

Current prospects

Tests on Old Bethel Valley Road help industry improve electric power transmission efficiency

ORNL employees are witnessing a science experiment that is taking place alongside their commuter route. ORNL will soon begin tests on new power transmission line technology as part of a cooperative research and development agreement with 3M.

Power transmission is often taken for granted until a power outage occurs or more power is needed than is available. The demand for power in the United States is expected to rise 25 percent in the next 10 years. Because of the growing demand for power—and the environmental and aesthetic concerns that delay construction of more towers—energy transmission faces some new challenges. Some of these challenges are outlined in the *Report of the President's National Energy Policy Development Group* and as initiatives in DOE's National Transmission Grid Study.

ORNL and 3M teamed up to develop and test composite-core conductors that might address some of these concerns. "3M has developed a composite-core conductor that can increase the current-carrying capacity of a transmission line by 1.5 to 3 times over that of conductors now in use," says John Stovall,

team leader in ORNL's Engineering Science and Technology Division. "We will be building a short power line for testing this new conductor."

Most overhead power lines today are aluminum-conductor steel-reinforced, or ACSR, cables made of strands of aluminum and steel wires. The conductor is "bare," meaning that there is no insulation or jacket covering it. Conductor sizes range from 0.75 to 1.75 inches in diameter with typical current-carrying capabilities between 500 and 1600 amps, depending upon size and other factors. The conductor configuration also varies with voltage level from single conductor to bundles of two, three or four, which reduce the electric field density.

Because of the strength characteristics of aluminum, a steel cable core was added to the center to reinforce the conductor, giving it greater strength overall and allowing towers to be built at a greater distance apart. ACSR presents two main problems: the steel oxidizes (rusts) in the weather and the aluminum stretches when it gets hot and, if allowed to get too hot, fails to retain its original shape—an effect called annealing.



Workmen install support towers for the conductor tests near Bethel Valley Road.

Curtis Botes

Electrical current running through the line generates heat. Power lines sag when they get too hot from carrying a lot of current. Sagging can lead to potential power outages, especially when demand for power soars. In the summer of 1996, one of the major west coast blackouts was caused when an overloaded power line sagged into a tree. The new 3M conductors alleviate both rust and heat sag.

Many factors contribute to the heat balance of a power line. The more current that runs through the line, the hotter the line gets. The typical upper operating range of ACSR is 75° to 100°C, which limits the amount of electrical current that can be transmitted over the system. When utilities are forced to operate ACSR at temperatures above 100°C, a permanent loss of conductor life occurs. Wind and heat radiation help to cool the lines, but it is hard to determine how much the wind and radiation will lower the temperature to allow increases in current flow.

3M researchers, working with Vinod Sikka of the Metals and Ceramics Division and ESTD's Roger Kisner, have produced a promising replacement for ACSR lines. The design uses 10,000 to 15,000 of the 3M Nextel 650 ceramic fibers, embedded in an aluminum matrix, to make a composite wire that is stronger than steel and that does not stretch as much when heated. Zirconium is added to the aluminum to make it more resistant to

(See TRANSMISSION, page 5)

Leadership Team ready to tackle tougher issues toward a better Lab

It's been a year since the Lab last surveyed its staff on their views of the quality of the ORNL work life and work environment. Two surveys—one done in early 2001 and a more detailed survey conducted about six months later—identified staff priorities, concerns and desires.

Staff will soon have an opportunity to serve on focus groups aimed at addressing some of the tougher issues that have emerged.

"It is fundamental that we understand and

dures, a more streamlined organization and opportunities to attend financial management workshops—all high staff priorities (see the sidebar, page 7). Where feasible, Lab management has tackled those items that could be addressed by management decision.

The employees' top priority on the initial Quality of Work Life survey—an increase in the pension multiplier—has proven more elusive. Some changes in the pension program were made in April 2001, and the Lab is continuing to evaluate its position relative to other labs.

"We continue to review our competitive position, the concerns and needs of the Lab staff and retirees and the investment performance and funding of the plan," Darryl says. "We are fully committed to fulfill all obligations to current and future participants. We certainly want to enhance benefits when doing so will not threaten our ability to meet future obligations and is consistent with our commitment to be a good steward of the plan

(See SURVEYS, page 7)

How staff feel about the work environment is critical to our success.

effectively address issues of importance to our staff," says Human Resources and Diversity Programs Director Darryl Boykins. "How our staff members feel about their working environment is a critical factor in the success of our science mission and our excellence in operations."

The Leadership Team has acted quickly where it could. Lab staff members now have a fitness center, changes in their travel proce-

Response fast, disruption brief after contamination turns up

ORNL's episode with the detection and cleanup of radioactive contamination during the week of the July 4th holiday underscores some of the challenges of a laboratory with a rich history of radioisotope production. Although the Lab's radioactive by-products are contained the overwhelming majority of the time, once it gets loose, contamination can be disruptive, to say the least.

In fact, the occurrence, which began with its discovery over the pre-holiday weekend, was enough to briefly empty out a few buildings and parking lots. It halted for a day the bustling private facilities construction as radiation protection and hazardous materials workers made sure the areas were free of contamination.

The offending material turned out to contain small amounts of strontium-90, a beta-emitting radioisotope. Readings were low-level, and beta particles are easily shielded. The bits of material that carried the strontium were typically in pieces too large to ingest, which is the primary health risk. Once it was rained on, the strontium was pretty much fixed in place.

"You couldn't breathe it in; the pieces would have lodged in your nose. The particles

contractor Bechtel Jacobs is under way to pin down the actual source.

All ORNL nuclear and radiological R&D operations within the main campus area were examined for their potential as a source for the event. Current Lab R&D operations were ruled out as a contributor.

Radiation protection workers surveyed the area along Fifth Street, which bisects the main campus, over the weekend of June 29–30. That street will become a main entrance for commuters and visitors when construction on the Joint Institute of Computational Science and Oak Ridge Center for Advanced Studies begins this month. The routine survey was in preparation for the increase in public traffic.

They encountered most of the contamination generally to the east—along Fifth Street and in the recently expanded flagpole parking lot across Central Avenue from Building 4500-North, near its intersection with Fifth Street. Other spots were found along Sixth Street, and more isolated discoveries were made to the east in the 7000 area and at the Bethel Church.

"Our priority was to determine the boundaries of the contamination, including whether it had been tracked into the buildings," Steve says. Surveyors found none inside nearby and heavily trafficked buildings such as Building 4500-North and the cafeteria. The boundary was determined to lie around an elongated plume stretching east of Isotope Alley, once the center of the Lab's radioisotope operations.

Most of the tainted pieces fell nearest to what's believed to be the source.

A review of activities indicated that the release likely first occurred early on Wednesday, June 26. With nearly three business days between occurrence and discovery, Lab officials offered to survey personal vehicles that had been parked in the flagpole lot or surrounding areas and any fleet cars.

Many commuters took them up on it. Of the 160 personal vehicles checked by the week of July 8, none revealed contamination.

Most fleet vehicles were likewise clear. Of 36 screened, three that were parked near Fifth Street had single specks of contamination that were quickly removed. One other turned up a small amount of contamination that was deemed not related to the June 26 incident.

OSSD radiation protection and hazardous materials personnel were "pulled from everywhere" to help with the cleanup. "We cleaned up spots of contamination as we found them," Steve says. Fortunately, levels were such that the more than 100 health physics and hazardous materials staff involved weren't required to dress out in decontamination suits during some of the summer's muggiest weather. The teams worked continuously, however, from the initial weekend through the next, except for a badly needed break for the July 4–5 holiday.

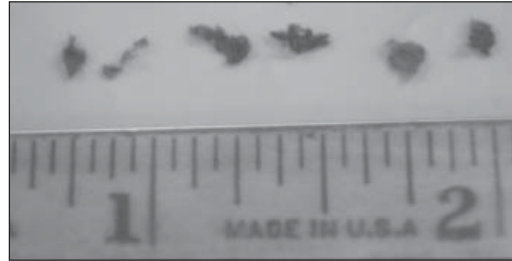
Their work showed that the radiation was at very low levels and the contamination itself generally didn't move once it had landed.

"Exposures from any particle were below what would be considered a health threat," says OSSD Director Carol Scott. "They were too large and discrete in nature to be respirable, and nothing even turned up on the HPs' and hazmat teams' shoes."

Nevertheless, a recovery operation led by Operational Emergency Coordinator David Milan has the goal of scrubbing, scouring or sucking up every hot spot detected, even in the grass. White "keep off the grass" signs were placed where the bits might have fallen (the levels of radiation were below what would warrant the magenta and yellow flags). The signs were to disappear as patches of lawn were checked and cleared.

While the recovery work is ongoing, by July 9, Environmental, Safety, Health and Quality Director Kelly Beierschmitt was able to tell staff, "Things are getting back to normal."

If you have questions or concerns about the event, contact Carol Scott, 574-7140, e-mail scottch.—B.C. **ornl**



The bits of filter media that contained the strontium-90 were too large to inhale or easily ingest, and most fell to the ground near the suspected source.

Rad protection, hazmat workers "from everywhere" helped with the cleanup.

were that large," says Operational Safety Services Division Deputy Director Steve Sims, a radiation protection specialist. "If it had gotten in your mouth you would have spit it out."

The hot bits were believed to have come from a decommissioned building in the "Isotope Alley" section of the Lab. A probe led by DOE environmental management



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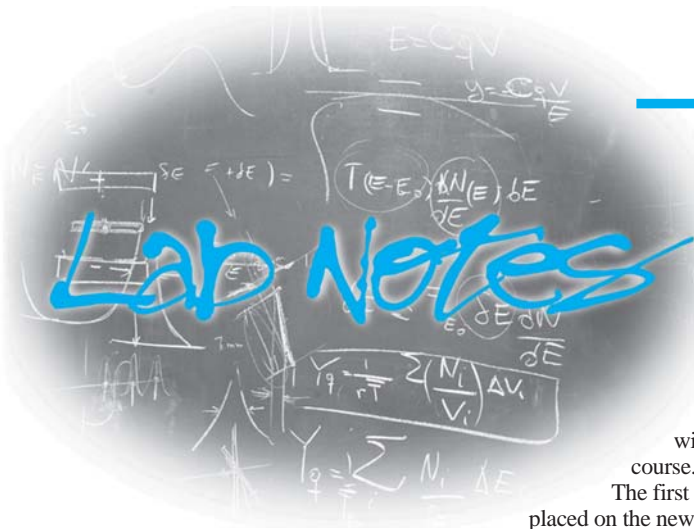
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Herschel Brooks of Facilities and Operations has a job with a view. He services HVAC systems, including the air conditioning for the Holifield tower. Herschel's looking west, toward the new facilities construction and main campus.



The signs they are a-changin'

"Virtually anyone who works at the Lab would agree that our sign situation is a mess," says Communications and Community Outreach Director Billy Stair. "We have hundreds of signs—61 on Bethel Valley Road alone—erected on an ad hoc basis over the past several decades. Some are important. Most are outdated, faded or have type so small you'd have to have weasel's eyes to read them."

Part of the Lab's modernization project is a drive to update, upgrade and bring order to the Lab's outdoor signage. "We don't want a mish-mash of ugly signs on a new campus," Billy says. "We've taken a step back to decide what signs we want to keep, which ones we can do without and to standardize the color, shape, font and height of the signs we put up."

ORNL's signs of the near future will come in four general categories—the largest will be directional signs on Bethel Valley Road to guide in visitors and new employees; then will come informational signs such as speed limit and other traffic signs. A third type of sign will identify buildings by name and function as well as number (an example is shown).



New sign sample: This one will appear on the east end of Building 4500-North.

The first wave of new signs will be placed on the newly refurbished Fifth Street entrance, which will be the new route to the Visitor Center as construction cuts off the former main entrance. The second phase will focus on signs from the Bethel Valley Road entrances to the Lab.

"You'll see a dramatic change by mid-autumn," Billy says.

Reactor at the core

The earth's core is formed from nickel and iron, right? Dan Hollenbach, a nuclear engineer at ORNL, and Marvin Herndon, a nuclear chemist in San Diego, disagree. They argue that the center of the earth might be a nuclear reactor, surrounded by crystallized nickel silicide.

An article in the August 2002 *Discover* magazine

presents Herndon's theory that the innermost core of the earth could be a nuclear reactor. To support this theory, Dan used ORNL's internationally known Standardized Computer Analysis for Licensing Evaluation software to perform all the calculations needed.

SCALE calculated the rate of nuclear fuel burnup for the center of the earth. Dan estimates that the core will have exhausted its fuel in two billion years, meaning that there will be no power source to support Earth's magnetic field, which protects Earth's atmosphere from solar radiation.

Dan also used SCALE to calculate ratios of helium-3 to helium-4. Helium-3 to helium-4 ratios found in the atmosphere, volcanoes and deep wells range from approximately the levels found in the atmosphere to 34 times those levels. The ratios produced by SCALE fall nicely into this range. Helium-3 is a daughter of tritium, a fission product. Decaying uranium produces helium-4. Results of Dan's calculations provide support for the existence of a nuclear reactor core.

"Most geophysicists do not like

Herndon's theory because their research is based on the nickel-iron theory. I would estimate that only one percent of geophysicists are willing to consider the theory while the rest have largely ignored it," says Dan. All of this means that the topic of what is at the core of the earth could become a hot debate.

SNS construction goes local

Nearly \$90 million in Spallation Neutron Source construction work is going to a Knoxville firm, Caddell/Blaine Joint Venture, in the largest award at ORNL since the Manhattan Project. The contracts are for the SNS's central laboratory and office building and the target building. The central lab and office building will be a 254,000-square-foot hub for daily activities at the SNS. Its completion is set for mid-2004. The target building, where the high-energy proton beam will hit the liquid mercury target, will house a suite of state-of-the-art instruments for understanding and analyzing materials.

"We are delighted that contracts of this size will go to local firms and local workers. These contracts bring to \$520 million the total spent in Tennessee on procurements and salaries for the SNS project," Lab Director Bill Madia said at the July 29 announcement in Knoxville. The two new contracts total \$86.4 million. The entire SNS completion continues on track for 2006.

Lab scores in Genomes to Life grants

ORNL was a big winner in DOE's latest round of Genomes to Life grants. The Lab is a participant in three proposals totaling, for ORNL, \$21.7 million. ORNL's projects center on biological research with energy and environmental applications.

"This is the next big step in biology—putting the information from the genome program to work," says Michelle Buchanan, director of ORNL's Chemical Sciences Division. "This is very much something for which the national labs are ideally suited because of their multidisciplinary teams and their exceptional analytical and computational capabilities."

The projects include a partnership with Pacific Northwest National Laboratory that focuses on isolating proteins from a single cell, which is currently a time-consuming process. ORNL is also participating with others in a Sandia National Laboratories-led project to develop advanced computational methods and infrastructure to analyze and simulate protein complexes, their regulation and their collective behavior. In the third DOE project, ORNL will work with Lawrence Berkeley National Laboratory to develop computational models to describe and predict the behavior of gene regulatory networks in microbes in response to environmental conditions found in sites contaminated with metals and radionuclides.

Reported by Bill Cabage and Jodi Lockaby



Jim Richmond

Construction on the east campus privately funded buildings forges ahead, with the steel superstructure appearing in late July. Work on the state-funded building begins this month.

Attending to the old

FEVARI project aims at identifying, addressing Lab's housekeeping, maintenance challenges

When it comes to ORNL facilities, most of the glory is going to the new ones. However, it's not possible to replace every ORNL facility, and with Lab infrastructures dating back nearly 60 years, there are major maintenance challenges. It is important for ORNL to take care of and improve existing facilities, too.

The FEVARI (Facility Environmental Vulnerability Assessment Recommendation Implementation) Project is working hard to fix known and potential environmental trouble spots at facilities managed by UT-Battelle.

"We are addressing high-priority vulnerabilities and preparing strategic plans that will eventually eliminate the remaining problems," says FEVARI Manager Dirk Van Hoesen of ORNL's Environmental Protection and Waste Services Division.

Legacy materials that have accumulated in the attics, basements, hallways and offices of ORNL facilities represent a major environmental and safety concern. This was evident in feedback from the recent group safety reviews and during facility tours that Dirk and colleagues completed during their assessment of the Lab's vulnerabilities.

ORNL has plenty to do to correct years of lax housekeeping. Dirk observes that "stuff tends to pile up." Dirk's been there.

ORNL has plenty of housekeeping to do. Stuff tends to pile up.

"When I moved out of my office in Building 1000 last year, I threw out three recycle bins full of 'memorabilia.' I left with three boxes and a bookshelf full of documents," he says. "With all the moves associated with the new facilities coming

up in the near future, getting these materials under control and establishing procedures to prevent future legacy cleanups is critical."

The August Safety 1st Monday, in fact, focused on the safety implications of legacy material and encouraged everyone to clean up their offices and areas through an ORNL-wide cleanup activity.

Legacy materials range from the mundane—used office equipment—to the most hazardous and challenging remote-handled waste, such as reactor components. "Inventorying and cleaning up legacy material is going to require a large effort," says Dirk. "For example, 20 large moving vans of old furniture and equipment were recently removed from just one of the Y-12 facilities that ORNL is vacating—and that is just the tip of the iceberg. This stuff had to be manually surveyed and green-tagged, which added to the cost of the cleanup."

Dirk estimates that, based on current practices, it could cost as much as \$100 mil-

lion to "clean house" at ORNL. To help reduce costs, efforts are under way to identify and implement breakthrough approaches to dispose of legacy materials that have accumulated in ORNL facilities. These initiatives will implement more cost effective and timely methods of

- transferring ORNL personnel out of old facilities at Y-12,
- cleaning and renovating existing ORNL facilities to achieve a safer and more productive work environment,
- recycling usable materials and equipment, and
- safely disposing of legacy contaminated materials and waste.

Buildings 4500 North and South are perfect candidates for FEVARI efforts. Dirk says these buildings can't be renovated until "we clean out the attics, basements, labs, hallways and offices. There's a lot of 'old stuff' in these buildings that has been there for years and no longer serves a useful purpose. Instead, it presents safety issues, such as old equipment falling from the tops of shelves, contaminated materials that have accumulated in some facilities because there has been no disposal outlet, or the combustible materials that have accumulated in the attics. These are vulnerabilities that affect all of us, and the FEVARI team is working hard to address them."

FEVARI's scope goes beyond housekeeping. A chemical inventory reduction has been successful in recycling useable chemicals and sorting and packaging those that require disposal. ORNL researchers can help this inventory reduction effort by contacting ORNL's Chemical Management Center when they need to acquire chemicals. The CMC safely maintains an inventory of chemicals that are no longer needed by researchers. Rather than purchasing new chemicals, researchers are encouraged to visit the CMC on line so that they can use existing chemicals and help reduce our chemical inventory.

FEVARI is also working to eliminate the disposal of radiological and chemical materials through ORNL's existing process waste drain systems. "We don't put much radioactivity or chemicals into these lines as it is, but considering the fact these waste systems are part of ORNL's older infrastructure, we can do better and eventually eliminate discharges of these materials to these drain systems," says Dirk.

What ORNL does put into the process waste drains, as well as storm drains, is cooling water. ORNL uses over 600 million gallons of once-through cooling water a year. Dirk says

that efforts are under way to identify equipment and facility modifications that would drastically reduce ORNL's "very inefficient" water use, cut costs and reduce the use of the process waste system.

Another FEVARI effort is to better understand and make recommendations concerning near- and long-term issues associated with subsurface contamination at ORNL. In parallel with ORNL's revitalization are environmental



Karen Billingsley


This cluttered ORNL lab is representative of a number of cleanup candidates identified by the FEVARI project.

cleanup efforts that are ongoing or recently completed. Reducing surface, subsurface and groundwater contamination that poses risks to the industrial worker is a primary focus of these cleanup efforts.

"It is critical that ORNL's active and operating facilities do not further contribute to groundwater and subsurface contamination and that we continue integration between ORNL's revitalization efforts and environmental cleanup efforts," says Dirk.

"This is especially important for the management of excavated contaminated soils encountered during ORNL construction or maintenance activities, and the decommissioning of DOE Office of Science facilities that are no longer needed, as was recently suggested in an Inspector General's report."

ORNL is implementing procedural changes that will help deal with these issues. ORNL's excavation permit and soil management procedures are being updated.

The issues go from infrastructure maintenance and renovation to legacy materials and housekeeping to waste management, and often involve complex regulatory issues," says Dirk. However, he points out that "understanding the vulnerabilities, and then planning and implementing solutions that address the vulnerabilities, goes a long way toward averting costly mishaps, running more efficient facilities and making the Lab a better place to work." —B.C., with Karen Billingsley 

ORNL people

Corporate Fellow **Stan David** of the Metals and Ceramics Division was recently awarded the Yoshiaki Arata Award by the International Institute of Welding. The Arata Award is given to a person “who has realized outstanding achievements in fundamental research in welding science and technology and its allied areas,” and whose research contributes greatly to the progress of welding engineering and related fields.

Corporate Fellow **Lynn A. Boatner** has been selected to receive the 10th Frank H. Spedding Award, “given in recognition of excellence and achievement in research centered on the science and technology of the rare earths.” The award was conferred last month at the 23rd Rare Earth Research Conference. Lynn presented a plenary lecture on the highlights of his work.

The Nuclear Science and Technology Division’s **Tim Valentine** has been named the American Nuclear Society’s Congressional Fellow for 2003. The ANS’s Glenn T. Seaborg Congressional Fellowship provides Congress with advice concerning scientific and engineering matters. Tim’s fellowship will be in Washington, D.C., for calendar year 2003.

NSTD’s **David W. DePaoli** was recently selected for the National Academy of Engineering’s Frontiers of Engineering program. The program brings together some of the best young engineering talent in the country for discussions on some of the hottest topics in the field.

The Physics Division’s **David Schultz** has been elected to the executive committee of the American Physical Society’s Division of Atomic, Molecular, and Optical Physics.

The Spallation Neutron Source project and its safety team received a best paper award at the recent Energy Facility Contractors Group conference. EFCOG is a DOE complex-wide operating group that deals primarily with safety and regulation of nuclear facilities. The authors of “Spallation Neutron Source Alternative Approach to Preliminary Documented Safety Analysis Update,” which represents the efforts of numerous SNS project and support staff, are **Bob Lowrie**, Westinghouse Safety Management Solutions, and **Mike Harrington**, SNS safety specialist.

The Community Mediation Center named Human Resources and Diversity Programs’ **David Rupert** its July volunteer of the month. The CMC, which serves the East Tennessee region with offices in Knoxville, Blount and

Jefferson counties, provides mediation services to courts, schools, businesses, community groups and individuals, using volunteers who have been specially selected and trained as mediators.

Rodger Martin, NSTD staff member and director of the Californium User Facility for Neutron Science, was recently named president of the new International Society of Californium-252 Brachytherapy. The society was formed during a June conference in Bologna, Italy, with the purpose of promoting the international medical usage of Cf-252 neutron sources.

Will Minter, director of the Small Business Program Office, has been appointed to the Tennessee Registry of Election Finance. The



ORNL’s three Presidential Early Career Award for Science and Engineering recipients picked up their awards in a July 12 White House ceremony. From left are the Physics Division’s Vince Cianciolo, White House Science Advisor Jack Marburger, the Metals and Ceramics Division’s Ian Anderson and the Environmental Sciences Division’s Jizhong Zhou.

registry is an independent state government agency with responsibility to enforce Tennessee laws regarding campaign finance, lobbyist registration and disclosure and conflict-of-interest disclosure.

Winners of the Oak Ridge Reservation Chapter of the National Management Association’s annual awards included scholarship winner **Mark T. Elmore** of the Computational Sciences and Engineering Division; new manager of the year Budhendra Bhaduri of CSED and administrative professional of the year Kathy F. Rosenbalm of the SNS.

The Operational Safety Services Division’s **Debbie Knox** received the sustained contribution award in this year’s EEO/Diversity Awards. Other winners are the Computer Science and Mathematics Division, outstanding R&D division; Environmental Protection and Waste Services Division, outstanding operations division; the Environmental Sciences Division’s **Steve Hildebrand**, outstanding division director; ESD’s **Lynn Kszos**, outstanding representative; and Biological and Environmental Sciences, outstanding directorate.

Transmission

Continued from page 1

deformation at higher temperatures. With these improvements, the new conductor can handle temperatures up to 210°C with approximately the same sag as ACSR at 100°C. The new composite core conductor can also easily replace traditional conductors to avoid the high cost and environmentally harmful effects of constructing new towers.


“The new conductor’s ability to handle greater temperatures will allow more current to be transmitted,” says John.

ORNL researchers will help 3M test the conductor cables. Beginning in August on Old Bethel Valley Road, the ORNL team will test the small-diameter conductor cable. 3M has also produced a medium- and large-diameter conductor cable to be tested successively. The tests will evaluate the overall performance of the conductors to verify predictions of computer models by looking at sag and tension data, such as stress-strain curve and breaking point, and by testing various conductor accessories that attach the conductor to the towers.

Each test will run from five to six months, putting the conductor through cycles to simulate average usage, including peak loads. The researchers hope to put each conductor through 500 cycles—taking it to peak load and then returning it to normal load—the equivalent of 30 years of peak loads.

The outdoor test site will be a closed loop consisting of approximately 1200 feet of composite core conductor. A direct-current power supply fed by a transformer will provide current for the site. The Tennessee Valley Authority (see *Reporter* No. 37, May 2002) is helping to design the line and install it and other accessories at the test site. ORNL researchers have been relying heavily on local craftspeople and businesses in gathering materials and preparing the outdoor test site.

If the tests show that the new conductor performs well, it could mean that electric utilities will take greater interest in replacing their ACSR lines with new cables. Widespread use of the 3M cables will lead to more efficient energy transmission and the supply of more power without the cost of adding unsightly new infrastructure.

It may also lead to one more solution to the growing energy demand.—*Jodi Lockaby* 

The new conductor’s ability to handle greater temperatures will allow more current to be transmitted—one more solution to growing energy demand.

Single-cell safeguard

Chemical Sciences Division technique uses algae as a water supply alarm system

Hoisting several 55-gallon drums, three terrorists on a boat dump toxic potassium cyanide into a river about 3 meters (10 feet) from the intake for a municipal reservoir that supplies drinking water. Their goal: kill thousands of people in the nearby city by poisoning their drinking water. Within a few minutes an alarm sounds and the water intake is shut down. This plot by a terrorist cell is foiled, thanks partly to one-celled aquatic plants.

ORNL researchers have developed a technique using algae in sunlit waters and a

light sensor to detect poisons deliberately added to sources of drinking water. Such a technique could quickly detect a terrorist attack like the one in the above scenario.

Algae grow naturally and abundantly on the surface of our drinking water sources by using the energy of sunlight and carbon dioxide in the air.

The Chemical Sciences Division's Miguel Rodriguez studies the algae that may safeguard our water supplies.



Through photosynthesis, healthy algae absorb considerable light but “leak” a little bit of it, according to Eli Greenbaum, a researcher in ORNL’s Chemical Sciences Division. Greenbaum and CSD research assistants Miguel Rodriguez and Charlene Sanders found that this light leakage gives healthy algae a fluorescence signature that can be measured by a standard fluorometer and recorded by a computer. They call the technology they’ve developed the Drinking Water Sentinel.

“If algae in drinking water is exposed to a poison such as potassium cyanide, methyl parathion, or the herbicides Diuron or Paraquat, the algae become unhealthy,” says Greenbaum, who came up with the idea to use algae to detect water contamination. “These aquatic plants then leak more or less light than is usual.”

“We found that algae exposed to any of these poisons in drinking water give off a fluorescence signature that can be detected by a fluorometer and that this signature is much different from that of normal, healthy algae. We observed that differences between fluorescence signatures of algae in regular water and those of algae in tainted water could

be determined over time by a fluorometer linked to a laptop computer.”

With funding from the Defense Advanced Research Projects Agency, the researchers have been developing a database of a variety of algae signatures and software to enable the computer to match detected and recorded signatures, to identify any poisonous substances added to the water. This detection system could be designed to warn municipal reservoir managers that the water supply may have been poisoned and suggest that managers consider shutting off the water intake to

protect the city’s population from a possible terrorist threat.

That would be a good idea because the chemicals likely to be dumped deliberately into a stream can damage the kidneys, central nervous system, or respiratory system in low concentrations, and in high concentrations they can kill people. The Drinking Water Sentinel could also be used by U.S. military forces to determine if the enemy had introduced chemical or biological warfare agents into their drinking water sources.—Carolyn Krause [ornl](#)

Technologies bolster home defense options

With homeland security’s emergence as a top priority for the nation, several ORNL technologies have recently been in the news, including the Drinking Water Sentinel, described in the preceding article. Three other Lab technologies have also received recent attention from various media.

Airline passengers can soon feel safer about who, and possibly what, is getting on the plane with them. The **Boarding Pass Analyzer** uses a mass spectrometry-based instrument to analyze a boarding pass as it passes through a scanner. The analyzer is able to detect the slightest trace of explosive powder, even if protective clothing was worn while handling it, by identifying the chemical composition of substances in the air surrounding the boarding pass. Developed by Gary Van Berkel in the Chemical Sciences Division, the boarding pass analyzer performs two stages of testing in order to avoid a false-positive detection. This technology quickly scans every passenger, eliminating the need for random or sporadic searches and without the demand for additional manpower.

Another technology to make the skies safer is being developed and tested in the Metals and Ceramics Division and funded by the National Safe Skies Alliance and the Transportation Security Administration. The **composite shielding** program includes development of a composite material capable of stopping shotgun slugs without damaging the material. The composite material can be used to decrease the vulnerability of an aircraft and its passengers to terrorist bombs or gunshots. The lightweight, flame-resistant composite material has a high-energy-absorption capability, allowing it to withstand the force from a bomb or shotgun slug without failing. Jim Hansen in the M&C Division is leading the development of composite shielding.

SensorNet technology will take advantage of the nation’s network of communications towers to provide real-time detection, identification and assessment of chemical, biological, radiological and nuclear threats to the United States. In a business where seconds count, ORNL’s Chemical Biological Mass Spectrometer system works rapidly—the CBMS system can detect known and unknown airborne chemical agents in less than 45 seconds and compare biological samples with a classified list of biological agents in four minutes. The system then uses American Tower Corporation’s existing nationwide network of wireless communication towers to communicate the detection, identification and assessment of a threat to an operations center. Finally, ORNL’s Hazard Prediction and Assessment Capability (HPAC) software determines data on the number of people exposed, source and atmospheric transport and dispersion information, and predicts immediate and latent effects on the population. In case of an attack, SensorNet could provide information that first responders need to make decisions and take actions that could save lives. Jim Kulesz in the Computational Sciences and Engineering Division is leading SensorNet’s development.—Jodi Lockaby



ORNL’s Gary Van Berkel and Samantha Richards of Mass Spec Analytical Ltd., of the United Kingdom, work on the Boarding Pass Analyzer.

Surveys

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on behalf of our participants and DOE.”

ORNL will receive updated actuarial projections for the plan later this year. “At that time we will be in a better position to make a prudent decision with respect to potential pension enhancements,” Darryl says.

Other issues, because they are complex or cultural, take time. Quality of Work Life Coordinator and Ombuds Steve Stow, who coordinated the surveys, has the job of taking the Lab’s pulse on the tougher issues.

“The cultural issues in particular, such as fear of reprisal, lack of job security, low morale—concerns raised by the survey results—have to be addressed over time through calculated management actions and decisions,” says Steve.

“Others, we might be able to address directly if we understand the root causes of the problem. These include four areas that we will be looking into with the focus groups.”

Steve says those four primary cultural issues arose in last year’s Quality of Work Environment survey: fear of retribution, the need for better communication, a desire for more employee involvement in decisions and a perception by some groups that diversity is not accepted or supported at ORNL as it should be.

Steve’s plan is to convene the focus groups, mostly of volunteers but also composed to represent the staff population, to analyze the root causes of the issues and then come up with some corrective recommendations, which will be publicized to the staff.

Key to the effort, however, is close participation from the Lab director and the Leadership Team. Lab Director Bill Madia says he’s committed to the cause.


“I intend to take a proactive role in this and so will the Leadership Team, because I

New since the surveys

Here are some of the actions that have evolved from last year’s surveys.

- Fitness center—in Building 4500-South, heavily used, very popular since it opened in February.
- Financial planning seminars—an ongoing, well-attended series hosted by Benefits’ Savings Plan Manager Michael Moore.
- Improved physical facilities—ORNL’s modernization program is proceeding at a freight-train pace. Even the mice are going to be happier.
- Travel rule revisions—Travel relinquishes “cop” role, personal use of frequent flier miles is back and trips are again arranged quickly over the phone.
- Take Your Child to Work Day—Forgotten already? More than 350 kids were here on April 26, the most recent TYCTW day.
- Reorganization—October 1’s reorganization included the frequently suggested reduction of a level of management. More importantly, it should smooth the way for increased scientific collaborations.
- Benefits for part-time staff—Part-timers are now eligible for continuous service awards.
- Postdoctoral communication—Plans are being made to enhance communications with postdocs, a desire that group expressed in the surveys.
- Benefits communication—Benefits has brought on a communications specialist who has already contributed to these pages.
- Salary plan decisions—The Leadership Team moved aggressively on bringing salaries up to market.
- Vending machines—Selections and quality were improved after many employees said they found vending services lacking.—*B.C.*

recognize that this is what it takes,” Bill says. “We’ll continue with the informal directors’ table lunch sessions, brown bags, senior staff meetings and routine group meetings. This way I can continue to task our managers from Level One on down with keeping their divisions and groups informed and, more importantly, remaining cognizant of staff concerns and addressing them.”

If you would like to serve on one of the Quality of Work Life focus groups, contact Steve at 576-7802, e-mail stowsh. —*B.C.* 

Service Anniversaries

August 2002

35 years: Russell E. Hand Jr., Networking & Computing Technologies; John D. Harrell, Craft Resources; Jimmie N. Treadwell, Computational Sciences & Engineering; Larry R. Walker, Metals & Ceramics

30 years: David C. Lousteau, SNS Experimental Facilities; Rebecca C. Parks, HR & Diversity Programs Dir.; Sarah G. Shinpock, Life Sciences; John R. Trabalka, Biological and Envir. Sciences Dir.; Sherry B. Wright, Environmental Sciences

25 years: Millie L. Atchley, Metals & Ceramics; C. M. Gallaher and John M. Wheeler, Business & Information Services Dir.; David L. Greene, James E. Hardy, Michael T. Hurst, Wayne W. Manges, Richard Montgomery and John C. Turner, Engineering Science & Technology; Gordon E. Michaels and Kathi H. Vaughan, Energy & Engineering Sciences Dir.; Sammie L. Norris, Logistical Services; Fred J. Peretz and Paul T. Singley, Nuclear Science & Technology; Don Pierce, Physics; B. A. Powers, Operational Safety Services; James E. Ray, Jr., Carlton P. Rose and Dennis L. Tilley, Craft Resources; Fern E. Stooksbury and D. M. Turpin, Networking & Computing Technologies; Linda D. Wallace, Contracts; Mary B. Watt, Engineering

20 years: Russ Miller, Office of Technology Transfer

Team UT-Battelle sponsors Alzheimer’s walk team

Anderson, Roane, Morgan, Scott and Campbell county residents can walk in a fundraiser to help support local families who have been affected by Alzheimer’s disease.

The Memory Walk 2002 is set for September 29 at the Oak Ridge Civic Center Pavilion. Team UT-Battelle is organizing a team for the walk, captained by the Office of Technology Transfer and Economic Development’s Terry Payne.

Alzheimer’s disease is a debilitating illness

devastating to both its victims and the victims’ families. Up to four million Americans may suffer from the disease.

Proceeds from the walk will provide programs and services for 22,000 East Tennessee victims, families and caregivers through the Alzheimer’s Association East Tennessee Chapter.

To volunteer for the walk, contact Terry Payne, 574-0008, paynetl.

Moving? Call OneCall

If you are a retiree and have changed your address, call OneCall, 574-1500 or 1-877-861-2255, and request a change of address form. Once Benefits Delivery receives your signed and completed form, your address will be corrected on Benefits Delivery’s files, and it will also update your address to receive the *ORNL Reporter*.

Deaths

Frank G. Tauxe, 55, of Knoxville, died July 18. He served as a shift commander in the ORNL Fire Department and had 27 years of service. His fire prevention sessions were familiar to many Lab employees. Frank was a Vietnam veteran and was retired from the U.S. Air Force 134th Air Refueling Group.

Why United Way?

After a harrowing year for the nation and world, United Way giving focuses on local communities

- An estimated 2,000 people are homeless in Knoxville on any given night of the year.
- Adults with disabilities often have valuable skills but have a difficult time finding employment and caring for themselves.
- Domestic violence cases rise in the summer months and right after Christmas.
- Taxpayers pay \$26,000 to incarcerate one prisoner for one year in Tennessee.

For most of us, these facts are startling and hard to believe, even though they often apply to situations in our own communities. For the people in these situations, these facts are the daily realities they must face.

The ORNL United Way campaign gives you a chance to make a difference in the life of someone facing these challenges. The 2002 campaign goal for ORNL is \$630,000, a five-percent increase over last year's contributions. Your campaign contribution can be directed to the United Way in your county or to a specific agency of choice in any county.

United Way contributions help those in need in our communities by providing funding for services, support and shelters. United Way supports rehabilitation programs that help individuals make the transition successfully from incarceration to freedom so that they do not fall back into trouble. United Way supports centers that provide shelter for the homeless and industries that provide meaningful work for those with disabilities. United Way also supports programs that provide refuge for individuals beset by domestic violence or other harmful situations.

The United Way has two main missions: to raise money and to distribute that money effectively. Through a volunteer process, volunteers investigate organizations or agencies and then decide how much, if any, money the agencies will receive.

"It's hard to prioritize who should get money and how much," says Ben Landers, president and CEO of the United Way of Greater Knoxville. "How do you decide if education, child care, elderly services or homelessness is most important? Our volunteers do a great job raising and distributing money."

Many ORNL employees live in Knox County, whose United Way celebrates 80 years of service this year. Fifty-two Knox county agencies will receive funding, including three new ones, to meet needs that have previously not been addressed in the community. Because of the efforts of volunteers, 90 percent of every dollar raised for United Way goes directly to programs and services, which is one of the highest percentages for charitable service organizations.

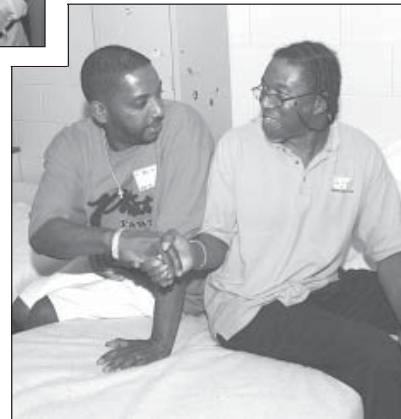
Your contributions to the ORNL 2002 United Way Campaign can help the homeless, the disadvantaged and the distressed. By helping ORNL exceed its \$630,000 goal for this year, you will be giving someone in your community a chance at a better, more productive life.—*Jodi Lockaby* [ornl](#)



Photos by Curtis Boles



ORNL volunteers have visited United Way agencies including the Sunshine Workshop (top and center) and the Salvation Army (below).



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