

SCIENCE

The reservation becomes an ecological observatory

The Oak Ridge Reservation is now officially one of 20 planned core ecological observatory sites that will provide valuable information to help scientists better understand how the ecosystem breathes.

An agreement between the Department of Energy and National Science Foundation sets into motion the Walker Branch Watershed portion of the \$434 million project known as the National Ecological Observatory Network, or NEON.

“The Oak Ridge Reservation is a giant outdoor scientific laboratory,” the agreement states. “It contains large blocks of forest and diverse vegetation communities that offer unparalleled resources for ecosystem-level and large-scale research.

Pat Mulholland, a senior scientist in ORNL’s Environmental Sciences Division, noted the significance of the inclusion of the Oak Ridge Reservation in this project. “Being selected as a core site to represent the Southern Appala-

chians and Cumberland Plateau domain is a reflection of the unique environmental and infrastructure qualities and the long history of excellent research conducted at Walker Branch Watershed,” Mulhol-



land said. Walker Branch comprises a 240-acre forest drained by two headwater streams within the Oak Ridge Reservation.

As part of the 30-plus-year effort, each NEON core site will be equipped with instruments to collect biological, biophysical, biogeochemical and land use and land management data. Fixed towers will support an array of sensors that will transmit data across the network, making NEON a

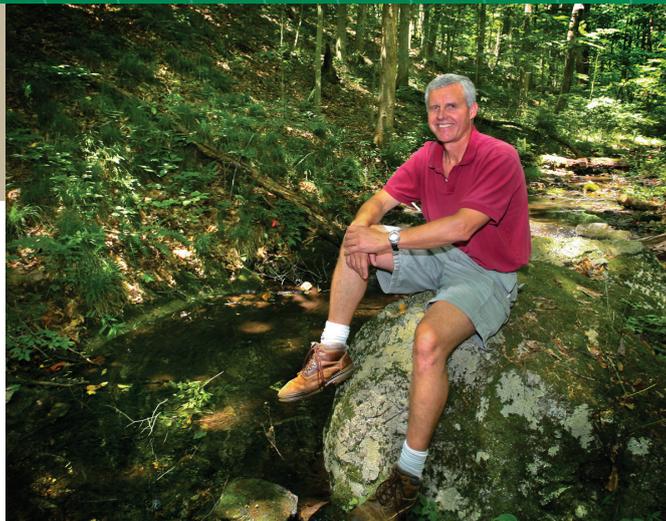
true national network rather than merely a collection of regional observatories. Construction at ORNL is tentatively scheduled to begin late next year.

Researchers are looking forward to the new views of ecology that will be created by continental-scale NEON data. Just as meteorologists today can predict the path of a tornado or hurricane, ecologists using NEON data in the future may be able to more accurately forecast biological phenomena such as



changes in forest productivity and chemical cycles in response to climate change — or the emergence of an invasive species.

“Being part of the NEON network will attract leading national and international ecologists to Oak Ridge to conduct research,” Mulholland said. “NEON infrastructure will also provide unique educational and research opportunities for students at all levels through Web site access to NEON results and on-site studies.” —Ron Walli 



Patrick Mulholland at the Walker Branch Watershed

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ORNL Wins 8 R&D 100 Awards

See “Thom’s Thoughts,” p. 7

Gas-cooled reactors may be key to future nuclear power, says Syd Ball



ORNL Director Thom Mason (left) recognizes Sydney Ball (Nuclear Science and Technology Division) for 50 years of service at employee service award presentation in 2008.

“You could reduce fuel use and spent-fuel waste by 33 percent and waste heat by 50 percent.”

Working in nuclear technology at ORNL since 1957, Syd Ball does not mince words when he stresses his belief that moving to the next generation of nuclear power plants would best be achieved through the implementation of modular high-temperature gas cooled-reactors (HTGRs).

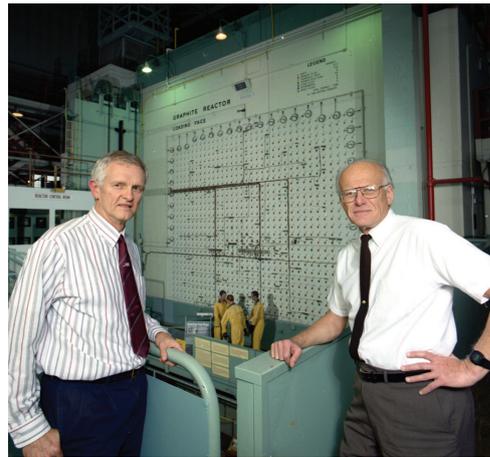
“The United States needs to get off its tail and build these things,” Syd said recently, noting that gas-cooled reactors would result in improved efficiency for electrical production over the conventional water-cooled reactors.

“With helium-cooled reactors, you could run gas turbine generators at higher temperatures with efficiencies approaching 50%,” said Syd, who currently leads a team in ORNL’s Nuclear Science and Technology Division that has been studying the gas-cooled-reactor concept. “Comparing gas-cooled reactors to water-cooled reactors, you could reduce fuel use and spent-fuel waste by 33 percent and waste heat by 50 percent. One of the big problems now with siting power plants is the shortage of cooling water, so a 50% reduction would be a big deal.

“Using auto mileage ratings as a fuel-use comparison, using gas-cooled reactors would be like getting 30 miles per gallon instead of just 20 miles per gallon.”

Syd added that gas-cooled reactors would be an obvious “green” choice replacement for the fossil energy now used for high-temperature process heat applications.

“Modular HTGR designs run between 250 and 600 megawatts (thermal), putting them in the category of the ‘small and medium’ reactors that are becoming more popular today,” said Syd in a presentation of this concept at the June meeting of Friends of ORNL.



Sydney J. Ball and Robert Paul Wichner standing in front of the loading face at the Graphite Reactor.

Idaho National Laboratory will lead the U.S. program to design the next generation nuclear plant, which will be a modular HTGR. Syd noted that the Obama Administration is supportive of the gas-cooled-reactor concept.

“President Obama and Russian President (Dmitri) Medvedev recently agreed to

collaborate on advanced reactor development and deployment,” Syd said. “I have met with my counterparts from Russia to move toward building some of these pilot plants.”

One of Syd’s challenges has been to provide more information to the Nuclear Regulatory Commission to help get it up to speed on gas-cooled reactor concepts. “The NRC is water-cooled-reactor oriented,” Syd said. “My hope is that we can get the NRC mind set more in tune with gas-cooled reactors.”—Fred Strobl

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Important benefits information coming in August



ORNL will assume the administration of its benefits services starting in September. In August you will begin receiving information explaining your new benefit services. Please open and read each mailing carefully to learn more about this change and how it affects you.

Fish can still flourish despite fly ash

Fish exposed to fly ash at the site of the Tennessee Valley Authority coal ash spill are faring better than some expected.

Oak Ridge National Laboratory in collaboration with TVA has found that while small amounts of some contaminants from the December 2008 fly ash spill have been taken up by fish in the Clinch and Emory rivers, to date, the fish collected downstream from the spill appear healthy relative to fish from unimpacted sites.

"We are looking to see if there has been an effect on overall fish health and reproductive condition, and so far, effects have not been evident," said Mark Peterson, leader of the ORNL Environmental Sciences Division's Ecological Assessment Team and the Aquatic Ecology Laboratory.

After the spill deposited 5.4 million cubic yards of coal ash into the Emory River and an embayment adjacent to the Kingston Fossil Plant, the public was concerned that the ash and associated chemicals could be a health hazard to local residents and to fish and wildlife, as well.

Likewise, Peterson and a team of ecologists in ESD, including Marshall Adams, Mark Greeley and John Smith, were interested in seeing whether trace components of the ash—such as selenium, which has been found to be toxic to fish and wildlife in large amounts—would be found in insect and fish populations following the spill.

A team led by Adams was able to get into the field quickly and collected fish as early as February 2009 at sites both downstream and upstream from the spill. Species tested for contaminant uptake and fish health include bluegill, largemouth bass, channel catfish, white crappie and gizzard shad.

It is the experience gained from assessing the legacy of contaminant deposits in the Clinch River and Watts Bar Reservoir from Department of Energy activities decades ago that provides the ORNL team with the expertise to evaluate the ecological conditions in these waters, researchers noted.

"We've been sampling fish from Watts Bar Reservoir since the 1980s to evaluate the impact of Department of Energy facilities, so we have some historical record of regional conditions prior to the spill," Peterson said. However, while there are some historical records with which to compare water quality and fish tissue concentrations pre- and post-spill, determining potential risk to the health of fish populations is more complicated. "Fish populations can be impacted by a range of factors at this site that are unrelated to the spill, including food and habitat availability, variations in water quality and the presence of historical contaminants such as mercury and PCBs," Peterson said.

Also, some fly ash-related contaminants may not cause effects that can be easily measured immediately after the spill. Contaminants like selenium are accumulated via the food chain, and it can take time for contaminant exposure to result in measurable impacts to fish populations.

The ongoing second year of fish sampling will be especially important in assessing the longer-term environmental impacts of the spill, researchers said. TVA, which is engaged with ORNL and multiple university and government organizations in monitoring and assessing the effects of the fly ash spill on the environment, is providing the funds to ORNL to continue research this year, including a study of fish embryos and larvae exposed to fly ash in ORNL laboratory tanks, to better determine long-term impacts.

—Katie Freeman 



Bluegill

Largemouth Bass



Channel Catfish



Crappie



Club ORNL events

Get the details and latest news online via <https://info.ornl.gov/sites/clubornl>. Request an XCAMS account, which will allow you to participate in these events or contact Lara James at 576-3753 or jamesla@ornl.gov.

- August 14-15** Fall Creek Falls Overnight
- August 30** Chef's Wine and Dinner
- September 4** Football: UT vs. UT-Martin
- September 9** Amadeus - KSO/ Clarence Brown Theater
- September 11** Chattanooga Day Trip
- September 18** Wahoo Ziplines
- September 25** Football: UT vs. UAB

A Day of Fierce Fundraising Festivities (Knoxville's Dragon Boat Festival)



“I enjoy the camaraderie and the competition, but I love the fact that money raised goes to support such a worthy cause.”

Of the three UT-Battelle/ORNL Dragon Boat teams, not one could boast a first place title. But there were no real losers on the hot, sunny day in June, as teams raced for charity in the 8th Annual Knoxville Dragon Boat Festival.

Paddling to the beat of a different drummer, participants were encouraged to raise \$179 in preparation for the event, all proceeds benefitting the local Knoxville Area Rescue Ministries (KARM). Founded in 1960 by five local pastors, KARM houses over 400 men, women and children each night and serves 1100 to 1600 meals a day—all for the homeless, poor and needy in Knoxville.

But don't let the benign nature of the charity fool you. The long day of dragon boat racing was not for the faint of heart. Each team (consisting of 20 paddlers and a drummer) participated in at least two races – morning and afternoon. The fastest boats advanced to determine the grand champion. Awards were given for top fundraising, best team name, most team spirit, best-dressed drummer and most festively adorned tent, provided as a place to socialize and relax between races.

Held at The Cove at Concord Park in Farragut, this year's festival had 64 registered teams. Camaraderie of the participants was clearly evident—supported by the beats and shouts of each team's drummer. Paddlers undoubtedly are still hearing commands like “paddles up”; “take it away”; and “one, two, three, four” in their sleep.

“It's all about synchronicity,” said Bryan Hilson. “The most unified boat wins.” Bryan and his wife, Carri, paddled with the Early Career Professionals team (ECP), consisting of 18 UT-Battelle employees, nine of whom are students/interns, and three family members. Overall, they landed in 7th place.

Human Resources Directorate's Nina Wilson listened to advertisements for the Dragon Boat Races for years and finally decided to participate. On June 26, she donned a festive hat, sat at the helm of the ECP boat and drummed her team to victory.

“It's fun and supports a great cause,” said Nina. With this year's event under their belts, the ECP team of rookies is already looking ahead.

“I look forward to going back next year, hopefully with many of the same teammates

and putting more focus on the fundraising side,” said Bryan. KARM depends on events such as this to keep the doors open and plates full. While numbers are still being tallied, the unofficial total sits at \$124,000 and counting.

Kevin Weiss captained the Chemical Sciences Division team, a.k.a. Lab Rats. It was his third year in the big boat. “After year one I was hooked,” said Kevin. “I enjoy the camaraderie and the competition, but I love the fact that money raised goes to support such a worthy cause.”

UT Battelle/ORNL's third team, Gender Neutral, had an even ratio of female to male paddlers and might just have a new lucky number. They placed 8th overall in both speed and fundraising efforts.

At the end of the day, over 60 participants were on hand to represent UT-Battelle/ORNL. Next year holds the opportunity to raise more money for such a worthy cause.

Paddles up!—Stephanie Ritchie 🌿



EARLY CAREER PROFESSIONALS

Check out this You Tube video (<http://www.youtube.com/watch?v=FzVZP1WL0Ms>) of a Lab Rats team race from the front row seat. To learn more about local Dragon Boat Racing, visit <http://knox.racedragonboats.com/>.

Sweet fun in the summertime

The following recipe is a heart-healthy version of a classic summer favorite. It was provided by Ellen McPherson, registered dietitian and certified diabetes educator with the Fort Sanders Diabetes and Cardiopulmonary Rehabilitation Center.



Banana Pudding

- 1.5-oz package of instant sugar-free pudding mix (vanilla or banana)
- 3 cups cold fat free or skim milk
- ½ to ¼ cup light sour cream, as desired
- ½ to 1 cup light whipped topping, as desired
- 1 to 2 bananas, sliced
- 35-40 vanilla wafers

Directions: In a bowl, beat pudding mix into cold fat free milk with a wire whisk, for 2 minutes. Add light sour cream and whipped topping. Layer pudding mixture, bananas, and vanilla wafers in a large bowl. (A glass bowl looks prettier.) Spread whipped topping over the top. Chill for two hours, or if you just can't wait, eat right away.

Recipe makes 8-10 servings; serving size, ½ cup.



Nutritional Information

Per serving:

- Exchanges: 1 starch
- Calories: 100
- Carbohydrates: 18 grams
- Fat: 5 grams

United Way kickoff features UT AD and “Voice of the Vols”

Basketballs bounced through Main Street on July 12, as special guests including UT Athletic Director Mike Hamilton and “Voice of the Vols” Bob Kesling helped kick off ORNL’s 2010 United Way campaign.

ORNL’s tradition of giving has made the Lab the region’s largest contributor to United Way, a position that was lauded by UT Athletic Director Mike Hamilton. Hamilton, who is chairing the 2010 Campaign for United Way of Greater Knoxville, shared his gratitude and admiration for ORNL’s generosity.

“Athletically speaking, we’re always trying to shoot for number one. When we go out and talk to other employee groups around the region, we’re always holding you up as the example to follow. So that’s a reason to keep advancing your cause and retain that number one spot,” the Vol AD told the Lab crowd.

Fellow UT athletic personality Bob Kesling, known as the “Voice of the Vols,” was also present to highlight the critical role of United Way. Kesling stressed the importance of teamwork—at the Lab, within families and in the community—as he joined in launching this year’s giving campaign.

“Being on a team is the most important thing you can do in your life. I’ve learned that there are a lot of people in our community who aren’t on a good team. We have an obligation to help all these kids and people who are on a bad team to get on a good team, and that’s what United Way does.”

Following the event speeches, Kesling put his Vol voice to work in officiating the play-off free hoops contest, which featured Doug Selby, Jason Craig, Banlim Loi, and Teresa Cochran. Raffle drawings resulted in lucky winners receiving an autographed basketball and UT football Skybox tickets. Attendees also had the opportunity to take photographs and get autographs from Hamilton and Kesling.

Also present at the kickoff were this year’s volunteer retiree representatives for the United Way of Anderson County campaign, Jim and Marilyn Reafsnyder. For information on contributing as an ORNL retiree, contact Marilyn at (865) 288-0497.—*Morgan McCorkle* 🌿



(From left) Broadcaster Bob Kesling and UT AD Mike Hamilton autograph basketballs for the United Way kickoff crowd.



“Voice of the Vols” Bob Kesling looks on as Teresa Cochran prepares to shoot.

From the Lab Director

Each year ORNL is a leader of the pack when R&D Magazine's R&D 100 Award winners are announced. This year is no different: Eight technologies from ORNL are among America's 100 leading innovations for 2009. Our total led the nation and puts us in second place to General Electric for the total number of these prestigious awards. Congratulations to those who contributed to the following innovations.

Telemedical Retinal Image Analysis and Diagnosis, developed and jointly submitted by ORNL, Automated Medical Diagnostics and the University of Tennessee Health Science Center. The ORNL team included Kenneth Tobin, Thomas Karnowski, Luca Giancardo, Deniz Aykac and Priya Govindasamy.

Liquid Microjunction Surface Sampling Probe for Mass Spectrometry, developed and submitted by Gary Van Berkel and Vilmos Kertesz of ORNL's Chemical Sciences Division.

Sulfur-Carbon Nanocomposite Cathode Material and Additives for Lithium-Sulfur Batteries, developed and submitted by ORNL's Chengdu Liang from the Center for Nanophase Materials Sciences, and Nancy Dudney and Jane Howe of ORNL's Materials Science and Technology Division.

Ultrasensitive Nanomechanical Transducers Based on Nonlinear Resonance, developed and jointly submitted by Nickolay Lavrik from the ORNL Center for Nanophase Materials Sciences and Panos Datskos of ORNL's Measurement Science and Systems Engineering Division.

Strontium Iodide Scintillator for Gamma Ray Spectroscopy, submitted by Lawrence Livermore National Laboratory. ORNL's participants included Lynn Boatner, Joanne Ramey and James Kolopus.

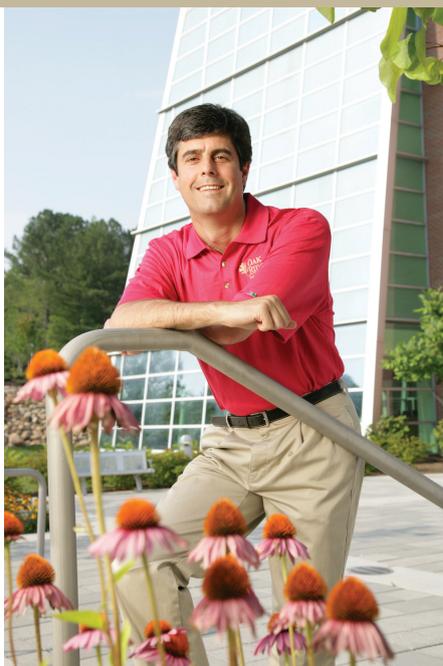
Mode-Synthesizing Atomic Force Microscope, developed and submitted by Ali Passian, Thomas Thundat and Laurene Tetard from ORNL's Biosciences Division.

High-Performance, High-Tc Superconducting Wires Enabled via Self-assembly of Non-superconducting Columnar Defects, developed and jointly submitted by SuperPower Inc., the University of Houston and the University of Tennessee, with ORNL researchers Amit Goyal, Sung-hun Wee, Eliot Specht, Yanfei Gao, Karren More, Claudia Cantoni, Keith Leonard, Malcolm Stocks, Tolga Aytug, Mariappan Paranthaman, David Christen, Jim Thompson and Dominic Lee.

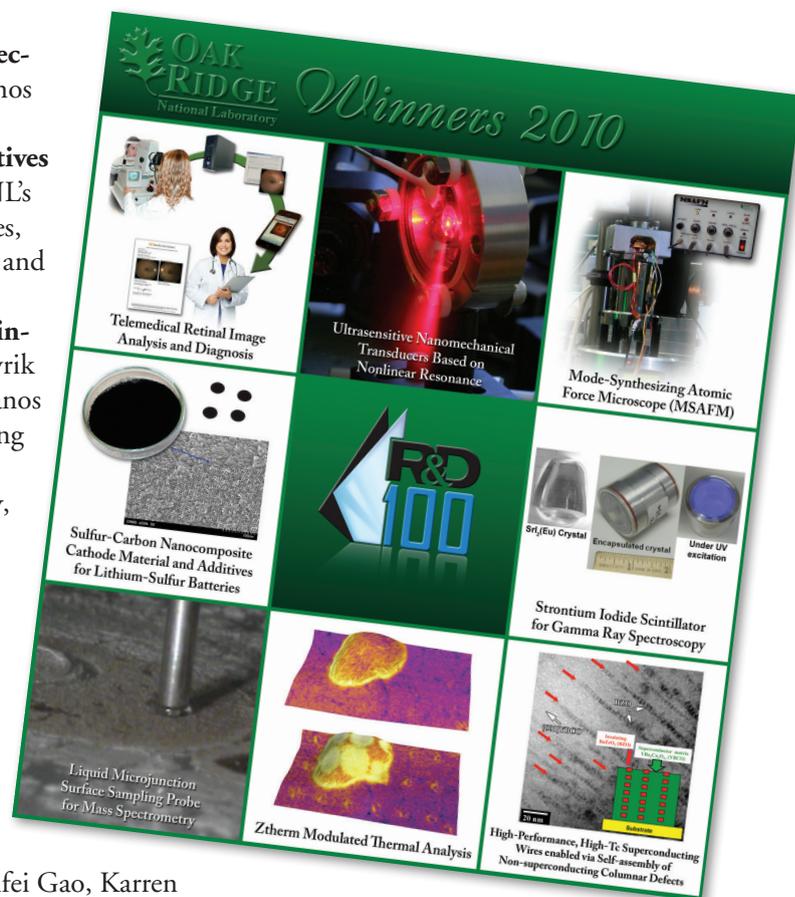
Ztherm Modulated Thermal Analysis, developed and jointly submitted by Asylum Research Company and an ORNL research team consisting of Maxim Nikiforov, Sergei Kalinin and Stephen Jesse.

Thomas Mason

Thom Mason



“Our total led the nation and puts us in second place to General Electric for the total number of these prestigious awards.”





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Climate change scientists turn up the heat in Alaska

Global warming's impact on cold weather climes such as Alaska's may extend beyond a thaw. Scientists at ORNL are planning an ecosystem experiment to test the effects of global warming on the icy layers of arctic permafrost, including the possibility that carbon dioxide stored in permafrost may be released as temperatures rise.

"The arctic regions are important to the topic of global warming because of the large land area they occupy around the world and the layer of permanently frozen soil, known as permafrost," said Stan Wullschleger of the Environmental Sciences Division and the ORNL Climate Change Science Institute.

Wullschleger and a team of architects, engineers and biologists from ORNL and other national laboratories are designing and then field testing large-scale manipulative experiments that purposely warm a test area in order to evaluate ecosystem response to projected climate conditions.

"Evidence is emerging that the arctic is experiencing a greater degree of warming than the rest of the globe," Wullschleger said. "Manipulative experiments will help us study a wide range of physical and ecological processes and their consequences in great detail."

To represent future climate conditions, researchers are seeking to develop above- and below-ground warming technologies to heat plots of land about 20 meters in diameter. ORNL researchers eventually hope to replicate these plots with treatments that include heating in combination with elevated carbon dioxide.

"That will be a major undertaking, and it will involve the support of the larger scientific community. We want to ensure that others are able to contribute to the development of this grand activity," Wullschleger said.—Katie Freeman 



A long-term ecosystem experiment performed by ORNL will test the impact of increased temperatures on Arctic tundra. (Photo by Stan Wullschleger)