Martin program at ORNL.

Letters

"Information explosion"

A note regarding "Depot for data" in the August issue of the *ORNL Reporter*: This article describes the Carbon Dioxide Information Analysis Center (CDIAC) as "the Lab's most venerable data center, operating since 1982." In fact, this honor probably belongs either to the Radiation Safety Information Computational Center, which was established in 1962 as the Radiation Shielding Information Center under the direction of Betty Maskewitz, or to the Controlled Fusion Atomic Data Center, which was informally established in 1958 by C. F. (Barney) Barnett and formally chartered in 1963 as the Atomic and Molecular Processes Information Center. Another candidate is the Nuclear Data Project, which was begun at ORNL in the mid-1940s by Katherine (Kay) Way, then moved to Washington, D.C., and returned to the Laboratory in 1964.

According to *ORNL: The First 50 Years*, the Laboratory's role as a storehouse of scientific information can be traced to former Director Alvin Weinberg, who was on the

President's Science Advisory Committee from 1959 to 1961 and chaired a panel to address the "information explosion" of the time. The panel's report, *Science, Government, and Information: The Responsibilities of the Technical Community and the Government in the Transfer of Information* (informally known as the Weinberg report), provided the impetus for the formation of a number of scientific information centers, including roughly a dozen at ORNL.

Another former ORNL director, Alvin Trivelpiece, sometimes referred to the Laboratory as "a knowledge factory." CDIAC and the other data centers at ORNL are carrying on a proud tradition of delivering the products of this knowledge factory to the world.

Bonnie Nestor, manager
Institutional Planning

We want your letters. Share your views on something you've read in ORNL Reporter, or on anything, and e-mail it to cabagewh@ornl.gov or mail it to MS-6146, Building 4500-South.

Service Anniversaries

September 2000

40+ years: Lawrence B. Shappert and Jack S. Watson, Chemical Technology; Kenneth S. Toth, Physics

40 years: George T. Yahr, Engineering Technology

35 years: Richard C. Durfee, Computational Physics and Engineering

30 years: Phillip S. Herrell and Allen White, Plant & Equipment; John T. Hogan, Fusion Energy

25 years: Ronald H. Baldwin, Metals & Ceramics; Mary A. Bogle, Environmental Sciences; Norma F. Cardwell, Contracts and Procurement; Roger D. Collins, James W. Daugherty, Frank J. Kolski, and James N.

Parks, Plant & Equipment; Edward C. Fox, John T. Shaffer, and John Whealton, Engineering Technology; Larry E. Hoover, Quality Services; Randall L. Linkous and Lorena F. Truett, Energy Division; Jinwun W. Lue, Fusion Energy; Daniel L. Million, Computer Science & Mathematics; Roger D. Spence, Chemical Technology; and Daniel M. Williams, Spallation Neutron Source Project

20 years: Kathy J. Brown, Life Sciences; Aurelia J. Carter, Metals & Ceramics; Terry R. Curlee, Lawrence J. Hill, and John J. Tomlinson, Energy; Terrence L. Donaldson, Chemical Technology; Barbara J. Frame, Sue F. Hartsook, George W. Ott, Jr., and Clifford P. White, Engineering Technology; Karen N. Gibson, Environmental Sciences; Vernon F. McClain and David E. Smith, Instrumentation & Controls; Terry G. Sanford, Plant & Equipment

Travel: Office move, a new provider, and an effort to streamline process

ORNL has a new travel services provider. Meanwhile, the Travel office is heading west.

Travel Management Partners took over the Lab's travel reservation service on September 1. TMP serves more than 112 operations in 32 states, managing air travel budgets totaling more than \$250 million annually. The company has served the Battelle Memorial Institute since 1991 (the agreement was renewed this year), and Pacific Northwest National Laboratory since December 1994.

Despite TMP's history of business with Battelle, Chief Finance Officer Greg Turner says ORNL chose the company only after an intense round of benchmarking and price comparisons. "They came out on top," he says.

ORNL's Travel Reservations office is relocating to Building 1062, on the west end of the Laboratory, effective September 5. Phone numbers stay the same except for the after-hours emergency number. Effective September 1 at 5 p.m., travelers can call (865) 241-9872 (241-XTRA) and be connected with TMP's after-hours desk.

The move puts Travel Reservations adjacent to Travel Settlement for a more cohesive management arrangement. "With the emphasis on e-tickets, electronic itineraries and no cash advances, it is no longer mandatory for the majority of travelers to pick up their packages in Travel," says Travel Manager Kathie Shearer.

"E-tickets are the way to go," says Kathie. "It's often no longer necessary to pick up, and keep up with, an airline ticket; you simply designate your ticket for pickup at the

airport."

Travelers' fears of electronic reservations usually disintegrate after the first trip with an e-ticket. But there are some things to be remembered.

"Travelers need to remember to always obtain a print-out of the ticket receipt from the airline," Kathie says. "Any airline ticket agent can do this for you at any time during your trip. It's required for travel settlement."

With flight cancellations in the news and the air travel industry running at or near capacity, Kathie also urges travelers to reconfirm their flights before leaving for the airport. Airlines will accept contact phone numbers to advise ticketed travelers of cancellations, delays or schedule changes.

"We list the traveler's home phone and work phone in the record if the traveler has provided that information to us in their profile. It is a good idea for the traveler to provide a business contact at the business location when calling to reconfirm flights. It also is a good idea to re-confirm flights on the return trip as well, and to bring a print-out of your itinerary with you to the airport," Kathy says.

Finally, in an effort to simplify and expedite the travel process, a travel caucus or focus group is being initiated to review the myriad business rules associated with travel. Travelers, especially those who frequently tote suitcases, often question the necessity of receipts, GSA rates and a host of other concerns. Kathie says these topics will be addressed and processes simplified and streamlined where possible.—B.C. [ornl](#)

Briefly

Cell 911 calls go outside

Emergency 911 calls made from cell phones on the Oak Ridge Reservation don't go to Lab responders. They go instead to outside agencies, which could cost crucial minutes in responding to accidents.

Such a situation arose on August 22 in Portsmouth when a subcontract employee was seriously burned by a chemical reaction during a process demonstration. A 911 call from a cell phone went to the local sheriff's office instead of to on-site emergency staff.

Similarly, a 911 call from a cell phone on the ORR would go to any of a number of surrounding county agencies. In an emergency, says 911 Systems Administrator Jan Thomas, call 911 from an ORNL phone, radio the Laboratory Shift Superintendent's office (station 10) or pull a fire alarm box.

Laptops, encoding software considered 'spy tools' abroad

The U.S. State Department's Office of Diplomatic Security has issued a warning that Egypt, France and Russia have decreed that laptop computers with encryption capability are considered "spy tools" and will be seized or denied entry into those countries.

Software with encryption capabilities includes such household names as Netscape, Eudora, Windows and Entrust, says Contracts' Patty Henegar, the Lab's export compliance manager.

Says the State Department warning, "If encrypted software is not removed from your PC prior to traveling, you risk seizure of the PC, being denied entry and possible incarceration."

ornl reporter

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