

'An agenda and a clear vision'

Keeping lines of communication open vital for UT-Battelle, says Bill Madia

If Bill Madia hasn't yet settled into East Tennessee, it isn't for lack of trying: He's building a house, and his office door at the Winter Palace (Building 2001) has rustic Cades Cove scenes affixed to both sides. Shortly before UT-Battelle assumed the M&O reins at ORNL, this highly sought-after interview subject gave a precious chunk of his time to *ORNL Reporter*.

I have some questions but you can take this anywhere you want to go.

I've made an interesting observation of a Lab characteristic: No matter where I go or speak, how big or small, it gets recorded and transcribed and reported and e-mailed. I'm not used to that. I'm a very open and candid person. Should I be more careful?

No. There is a hunger for information. What are the other differences you see when comparing ORNL with other Labs?

I generally try to be positive and stay away from comparing and contrasting. We have an agenda and clear idea on where the Lab needs to go. Communication—healthy, open candid, diverse communication—is extremely important in creative environments. Maybe not as important in a manufacturing plant, but in a national laboratory folks need to feel a sense of ownership—have opinions felt and



Curtis Boles

The cardigan Bill Madia wore to a set of all-hands meetings was one of the first outward signs to Lab employees that things might be different under UT-Battelle.

heard. That is extremely important.

This Lab by far has the greatest hunger for information—our culture requires it—but the appetite for information is overwhelming. I've had two requests to speak just this morning. I try to say yes to all of them.

Is there a general tone at these meetings?

I see no particular trend beyond, "Are you going to do anything weird to us? Will we all have to wear lab coats?" Or it's rumors, like, "Will UT-Battelle stop all Work for Others?" I would have never thought to put that in a presentation! That's why I need to hear what they have to say, without fear of retaliation.

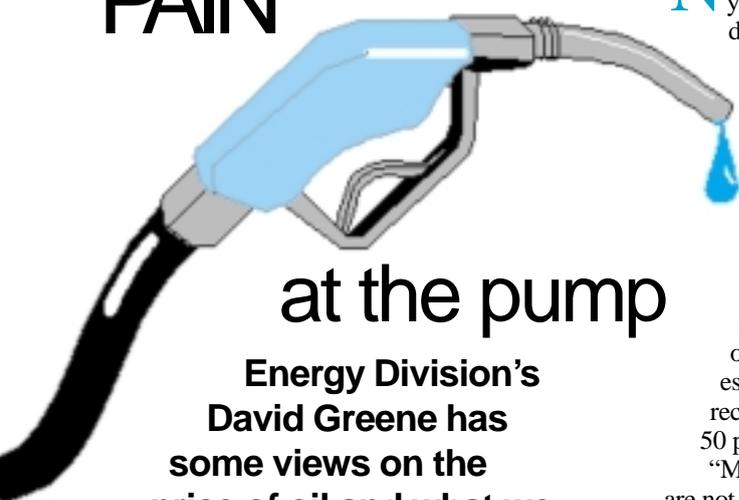
Then the real concerns come out, and that's what you want.

The new facilities initiative surprised a lot of people.

Our most negative surprise was the condition of the physical plant. I worked here as a graduate student in the early '70s on the tandem Van de Graff. I had this image of ORNL—it was newer and more modern. On my subsequent visits, almost yearly, I'd go to Wigner, or HTML, kind of nice places. But then we started coming here every day and going to Building X and Y, and we saw where

(See MADIA, page 4)

PAIN



at the pump

Energy Division's David Greene has some views on the price of oil and what we ought to be doing about it.

Nearly everyone has noticed because nearly everyone drives: Since the beginning of the year prices at the gas pumps have bounded upward after a long period at near-depressed levels.

Corporate Fellow David Greene, a program manager in Energy Division's Center for Transportation Analysis, is the Lab's, and possibly DOE's, foremost expert on fuel economy—a field that is experiencing renewed interest. He has some interesting views on why gas prices are up and what we ought to do about it.

The root of the problem, Greene says, is our still-growing dependence on foreign oil.

"We import half of the oil we use; those are record levels," he says. "It is only partly our imports that give OPEC a large market share. It's everyone else's oil demands, as well, plus OPEC's very large, 75 percent, share of the world's proven oil reserves. OPEC has a large enough share of the oil market to manipulate prices, especially if they have cooperation from non-OPEC oil producers, as they have recently from Mexico and Norway. With Mexico and Norway, OPEC has a greater than 50 percent market share.

"Mexico and Norway usually produce more oil when prices are up, but this time they are not producing more, so there is definitely some collusion," he says.

At the same time, gasoline stocks are at record, alarming lows. Greene says refiners overproduce gasoline in winter, building up stocks to meet higher demand in summer, which

(See PUMP, page 2)

Pump

Continued from page 1

maximizes refinery productivity.

"But this year they haven't made or stored as much gasoline," he says. "It could be because they expected high crude prices to come down and were reluctant to buy more crude when prices were high."

As a result, the Energy Information Agency, which tracks fuel supplies, is predicting that prices will go higher by about 25 cents per gallon, and may reach \$2 per gallon in certain locations. Gasoline prices are highly sensitive to any occurrences in the market, a characteristic referred to as "inelasticity." That's why political turmoil, cartel shenanigans or virtually anything that affects the supply of oil shows up immediately on the service station signs. So why are the oil-producing nations behaving this way?

"Money," says Greene. "Why sell oil for \$10 a barrel when you can get \$20 and even \$30? OPEC has reduced its output of 28 million barrels per day by only 1 million barrels, or about one and one-half percent of the overall world production of 66 million barrels, and we've seen the immediate result through the inelastic supply and demand."

"With the Asian economies coming back, which is increasing demand for oil, cutting back on oil production when demand is rising is a double whammy."

That whammy may be blunted by OPEC's recent decision, with considerable U.S. encouragement, to increase production.

In a 1997 issue of *Harvard International Review*, Greene was one of the few experts

Greene was one of the few experts who stuck to his guns and warned that energy supply was still something to worry about.

who stuck to his guns and warned that energy supply was still something to worry about, even when the market was awash in cheap oil. He believes that the United States can best protect itself from the vagaries of the oil market, and avoid future energy crises, by investing in efficiency and renewable energy technologies. He gives four reasons why.

One, because of our growing dependence on oil, particularly foreign oil.

"We may decide we can afford to pay \$100 to \$200 billion a year more for oil. If we don't mind paying more for oil, then dependence on foreign oil isn't a problem. But every economic recession in recent times has been

preceded by a major increase in oil prices. If a recession is a problem, then dependence on foreign oil is, too."

Two, we should invest in new efficiency and

renewable energy technologies because of the greenhouse gas emissions that arise from burning fossil fuels. More and more skeptics are becoming convinced that the Earth's climate is changing largely as a result of the burning of fossil fuels like petroleum.

Third, because of other pollutants that come

from burning fossil fuels.

Finally, because such new technologies offer sustainability to a world that is rapaciously consuming its supplies of petroleum.

"We are not going to one day just run out of oil. That's not how it is," Greene says. "It is true that at current rates of consumption the world's resources of conventional oil would be used up in 50 years. But much of the oil in wells is left in the ground, and technologies for retrieving more of that oil are improving."

"Natural gas is a promising transportation fuel. You can use shale oil and coal tar to make transportation fuel, but they come with their own environmental problems and are more expensive."

"Before we run out of oil, prices will rise and other energy sources will be substituted. The question is whether we want that transition to be disruptive to our economy and damaging to the environment or clean and economical. If we want the latter, we need to be developing the technology today."

However, Greene, whose office décor includes leftover 50th birthday party favors, says talk of our having a "50-year supply of oil reserves" is pretty shortsighted.

"It took on the order of 200 million years to make the world's fossil fuel resources, and in about 200 years we've used up half of the Earth's conventional oil. Doing nothing and assuming a technology fix will come along seems imprudent. Something will happen. And that's why DOE should be doing this research now."

In the short term, what should be done? Greene thinks that selling off part of the Strategic Petroleum Reserve is a good idea. But isn't that manipulating the market?

"The market is already being manipulated," he replies. "It's simply a case of buying low and selling high. Even though it's not a big reserve, selling some of it could ease prices a bit, and might even help break down discipline in the cartel."

In a competitive oil market, Greene believes the price of oil would be about \$10 to \$12 a barrel. High fuel prices in other countries and locales, he says, are mainly the result of taxes.

"We could take that route and discourage oil consumption through cost, but it's probably not feasible politically," says Greene.

"It's much better to have better technologies—better, cleaner cars. Our supply of oil in the future is going to depend on our technology."—B.C. [ornl](http://ornl.gov)

Comeback for mpg: www.fueleconomy.gov/feg/

Car and truck buyers concerned about either the environment or the price at the pump can turn to the *Fuel Economy Guide*, an ORNL-maintained Web site with information about the environmental and energy consequences of vehicle choices. At www.fueleconomy.gov/feg/, shoppers can check out EPA gas mileage numbers, compare estimates of greenhouse gas emissions and follow links to other car buyer information sites.

DOE is distributing the EPA's estimates of gas mileage for every 2000 model car and light truck, plus recently added data on used cars back to 1985. The site is maintained by Energy Division's Center for Transportation Analysis, led by David Greene.



is published for the employees and retirees of Oak Ridge National Laboratory, which is managed and operated for the U.S. Department of Energy by UT-Battelle.

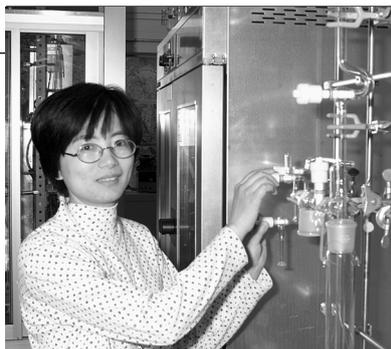
Bill Cabage, editor
Phone 574-4399
E-mail cabagewh@ornl.gov

Deborah Barnes, associate editor
Phone 576-0470
E-mail barneds@ornl.gov

fax: 574-1001

On the Web: www.ornl.gov/reporter

DOE Inspector General Hotline: 1-800-541-1625



Curtis Boles

Reporter reader Huimin Luo performs biotechnology research in the Chemical and Energy Research section of the Chemical Technology Division.

Lab Notes

State of Lab: Excellent, best wishes

"I believe that the state of the Lab is excellent!" said outgoing Lab Director Al Trivelpiece at March 15's State of the Lab/ farewell/birthday celebration. The director's final assessment of the Lab segued into a series of tributes from old friends and colleagues from far and near.

The tribute included reminiscences by former Director Herman Postma, former Deputy Director Murray Rosenthal, former Rep. Marilyn Lloyd, former Office of Science Director Martha Krebs, current Office of Science Director Jim Dekker and Michelle Buchanan, who represented Lab researchers.

Postma, who was pretty funny as the emcee, recalled how he lured Trivelpiece to the directorship in 1988 with false notions of a slow pace of life with plenty of free time for things like research.

After his top Lab director prospect expressed initial reluctance, "I started lying," Postma said.

In his State of the Lab talk, which coincided with his birthday, Trivelpiece recounted a history of significant events for ORNL, such as the HFIR restart, Tiger Teams, the end of the Cold War, the end of the Advanced Neutron Source and the subsequent birth of the Spallation Neutron Source project.

"It has never been dull," he said of his 11 years.

Gasprices? What gasprices?

One ORNL employee isn't feeling much pain over soaring oil prices. Brendan Kirby, who works in the Energy Division, glides to and from work in an electric vehicle.

It's not particularly futuristic, like the car Environmental Sciences Division researcher Jonathan Scurlock described in the December 1999 *Reporter*. In fact, Kirby's ride is a little retro.

"It's a 1980 Ford Courier pickup chassis that was converted into an electric vehicle for the 1982 World's Fair," says Kirby. "The fair gave it to the University of Tennessee, which then sold it to a junkyard in Maynardville."

Kirby tracked it down there and essentially pushed it off the lot, reworked it and now

drives it on the 25-mile commute to work and back. It can go about 60 miles per charge and scoots along pretty well. "I've had it up to 70 on level road," he says.

The truck, which has a new state-of-the-art controller that greatly enhanced its range, is powered by 20 deep-cycle lead acid batteries. He plugs it in nightly.

Heat is provided by a small ceramic heater that "works really well."

Kirby has a background in electric vehicles: He worked on them in college and previously owned an electric Pinto.

On a test spin, the "ElectroVan" demonstrates good pickup and a quiet ride (essentially gear whine without the putt-putt). "I love to drive it," he says.

He should, especially now. The gas gauge needle is permanently resting on "E."



Brendan Kirby checks under the hood.

Values drive aids Ronald's house

ORNL employees came to the aid of families with seriously ill children on March 28. Staff members, through the Lab's Values Committee, donated items to Knoxville's Ronald McDonald House.

Families may stay at the McDonald's Corporation-sponsored facilities at low cost while seriously ill children are treated at nearby hospitals. A second house has been opened in the Knoxville area, adding to local needs.

The network has almost 200 houses nationwide. Although McDonald's provides the facilities with grants, each house relies heavily on community support.

"We collected quite a few items, especially household goods, small appliances and food," said Amy Dindal of the Chemical and Analytical Sciences Division, who added that two vanloads of goods were sent to the area quarters.

Ongoing Values projects include roadside trash pickups, greeting card recycling for St. Jude's Hospital and the Recycle Your Vision program for used eyeglasses.

Flouting Murphy won the Nobel

Bill Phillips shared the Nobel prize for physics in 1997 for his work with cooling and trapping atoms with laser light. He described the method, which is highly useful in the development of better atomic clocks and is one of the focal points of research at the National Institute of Standards and Technologies, where he is a fellow.

The idea behind laser cooling of atoms is that the force of light can slow an atom's motion. Conventional refrigeration doesn't work because the cooled gas simply solidifies, liquifies or condenses onto the side of the container. With laser cooling, the atoms can be cooled to almost absolute zero by capturing them with magnetic fields and exposing them to laser forces.

In fact, laser cooling worked much better than theorized; initially researchers doubted what they were seeing. "It was a clear violation of Murphy's Law," Phillips said.

Laser cooling and trapping's uses will go far beyond atomic clocks, Phillips said. Other uses include biomedical tools, gyroscopes, interferometers and even quantum computing.

His talk included a lot of splashing around of liquid nitrogen, a cool tabletop demonstration of magnetic levitation and extremely

intuitive handwritten overhead transparencies. His talk at ORNL came about through the Superconductivity Pilot Center's Bob Hawsey, whose brother knows Phillips through their contacts at Juniata College in Pennsylvania, which

Phillips attended. The talk, in fact, was broadcast to Juniata, a first for an ORNL distinguished lecture.

Curtis Boles



The liquid nitrogen flowed freely during Nobel laureate Bill Phillips' talk.

Reported by Bill Cabage

Madia

Continued from page 1

a lot of folks spent their time. On many evenings I'll drive around, pull off and talk to people. This is an old plant, and staff has gotten used to it. Some of my earlier comments may have been harsh, but we've got the cafeteria right in the middle of a tank farm. Imagine someone from Motorola or the new Ford research lab, what their impression is.

The quality of the physical plant doesn't communicate the quality of the science.

Would you care to explain how third-party financing would work with the building program?

We can't do this on our own. I've been working with the Department of Energy at all levels. Its multipurpose national labs desperately need infrastructure modernization. And, frankly, you don't get any resistance! Everyone recognizes the magnitude of the problem. But our chances of getting capital funds from the government are low.

Our previous experience allows for third parties, like the state, to construct facilities on the federal reservation. Clearly, there are land-use issues that have to be resolved, but we can either accept the status quo or pursue reasonable policies that allow private construction on the Oak Ridge Reservation. A good example is the Joint Institute for Neutron Studies, funded by \$8 million from the state.

There are clear precedents, such as the state's investment in the Holifield facility. The only viable path we see in revitalizing the physical plant is this four-part strategy: First, build the Spallation Neutron Source, our major facility. Second, the state has committed \$26 million (JINS and three new buildings). Third, third-party financing. And fourth, renovate what we already have, such as the 4500 complex.

Have you encountered things we do here that you wish you'd done elsewhere?

Lots! One example: This is the best Web page system I have seen. I can fire up the internal Web page and do more than any Lab I've been to.

"Am I going to turn ORNL into an applied laboratory to the detriment of basic science? I'd never think about it. There is a very healthy balance in the ORNL portfolio."

This Lab has a very healthy culture of science moving to technology to commercial applications. I think it's an artifact of being managed for 50 years by for-profit companies. Folks are always looking for where the science and technology will lead. It's deeply ingrained in Oak Ridge culture.

I get the question all the time: Am I going

to turn ORNL into an applied laboratory to the detriment of basic science? I'd never think about it. There is a very healthy balance in the ORNL portfolio. Even the theoretical groups are bent toward applications. They are always looking to what comes next.

One of the ways UT-Battelle says it can realize its 20 percent overhead reduction goal is by getting out of expensive and unneeded space at Y-12. However, Engineering Technology Division's move out of Y-12 to downtown has been delayed in hopes that facilities on-site could be ready fairly soon, saving the cost of moving twice. That seems pretty optimistic.

It is. Here's why we did it. The ETD move we hope to make will be the nucleating point for third-party financing. It's an obvious need: They had a good, justified plan and a well-defined need. Their Energy Efficiency and Renewable Energy customer and others in DOE have been supportive of third-party financing concepts. Because all the moons are lined up so well, we've asked ETD to hold up on their move until we can see the results of our third-party financing approach. Would I have liked six more months? Sure. But that's the hand we're dealt.

Another surprise was the desire to get out of Building 3019 and the uranium-233 business. I'm now learning that the U-233 storage facility increases the cost of doing business with ORNL. Would you care to elaborate on that?

We're the repository for the nation's primary stockpile of uranium-233. That is a substantial and complex financial, operational and risk liability for ORNL. We have about 500 kg of U-233, and that's some pretty hazardous stuff. We have to resolve if that's truly an asset for the department and the Laboratory. If it's not, we should get it off of our books. Is it an asset for us? That's the question we're asking.

The presence of the U-233 makes the Lab a Category I nuclear facility and brings in the

Defense Nuclear Facility Safety Board. That's not bad per se if it's a going-forward asset. But it's an open question: What is the value to the Laboratory in view of the risk? We've seen the negatives, and we're looking at positives that counterbalance them. And, frankly, there are some.

I understand the decision to hold up on HR reengineering was the lack of promotion opportunities in the concept.

It was basically promotion-less. The reengineering proposal literally did not have



Bill Madia and others on the UT-Battelle leadership team have appeared before numerous Lab groups. Drawing a crowd has not been a problem.

promotions in the system. You would never be promoted again. That aspect was very troubling to me. Promotions are part of our culture, fundamentally ingrained as a way to recognize and reward. It's central to how we manage.

The idea of putting promotions back in is not without controversy on its own. When you dig into why promotions were a problem, two major themes arise: complaints about paperwork and bureaucracy. Somebody's making them too hard to do. There was also a feeling of lack of control. "The system won't let me do the right thing." But the system should support, not impede.

How do you and the other UT-Battelle folks who have moved here like East Tennessee?

Some interesting observations about East Tennessee: Folks are extremely friendly. They go out of their way to be nice to you. We've kind of come in as foreigners, and you wonder how you'll be received by both the Lab and community. It couldn't be better. I feel comfortable walking into any group because the reception and support have been so positive. The community has been that way—very, very nice to us.

Any closing thoughts?

The scientific depth of ORNL is impres-

sive. The Lab is big and strong scientifically and it shows. When you meet with a particular division, a lot of good, really strong folks show up.

There are still some “we vs they” distinctions between research and support groups that we should work on. At the end of the day it takes all groups to be successful. If you’re a chemist working in the Lab and the facilities people, the contracts people, the finance or the HR people don’t do their jobs, we all fail. We’re all interdependent: If one falls down, the Lab falls down. Simultaneous excellence is the core belief.

These are hard jobs. No matter where you have a job in the Laboratory, it’s a tough job in a tough business. We’ve got to learn to have some fun while doing it—not careless fun, but you want to drive in to work and look forward to it being enjoyable. We had a good time in the proposal process and we’ve had a good time in the transition.

We try to bring in a positive attitude, and it can be infectious. ORNL can be a hard place to work, but it can also be a fun place.—*B.C.*

Blood donors now on the level, drive starts April 13

Donating blood at ORNL is no longer a literal uphill struggle. The Lab’s spring blood drive is scheduled for April 13, 14, 17, and 18, and they have a new location—at Building 1503 on the west end.

Donors previously had to ascend the hill up to Building 2001, which may have had the effect of discouraging some. The new site is on much more level terrain, and outside the gate.

“Thanks go to the Values Committee and our Environmental Sciences Division representative for helping us find the new location,” says blood drive volunteer coordinator Missy Pointer.

The new four-day schedule, starting at 7 a.m., is designed to make it easier for shift personnel to donate, she says. Medic mobile stops are also planned for 701 Scarboro, the Robotics and Process Systems Division and the High Flux Isotope Reactor.

It’s important to donate blood, if you can, because maintaining a certain level guarantees full coverage for ORNL employees and their families.

Retirees who want to help the drive may call Ernie Wilson, 922-0246.

Advanced Propulsion Center is ORNL’s latest DOE user facility

ORNL’s latest addition to its list of user facilities is the Advanced Propulsion Technology Center. The center is one of 17 user facilities available to researchers inside and outside ORNL that encourage collaborative efforts among ORNL, private industry and institutions.

The center, located at Y-12 with most of the hosting Engineering Technology Division’s facilities, specializes in the detailed characterization of internal combustion engine emissions and efficiency. Directed by ETD’s Ron Graves, the center does work for the DOE Office of Transportation Technologies in the Office of Energy Efficiency and Renewable Energy, other federal agencies and outside institutions upon DOE approval.

The facility’s comprehensive capabilities include tabletop engine exhaust simulators,

single and multicylinder engines and full vehicles. The center boasts several special diagnostic and measurement tools—including many rarely found at other facilities around the country—that aid in development and evaluation of engine and emission control technologies.

Current R&D projects at the center include determining the effects of fuel sulfur on diesel emissions controls, ignition phenomena, diesel and gasoline engine particle emissions, advanced engine control strategies, and catalyst surface diagnostics.

ORNL’s Office of Science and Technology Partnerships coordinates these efforts. Six cooperative R&D agreements (CRADAs) currently exist between the newly designated DOE national user center and outside institutions.—*Fred Strohl*

NTRC facility will test truck brakes

A first-of-its-kind facility for testing commercial truck brakes could help put a screeching halt to hundreds of accidents caused by mechanical failures.

The facility will be housed in the National Transportation Research Center, a collaborative effort by DOE, ORNL, the University of Tennessee and the Development Corporation of Knox County. It is expected to open this summer.

“Faulty brakes contribute to about one third of truck-caused crashes,” says Energy Division’s Scott Stevens, who heads the project. “The problem is that current methods of inspecting brakes are labor- and time-intensive and subject to considerable error.”

Compounding the problem, as electronic brake systems are developed, new test

equipment will be required to accurately measure and evaluate their performance. The proposed brake testing facility will be capable of characterizing the brake performance of an entire vehicle quickly and accurately.

The new device, being developed jointly with Jeff Hodgson of UT, will also simultaneously and accurately weigh every axle of the vehicle. It works by measuring the forces exerted on a supporting structure by the tires of a vehicle. The device consists of a group of plates with attached sensing devices that can support the entire vehicle.

Like the system Stevens and collaborators developed to prevent truck rollovers, the thrust of this project is to make highways safer.—*Ron Walli*

Service Anniversaries

April 2000

40+ years: Ray L. Johnson Jr., Spallation Neutron Source Project

40 years: John P. Moore, Metals and Ceramics

35 years: William H. Miller Jr., Metals and Ceramics

30 years: Carla A. Giles, Computer Science and Mathematics; B. Mike McNeely, Business Management

25 years: Linda W. Armstrong, Environmental Sciences; Glenn C. Barber, Fusion Energy; D. Jean Carr and Robert G. Martin, Human Resources; Dorothy W. Coffey, Metals and Ceramics; Nancy S. Dailey, Office of Environmental Protection; Charles W. Forsberg and John R. Parrott, Jr., Chemical

Technology; Thelma F. Garrett, Procurement; Sara H. Harmon, Chemical and Analytical Sciences; Thomas D. Latham, Instrumentation and Controls—Technical Support Section; Carolyn C. Overbey, Finance and Accounting; Charles C. Roberts, Ronald M. Sizemore, Randall C. Vaught and Joseph G. Whedbee, Plant and Equipment; John B. Wilgen, Instrumentation and Controls

20 years: Janet L. Dippo, Computing, Robotics and Education; Russell D. Johnson, Office of Laboratory Protection; Ruth D. Lawson, Spallation Neutron Source Project; Bryant L. Morgan, Engineering; Jennifer L. Seiber, Environmental Sciences; Teresa R. Subich, Instrumentation and Controls

Cosmic bottleneck

Holifield's fluorine-17 beam helps experimenters understand stellar processes

It's in the stars, and Physics Division researchers are using the Holifield Radioactive Ion Beam Facility to understand exactly what is happening in those stars. Beams generated at the unique facility are recreating the processes that happen only under violent stellar conditions—and they are helping researchers understand them.

Principal investigator Jeff Blackmon, Group Leader Michael Smith, postdoctoral researcher Dan Bardayan and university collaborators just completed an experiment that uses a beam of fluorine-17, which has a nucleus that lives for only one minute. Many thought it was too difficult to create in sufficient quantities for experiments.

Holifield's fluorine-17 beam, says Smith, is "fantastic, a very high-quality beam that is equal in quality to widely available beams of stable nuclei. It allows us to do precision measurements with a unique, very exotic radioactive nucleus."

Blackmon describes the experiment as an attempt to understand how elements are created in X-ray bursts and nova explosions, which are more frequent events than the headline-grabbing supernovae. "Nova explosions occur in our galaxy every year, but we would be fortunate to see even one supernova occur in our galaxy in our lifetime," says Blackmon.

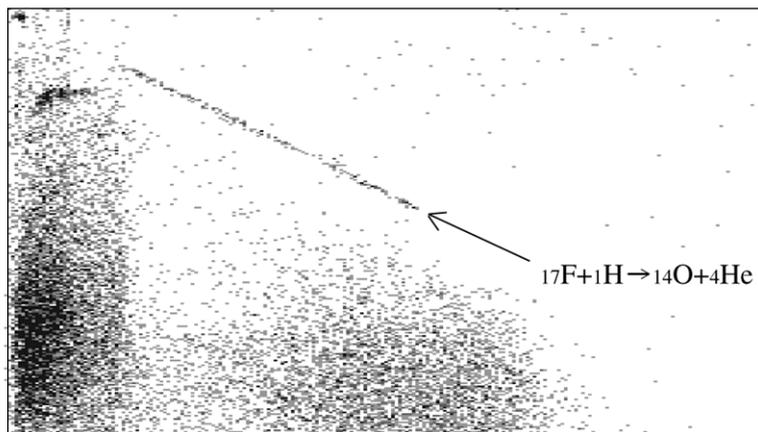
"Novae and X-ray bursts occur in binary star systems when gas is transferred from one star to another and reacts violently. The explosions occur on the surface of the star and can recur, as opposed to a supernova, in which a massive star is obliterated from the inside. The star that explodes in an X-ray burst is a neutron star, and in a nova it's a white dwarf."

Reactions between hydrogen and other light elements, such as carbon, start the explosion. Gradually nuclear reactions produce heavier and heavier elements. "It's this synthesis of the elements, and the prodigious generation of energy, that we'd like to understand," Blackmon says. "The reaction of carbon and hydrogen creates oxygen-14, a radioactive oxygen nucleus with low neutron content. Oxygen-14 is special because it can't react with the abundant hydrogen. This suppresses

the explosion for a time. For the explosion to continue, the oxygen-14 must react with helium, which is very hard to do. This is called a bottleneck at O-14. Understanding how oxygen-14 reacts with helium is very important to understanding these explosions and the elements they produce."

Fluorine-17 and hydrogen are the two products of the reaction of oxygen-14 with helium. The chances of such a reaction occurring hinge upon the relative velocities of the particles.

"There are certain 'magic' velocities where,



The reaction products oxygen-14 and helium-4 have a unique energy relationship that allows them to be easily distinguished from other reaction products. Particles from nuclear reactions are detected in a large array of silicon semiconductor detectors; the energy, trajectory and time of arrival of each particle are then measured. When two particles arrive within 100 nanoseconds of each other, the energy of one particle is plotted versus the energy of the other particle, and in the case of O-14 and He-4, you get a distinctive streak.

if particles collide, nuclear reactions occur much more frequently," Blackmon says. "Certain energies make things happen. We try to find and study these magic velocities, called resonances."

Blackmon and collaborators, along with the HRIBF operations staff, have essentially reverse-engineered the stellar process—creating the fluorine-17 beam and smashing it into a hydrogen target, a polyethylene film similar to food wrap. Those collisions create oxygen-14 and helium, which they detect in a complex array of silicon semiconductor detectors.

"Less than one in a trillion atoms will undergo this reaction," Blackmon says. "Our beam has up to two million atoms per second, which is fantastic, and it is a very high-quality beam. We can vary the velocities of the beam

and look for the magic velocities that lead to significantly enhanced probabilities for reactions."

What Blackmon has seen is that reactions at lower energies, while less common than those at higher energies, could be more prevalent than previously believed. And that's important because those lower energies play a more important role in X-ray bursts and novae—they are more representative of the energies of particles on the surfaces of neutron stars or white dwarfs.

"This intense fluorine-17 beam allows us to look at the lower energies," he says.

Michael Smith says this experiment helps scientists place their models of stellar explosions on a firm empirical foundation. The facility's success with the fluorine-17 beam is that much sweeter because most doubted it was feasible.

"In the last year the staff has increased the beam's intensity by a factor of 100," Smith says. "The high intensity at low energies allowed us to pull this experiment off."

"Hits," or reactions, at low energies occurred only a few times a day during the 24-hour-a-day run of the experiment, which began in January and closed on February 11.

Smith says the reliability of the beam and the success of the experiment is a triumph in

particular for the Holifield Facility's radioactive beam development and operations staff.

"This was a difficult experiment operationally because we had to change the beam's energy frequently," he says. "It was hard work for the operations staff, who were also instrumental in the years of preparation of the facility."

Blackmon is now analyzing the data to make a final determination of the yield of this reaction as a function of energy, and Smith will put the rate into a computer model of the exploding stars to determine the astrophysical impact of their measurements.

"The beam has run almost continuously since December. It's logged well over 900 hours of fluorine-17 beam in that time. This has been a great payoff for the years of development work."—B.C. [ORNL](#)

The reliability of the Holifield Facility's beam, which many thought was too difficult to create, and the success of the experiment is a triumph in particular for the facility's development and operations staff.

UT-Battelle's HR director describes transition for retirees

ORNL Reporter asked new Human Resources Director Darryl Boykins some questions about retirees' benefits.

UT-Battelle assumed the management and operation of ORNL on April 1, 2000. Will my benefits change?

This change in contractor will not result in any change in your benefits except as outlined in a letter that has been mailed to all active employees, retirees and spouses, and those on long-term disability. The transition from LMER to UT-Battelle will not require you to re-enroll in any benefit plans. Your coverage will continue without interruption.

What will change?

Those who have Prescription Drug coverage with Merck-Medco under CIGNA medical insurance will receive a new drug card. This is the card that is used for retail purchases at participating pharmacies and is used for mail order purchases. Your current card, which bears the Lockheed Martin logo, should be used through the month of April.

On May 1, you should begin to use your UT-Battelle card.

New cards will be mailed to you at your address of record on the official retirement database. Please assure that you have reported any recent changes in address to LMER so your card can be delivered in a timely manner. If you have any questions about your address currently on record or about how to change your address, please call the OneCall Service Center—in Oak Ridge at 574-1500 or 1-877-861-2255

What else will change?

There have been several changes to the Savings Program that affect retirees' accounts. Two new equity funds have been added to the Saving Program. You can now choose a small cap growth and/or an international growth mutual fund option, if they suit your personal risk tolerance and asset allocation model. The small cap growth option is the Special Equity Fund managed by the Managers Funds LLC. The international growth option is the Euro-Pacific

Growth Fund managed by the American Funds. Both options would be considered "more aggressive" in the Savings Program's array of investment vehicles. You'll find a summary of each of the current investment funds in the "Savings" section of your *Retiree Handbook*.

Call State Street Bank & Trust (1-888-472-8348) for a prospectus.

The Lockheed Martin Corporation Stock Fund will be frozen. Participants will no longer be able to purchase additional shares of LMC stock. Participants who have a portion of their savings in the company stock fund may transfer their balance in this fund to another investment option within the plan. Balances do not have to be transferred all at one time. However, the final date to complete the transfer will be March 31, 2003, unless that date is extended.

The two bond funds, Intermediate-Term Investment Grade Bond Fund and Long-Term Investment Grade Bond Fund, will be converted to mutual funds in coming months. The new bond mutual funds will be very similar in investment objective to the current choices.

ORICL rolls out summer term; enroll by May 8

Looking for something interesting and fun to do this summer? The Oak Ridge Institute for Continued Learning is offering more mind- and horizon-expanding courses and field trips.

The coming summer term, which starts June 12 and ends August 4, will include 25 to 30 courses and seven or eight field trips. Among the course offerings will be a series of lectures on the medical effects of nuclear radiation; the continuation of two religion courses, one on Islam and one on the Literature of Faith and Doubt; lectures on African American women writers; a course on Anderson County social services; recollections of Oak Ridge before and during the Manhattan Project; a course on cultural anthropology; and one on forestry.

Included in the field trips will be a trip to the Scottish Games in Gatlinburg and one to the Arrowmont Art School, also in Gatlinburg; the Lincoln Museum at Lincoln Memorial University; the Scopes Trial play in Dayton; and the Thil Glass Show at the Knoxville Museum of Art.

Volunteer-run ORICL, affiliated with Roane State Community College in Oak Ridge and the Elderhostel Institute Network, provides interesting and stimulating lectures, discussion groups, and field trips for mature individuals of all ages—something for everyone. The low-cost yearly membership is open to residents in Oak Ridge and the surrounding area of all backgrounds and educational levels. Members may take up to five courses per term. The no-exam courses are given at the new Roane State Community College building in Oak Ridge. Teachers are

local experts and professors from the University of Tennessee and local colleges. Classes vary in length to accommodate the traveling seniors.

The catalog will be mailed to current members on April 8. Nonmembers should call the ORICL office at 481-8222 to be placed on the mailing list. Or check it out on the Web at <http://KORRnet.org/oricl>. The registration deadline is May 8, 2000. [ornl](#)

Retirements

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

David E. Reichle, associate director for Life Sciences and Environmental Technologies, retired March 31 after 34 years of service at ORNL, plus two more as a postdoc. He and Donna reside in Kingston.



Reichle

Harry G. Lovelace has retired after 25 years of service at ORNL. He was a shift commander for the ORNL Fire Department. He lives in Lenoir City.



Lovelace

Should I continue to call the OneCall Service Center?

Yes, we will continue to utilize the Benefits Delivery services of Lockheed Martin Energy Systems. As you have done in the past, you should first call your insurance company for questions about medical or dental benefits or claims. Those toll-free numbers are listed on your medical and drug cards and on the correspondence you receive from these companies. If you need additional assistance, dial the OneCall Service Center—574-1500 or 1-877-861-2255. If your needs cannot be satisfied over the phone or through the mail, the center will schedule an appointment for you to visit the office. [ornl](#)

Educational Assistance Offices are now separate

ORNL's Educational Assistance Office is now separate from the Energy Systems EA office. The separation, however, won't affect the normal processes of the system its users have been accustomed to, says Lab Educational Assistance Coordinator Tony Reynolds.

Lab employees can access the new Educational Assistance System internal Website at www-internal2.ornl.gov/eduasst/prod/EAS_gen_home.cfm. The url for approvers is www-internal2.ornl.gov/eduasst/prod/EAS_appr_home.cfm.

The Web pages will have further details on the EAS programs. Call Reynolds, 576-5059 or utr@ornl.gov, if you have questions.

Increasingly electronic library expands research services

BY BOB CONRAD

With the hallway of Building 4500-North running through the heart of it, staff, guests and visitors can't help but be aware of Central Research Library as they enter the Laboratory. What many may not realize is the extent to which the ORNL Library now extends into every office at ORNL. Researchers no longer have to go to the Library to access most of the information and services essential to their research.

"When ORNL Research Libraries became part of ORNL in 1996, ORNL made it clear to us that they wanted the library at the desktop," says library director Randy Hoffman. With this mandate, the library has aggressively pursued the vision of an electronic library. As a result, researchers are relying on the library more than ever to find and retrieve the information they need electronically.

The library has been investing in electronic information since the mid-1990s, embracing the Web and using it to push information and services to the researcher's desktop. Although many vendors were slow to embrace the Internet, the library has worked with them to make the journals and databases that researchers need available on the Web.

Some researchers were initially hesitant about electronic access, preferring the hard copy. Not Corporate Fellow Eli Greenbaum.

"I love it. I love every aspect of electronic information," says Greenbaum. "It has taken a lot of the tedium out of finding information."

Corporate Fellows Council Chair Tom Wilbanks identifies library activities as one of two overhead activities that should be spared cost-cutting (the other is LDRD and seed money).

ORNL researchers now conduct more than 9,000 searches a month in Science Citation Index, the most popular of the many science and technology databases accessible from the library home page.

Even more popular than electronic databases has been the addition of significant numbers of electronic journals. The library went from 193 electronic journal titles in 1998 to more than 950 electronic journals today. Through participation in a DOE library consortium, the library was able to add 360 new Elsevier electronic journals, the first significant addition to the journal collection in many years. Library statistics indicate researchers have been browsing 6,000 articles and downloading 2,000 articles a month from Elsevier alone.

Researchers have enthusiastically embraced the electronic library. Greenbaum says, "The Internet has made the library itself so much easier to use." Now rather than type cards, he can request library materials, order books or place document delivery requests for journal articles from the library's home page. ORNL staff can also post questions electronically to reference librarians or request literature searches without leaving

their offices. To help researchers navigate the maze of the Web, Library staff have developed subject-oriented gateways to Web information; the gateway pages provide access to reference materials, news resources and many other links.

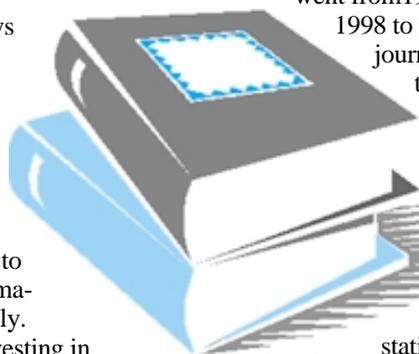
The librarian's role also has changed dramatically in the past few years. "Rather than being a physical location where print documents are stored for browsing by the staff, the library has evolved into a group of skilled people who help the staff access a far larger body of literature and other information," says Wilbanks. "Library staff have become advisors, mentors and facilitators for the research staff as researchers learn to operate from their desktops in the new information environment."

Many researchers are not eager to see the physical library disappear. It's not likely to happen any time soon. Until publishers work out access to archival collections, the ORNL library, like most other libraries, continues to receive paper copies of most subscriptions. The library also has extensive book and report collections at Central Research Library and in the four satellite libraries.

As part of National Library Week, April 9-15, the ORNL Research Libraries are implementing a new home page. The library staff has worked with ORNL researchers to design a page that will make it easier to take advantage of library resources and services.

The page's slogan, "Creativity, Innovation and Discovery," reflects the library staff's pride in their support for research activities at ORNL. [www.ornl](http://www.ornl.gov)

Bob Conrad works in the Central Research Library. The library's internal Website is at www-internal.ornl.gov/Library/library-home.html



ornl reporter

P.O. Box 2008
Oak Ridge, TN 37831-6146

Bulk Rate
U.S. Postage
PAID
Permit #37
Powell, TN

Number 14, April 2000

[Bill Madia interview](#), page 1

[Gas prices](#), page 1

[Lab Notes: Electric pickup, Nobel laureate's talk, new blood drive locale, employees give](#), page 3

[Cosmic bottleneck](#), page 6

[Q&A for retirees](#), page 7

Inside