

**SCIENCE**

**Defense from a distance  
ORNL robotics sensors detect underwater  
explosive ordnance**



*An unmanned, autonomous underwater vehicle surveys a glacier and remote fjord in western Greenland. Photo: Woods Hole Oceanographic Institution (A.Kukulya).*

**Modern weapons technologies often keep members of the military out of harm’s way by allowing them to perform missions from a distance.** Researchers at the Department of Energy’s Oak Ridge National Laboratory are helping the military play defense from a distance, as well.

Dan Archer and Thomas Karnowski, along with their team of scientists, are working with the Navy and the Woods Hole Oceanographic Institution to continue the development of unmanned, autonomous underwater vehicles with sensors that can scan areas, detect anomalies and differentiate between objects—like a wrench and a hammer versus an explosive mine.

“It’s a difficult problem because if you have a wrench and a hammer—fine—you can distinguish those,” Archer said. “But throw a bunch of other stuff on the table and then try to find the tools amongst the clutter and distinguish them from one another.”

Underwater machine vision can use both visual and sonar data. However, in depths greater than 15 feet, water filters the visible light spectrum, making a red object appear gray. Combine that with sand, salt, seaweed, current and bubbles, and accurate perception becomes difficult.

As a result, scientists are emphasizing the collection and processing of sonar data. During a mission, vehicles may collect many hours of data that will be analyzed by humans looking at each frame searching for an anomaly. The idea is to automate this process using machine vision embedded in efficient computational resources.

Supported by laboratory funding in collaboration with an Office of Naval Research-funded project, Karnowski analyzes the visual and sonar data and is developing an algorithm to make data analysis a more efficient process. With an efficient algorithm, the unmanned underwater vehicle can use the algorithm to understand what is being seen, eliminating the need for human workers doing their best to sift through hours of data.

“That’s the whole idea,” Archer said. “How do we apply our scientific expertise developed in other areas to enhance national security in an automated fashion that will become more efficient and cost less over time? All the science that goes into that is the key.”

However, these sensors don’t stop at just recognizing different objects—the goal is to understand them. The next step is a merging of the sensor analysis with the controls of the vehicle.

Using the data from the multiple sensors (like depth, speed and heading), the onboard processors can make sense of all the information at one time in order to lead more efficient missions and relay the information back to whoever is looking at the data.

The wars and defense of the future are not human oriented, but robotics oriented. For robots to perform their mission of safety and security they have to have sensors embedded and the work at ORNL will provide those sensors. With safety at the forefront of robotics design, these are the droids we are looking for.

–Dylan Platz 

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Karnowski analyzes the visual and sonar data and is developing an algorithm to make data analysis a more efficient process.

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## ORNL retiree Ernest Shepherd recalls 1944 hospital bombing



ORNL retiree Ernest Shepherd wears an Army uniform similar to what he wore during World War II while attending the Lab's Veterans Day ceremony Nov. 11. (Photo by Jason Richards)

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“It blew out all the windows in that whole building. It killed 29 people and many more were injured, including myself.”

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A highlight of November's annual Veterans Day ceremony at ORNL was a tribute to ORNL retiree Ernest Shepherd.

Ernest – who turns 90 Feb. 10, attended the event wearing an Army uniform similar to one he wore in 1944 when he served in Europe during World War II. He was honored with a video tribute for his service.

Working as a medic in England during the Allied invasion of Normandy, Ernest treated Allied soldiers wounded during the invasion. Later that year, his unit went to Belgium. Working in a hospital there, he survived a German V-bomb explosion.

“It blew out all the windows in that whole building,” said Ernest, who was located on the second floor about 300 feet from where the bomb exploded. “It killed 29 people and many more were injured, including myself.”

Despite being cut in the face with shrapnel and flying glass, Ernest still sought to help others in the hospital amidst the chaos.

“There were between 12 to 15 of our hospital personnel – some of whom I knew – who were killed immediately,” Ernest recalled. “There was one major who was the medical director – someone who I really liked – who also got killed. It was a tough time.”

Ernest eventually recovered from his wounds and returned to the front lines during early 1945. He helped treat soldiers wounded during the Battle of the Bulge in Belgium.

His unit was part of the Allied forces advancing toward Germany during the winter and spring. One day in April, Ernest was fortunate enough to meet up with his brother, Henry, who was driving a tank.

“Some tanks were passing by and suddenly Henry's head popped out from one of the tanks,” Ernest said. “Who would have thought that thousands of miles from East Tennessee we would have met up like that?”

Ernest worked 26 years as a carpenter at ORNL. He and his wife, Armistine, live in Knoxville and will celebrate their 65th anniversary April 27. His daughter, Susan Horn, works in ORNL's Business Services Directorate. His son, David, is an electrical inspector for the city of Knoxville.

Ernest has been a constant attendee at ORNL Veterans Day activities during recent years. He appreciates people hearing stories about his experiences during the war and his expressions of love for his country.

“The war was tough and I saw a lot of suffering and death, but I'm proud of what I was able to do over there almost 70 years ago,” Ernest said. “As a medic, I was able to help people. I did my duty for my country at a time when it was in need.” –Fred Strohl 🌱

Reporter is published for retirees of ORNL, which is managed by UT-Battelle for the U.S. Department of Energy.

**Fred Strohl**  
Editor  
(865)574-4165  
strohlhf@ornl.gov

**Morgan McCorkle**  
**Dylan Platz**  
Writers

**Cindy Johnson**  
Design and Layout

## CORRE adds 5 new board members

The Coalition of Oak Ridge Retired Employees (CORRE) has added five new board members for 2014.

They are Shirley Cates, Joe McGrory, Ross Toedte, Mary Jane White and Dave Whitehead. Remaining on the board are Mike Bradshaw, Steve Cates, Ken Moore, Dwight Morrow, Pete Peterson, Dave Reichle, Steve Stow, Mike Willard and Bob Worrell.

Board officers for 2014 are President Dave Mason; Vice Presidents Charlene Edwards, Bob Hightower and Garry Whitley; Secretary/Treasurer Mary Helen Rose; Communications Director Judy Kibbe and Past President Dub Shults. Former board members whose terms ended in 2013 are Carl Burtis, Phyllis Green, Jim Hackworth and Ron Honeycutt.

CORRE is in the process of replacing its website with one that is more efficient, more user-friendly and less expensive. The web address remains unchanged: [www.corre.info](http://www.corre.info). Suggestions are always welcome. 🌱



## Van Berkel earns top science, technology honor at Awards Night

**Gary J. Van Berkel of ORNL's Chemical Sciences Division** earned the ORNL Director's Award for Outstanding Individual Accomplishment in Science and Technology during the Nov. 15 ORNL Awards Night event in Knoxville.

The award recognizes Van Berkel's sustained leadership and innovation in the development of disruptive sampling systems for mass spectrometry, resulting in multiple commercial licenses and new product offerings. He was earlier named ORNL's Inventor of the Year.

David Fowler of ORNL's Energy and Environmental Sciences Directorate earned the Director's Award for Outstanding Individual Accomplishment in Laboratory Operations. Fowler was honored for recent accomplishments that exceeded normal performance expectations and positively advanced ORNL's mission. He also won the Excellence in Operations category.

Donald Cross of ORNL's Computing and Computational Sciences Directorate earned the Director's Award for Outstanding Individual Accomplishment in Community Engagement. Cross provided outstanding leadership and selfless dedication in community service through the mentoring of special needs children and adults in a wide variety of organizations. He also won the award for Exceptional Community Engagement by an Individual.

A team composed primarily of members of ORNL's Energy and Environmental Sciences Directorate earned the Director's Award for Outstanding Team Accomplishment. The 12-person team, which also won the Scientific Research category, was recognized for groundbreaking research in biotic and abiotic mechanisms of mercury methylation in the environment, leading to high-impact publications in Science and Geoscience.

Members of the team were Alexander Johs, Mircea Podar, Craig C. Brandt, Jerry M. Parks, Xianping Lisa Yin, Dwayne A. Elias, Jeremy C. Smith, Baohua Gu, Carrie L. Miller, Scott C. Brooks, Steven D. Brown and Liyuan Lang.—*Fred Strohl* 🌱

## Icenhour named interim ALD for Nuclear Science & Engineering

**Alan Icenhour has been appointed** Associate Laboratory Director of the Nuclear Science and Engineering Directorate. He replaces Jeff Binder, who moved to the University of Illinois to direct that institution's Applied Research Institute.

Icenhour has more than 25 years' experience with the nuclear fuel cycle, including reactor and nuclear facility operations, enrichment technology, radiochemical processing, nuclear fuels, isotope production, radioactive waste management and nuclear security. Currently director of the Nuclear Security & Isotope Technology Division, Alan has held a number of management positions relating to the Laboratory's nuclear engineering portfolio.

He received his bachelor's degree in nuclear engineering from North Carolina State University and his master's and doctorate in nuclear engineering from the University of Tennessee.

John Begovich was named interim director of the Nuclear Security & Isotope Technology Division while Icenhour serves as interim ALD.—*Fred Strohl* 🌱



Van Berkel



Fowler



Cross

## 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 865-576-3753 or [jamesla@ornl.gov](mailto:jamesla@ornl.gov).

## Service Anniversaries

## December 2013

**35 years:** **Ranell W. Lane**, Nuclear & Radiological Protection; **James W. Terry**, Environmental Sciences; **Rebecca A. Fortner**, Chemical Sciences; **Philip C. Arwood**, Information Technology Services

**30 years:** **Dwight A. Clayton**, Electrical & Electronics Systems Research; **Tracy L. Rollins**, Facilities Management; **Cecil Albert Carmichael Jr.**, Materials Science and Technology; **Sherry E. Williams**, Environmental Protection & Waste Systems; **David Howard Cook**, Research Reactors; **Gary H. Henkel**, Office of Integrated Performance Management; **George Ostrouchov**, Computer Science and Mathematics

**25 years:** **Marilyn Rich** and **David W. Bradford**, Business Management Services; **Carolyn J. Ladd**, Human Resources Dir.; **Bob Conrad** and **B. Lamar Lepard Jr.**, Information Technology Services; **W. Don Creekmore**, Integrated Operations Support

**20 years:** **John S. Hsu**, Electrical & Electronics Systems Research; **S. Kaye Colyer**, Human Resources Dir.; **Dale Patrick Kaiser**, **David B. Watson**, and **Mark S. Bevelhimer**, Environmental Sciences; **Leslie C. Wilkerson**, Laboratory Protection; **Angela Gayle Shillings**, Acquisition Management Services

## January 2014

**40 years:** **Michael J. Cole**, Fusion & Materials for Nuclear Systems

**35 years:** **David Russell Trotter**, Research Accelerator; **Kat W. Eldridge**, Nuclear Security & Isotope Technology

**30 years:** **John E. Richmond**, Nuclear & Radiological Protection; **Charles Edwin Banks**, Utilities; **Ron G. Maples**, Instrument and Source; **Regis S. Loffman**, Environmental Protection & Waste Systems; **Peggy C. Anderson**, Office of Integrated Performance Management; **Virginia H. Dale**, Environmental Sciences; **Chris Lindsley**, Computational Sciences & Engineering; **James L. Davidson**, Logistical Services; **David F. Williams**, Nuclear Security & Isotope Technology

**25 years:** **Lenora E. McBee**, Accounting Services; **Danny Davis**, Integrated Operations Support; **Harold Toy**, Research Accelerator; **Lara A. James** and **Sheila Lynn Causby**, Information Technology Services; **Vaughn P. Patania**, Research Accelerator; **Jy-An John Wang**, Materials Science and Technology; **T. A. Dyer**, Nonreactor Nuclear Facilities; **Penny Ann Crabtree**, Safety Services; **Pamela R. Golden**, Facilities Management

**20 years:** **Kimberly K. Anderson** and **Mia D. Prater**, Nuclear Security & Isotope Technology; **Jeffery Lee Morris**, Safety Services; **James Parfitt**, Nonreactor Nuclear Facilities; **Lora Wolfe**, Computer Science and Mathematics

## February 2014

**40 years:** **Joe D. McAmis**, Utilities; **Christopher Owen Stevens**, Materials Science and Technology

**35 years:** **Robert M. Wham**, Nuclear Security & Isotope Technology; **David D. Drake**, Nonreactor Nuclear Facilities

**30 years:** **Greg A. Irby**, Utilities; **Kevin Lyn Rogers**, Research Reactors; **Curtis William Ayers**, Electrical & Electronics Systems Research; **Patricia W. Garland**, Energy & Transportation Science; **Lawrence Paul MacIntyre**, Computational Sciences & Engineering; **Cynthia Manley**, Information Technology Services

**25 years:** **E. B. Golden Jr.**, Laboratory Protection; **David G. Edds**, Safety Services; **C. Denise McNelly**, Office of Integrated Performance Management; **Bill K. Needham Jr.**, Utilities; **Chris Luck**, Research Accelerator; **Kenneth E. McNabb**, Fabrication, Hoisting & Rigging; **Laura Chavez-Becker** and **Michael A. Miller**, Information Technology Services

**20 years:** **Timothy E. Valentine**, Reactor & Nuclear Systems; **Mary Jean Harrison**, Utilities; **Roger J. Weaver** and **Tim Alan Raley**, Nonreactor Nuclear Facilities

## Join the Friends of ORNL

Friends of ORNL (FORNL) is a non-profit organization that provides members with a way to keep in touch with co-workers, retirees and current ORNL activities. Luncheon lecture meetings are held at 11 a.m. the second Tuesday of each month. Membership is open to current and former ORNL employees, as well as any person or organization with an interest in ORNL and its programs. Dues are \$20 per year and \$200 for a life membership. Contact Chuck Coutant at [ccoutant3@comcast.net](mailto:ccoutant3@comcast.net) for information.

## Liane B. Russell Fellowship established

ORNL has established a research award in the name of its most acclaimed woman scientist.

The Liane B. Russell Distinguished Early Career Fellowship is intended to attract a diverse work force of scientists and engineers who have demonstrated outstanding scientific ability and research interests that align with DOE and ORNL research missions.

The competitive, three-year fellowship is aimed toward establishing long-term research careers at ORNL. The fellowships will be available to outstanding scientists and engineers who have received their doctorate degrees within the past seven years, with emphasis given to attracting women and minority candidates.

“We’re privileged to have the legacy of someone as scientifically accomplished and socially conscious as Liane Russell to associate with these grants,” said ORNL Director Thom Mason.

With her husband, the late William L. Russell, Liane Russell led a research program that charted significant advances in the field of mammalian genetics and mutagenesis. Shortly after World War II, the Russells moved from the Jackson Laboratory in Maine to establish ORNL’s famed Mouse House, a colony of mutant mice used in genetics research.

“In my life, I was very fortunate in being given opportunities to pursue my own ideas in exciting research areas,” Liane said. “But this is, sadly, not the case for many young women hoping for scientific careers and ending up in merely supporting roles, perhaps doing only routine jobs. So, I’m particularly honored to have my name attached to this program.” 🌱



*Liane Russell working in her laboratory.*

## Former UT-Battelle Scholar living his dream in California

When Lenoir City High School senior Wes Alvaro earned the 2004 UT-Battelle Scholarship to the University of Tennessee, he dreamed of a career in computer science.

Ten years later, Wes’ dream has come true as he today works for Google in providing support to its customer service group.

“My desire was strengthened while in college and working as an ORNL intern,” Wes said recently while home for the holidays in Lenoir City.

Wes earned bachelor’s and master’s degrees in computer science from UT and was working on his doctorate when he decided to accept a job offer from Google almost three years ago, placing him in his current position in the San Francisco area.

“I felt like it was time for a change and the Google opportunity was the type of opportunity I was seeking,” Wes said.

Wes develops and services tools for Google’s customer service group, which is considered a crucial aspect of the Google operation.

“Google takes its customers’ concerns quite seriously and my job is to help the customer service reps with the support they need for whatever the issue,” said Wes, who works with a group of 15. “Over these past few years, we’ve developed different tools to help the process along.”

Wes and his wife, Sarah, a Nashville native and also a UT grad, have found life somewhat different from what they were used to growing up in Tennessee.

“There are more people and more diversity,” Wes said. “I would say life is not as different from what we thought it might be, but there’s still a lot of stuff going on. The heavy traffic we have to deal with can be challenging.”

Wes and Sarah are able to visit Tennessee several times a year. Wes’ mother, Deb, works in ORNL’s Information Technology Services Division.

“We enjoy returning to Tennessee, but California is our home,” Wes said. “It is a perfect area for the work I do.” 🌱



*Wes Alvaro takes a break at a San Francisco area marina.*

# OAK RIDGE NATIONAL LABORATORY

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OAK RIDGE, TENNESSEE

Friday, December 11, 1953

## Safety Award Plan Greatly Improved; Lists New Benefits

A new safety-award plan, which increases the value and frequency of individual safety awards is now in effect, announced Dr. C. E. Larson, director of Oak Ridge National Laboratory. This plan is more attractive than the previous one which permitted expenditure of up to \$2.00 per employee per calendar year.

### Value Increases

The new plan provides for awards for each specified period without a lost-time accident, and for successive increases in the value of the award for such periods in excess of 1,500,000 man-hours, as follows:

- 1,500,000 to 3,000,000 man-hours, \$2.00 per employee.
- 3,000,000 to 5,000,000 man-hours, \$5.00 per employee.
- 5,000,000 man-hours or more, \$10.00 per employee.
- Each additional 5,000,000 man-hour period above the 5,000,000 level, \$5.00 per employee.

"The continued and greater-emphasized adherence to good safety practices by all Laboratory employees should result in better returns in both the safety-award program and in the basic objective of accident prevention," said Dr. Larson.

## Welding Society Meets on Monday

The Northeast Tennessee Section of the American Welding Society will hold a dinner and technical meeting on Monday, December 14, at the S and W Cafeteria in Knoxville. Dinner will be served at 6:45 PM.

Robert A. Davis, district engineer of the Birmingham Plant, Chicago Bridge and Iron Company, will be the speaker for the occasion. Mr. Davis will use as his subject, "Fabrication and Field Erection of Pressure Vessels." Tickets may be obtained from G. M. Slaughter, Building 2005, Extension 6183.

### Transfers To Birmingham

Mr. Davis began his steel fabricating with Reeves Brothers at Alliance, Ohio, in 1919, and transferred to Birmingham in 1925 with the new Reeves Southern Plant. When Reeves sold the plant to the Chicago Bridge and Iron Company in 1930, Mr. Davis continued as chief draftsman until 1945. Since that time he has held his present position with that company.

### Holds Many Memberships

The speaker holds membership in the Engineers Club of Birmingham, the National Association of Corrosion Engineers, the Digestor Corrosion Committee of the Technical Association of Pulp and Paper Industry, the Birmingham Chamber of Commerce, and the American Welding Society.

## Ten Years Ago This Month...



THIS ORDINARY-SEEMING PEN-LIGHT was used to carry the first sample of plutonium produced at Oak Ridge National Laboratory to the University of Chicago for research studies. Though tiny in size, unusual precautions were taken to safeguard the rare metal, and the pen-light container was used on the principle that its complete innocuousness would deceive any spy who might attempt to waylay the messenger and steal his precious cargo. Needless to say, no such incident occurred, and the pen-light is now just another souvenir of the pioneer days of the atomic energy project.

## Dr. Householder To Address AIChE

Dr. A. S. Householder, director of the Oak Ridge National Laboratory Mathematics Panel, has been invited to address a symposium on "Use of Computing Machines in Chemical Engineering," which will be held in connection with the forty-sixth annual meeting of the American Institute of Chemical Engineers in St. Louis, Mo., next week, December 13-16.

Dr. Householder will present a paper entitled "Preparation of Problems for Digital Computers."

### NEGATIVE REPORT

Dr. Walter C. Alvarez, in his column in the Dayton News, recently discussed the controversy over whether cancer of the thyroid should be treated with radioactive iodine. Dr. Alvarez reports that, because some cancer cells in the thyroid do not concentrate the iodine strongly enough, this radioisotope has not proved as useful as doctors had hoped.

## Applications Pouring In

Applications are pouring in the ORNL Recreation Office for tickets to the Carbide children's Christmas parties, scheduled for Monday and Tuesday, December 21 and 22. These parties will be held at 10:00 AM and 1:00 PM on both days at the Oak Ridge High School auditorium. An additional party for children in Gamble Valley will be held on Tuesday, December 22, at 11:00 AM.

In order to be eligible to attend, children must be between the ages of two and ten, inclusive. ORNL parents are urged to send their children to the parties by themselves, if possible, or in the company of an older child. If parents believe that their children

## Keim, McNally Featured At ACS Conclave

Dr. C. P. Keim, director of the Stable Isotope Research and Production Division at Oak Ridge National Laboratory, will present a paper at the Regional Conclave of the American Chemical Society in New Orleans, which is now in session.

The title of Dr. Keim's paper is "The Electromagnetic Isotope Separation of the Palladium, Platinum, and Rare-Earth Elements."

Another member of the division, Dr. J. R. McNally, will also present an invited paper at this meeting. The subject of Dr. McNally's address is "Spectro-Isotopic Applications of High-Resolution Spectroscopy."

## Local Men Speak At ASM Meetings

Dr. J. O. Betterton, of the ORNL Metallurgy Division, will be the speaker at the fourth annual lecture in the series.

## K. D. Nichols Makes 'Orientation' Visit To Local Plants

Kenneth D. Nichols, general manager of the U. S. Atomic Energy Commission, paid a two-day visit to Oak Ridge this week as part of a routine orientation visit, which is to include all the major AEC installations in this country.

Nichols, who was with the Manhattan Engineering District in World War II, is a former Oak Ridge resident. As district engineer, he was responsible for the supervision of the research and development connected with, and the design, construction, and operation of all plants required for the production of uranium-235 and plutonium, including the construction of the towns of Oak Ridge and Richland, Washington. He served with the Manhattan District until the responsibilities for atomic energy were turned over to the AEC in 1947.

### Visits Laboratory

His visit included a tour of the three Carbide plants in Oak Ridge.

## Sixty years ago this quarter Taken from ORNL "The News" for Winter of 1954

- As shown on the backdrop page, in 1943 an ordinary-seeming pen-light was used to carry the first sample of plutonium produced at ORNL to the University of Chicago for research studies. Though tiny in size, unusual precautions were taken to safeguard the rare metal, and the pen-light container was used on the principle that its complete harmlessness would deceive any spy attempting to steal the precious cargo.
- Dr. Larson and Dr. Weinberg, director and research director of ORNL respectively, spoke to the contributions of the Laboratory over the first decade of operation. The first decade's contribution was to the defense of the nation. The second decade presented an opportunity to concentrate on projects associated with the peacetime aspects of atomic energy. Of national importance was the use of nuclear power for the generation of electric power.
- The January 1954 issue of National Geographic magazine featured ORNL in an 18-page article on the use of radioisotopes in biology, medicine, agriculture and industry. A good portion of the article describes the graphite reactor as the principal source of radioisotopes and details on the processing and shipping of radioisotopes in the US.
- The ORNL Graphite Reactor continues to be the nation's principal producer of radioisotopes. Approximately 50,000 radioisotope shipments had been made and shipments averaged about 1,000 per month. Most widely used isotopes were: radiocarbon, radio phosphorus, radio iodine, and radio thallium.—prepared by ORNL History Room volunteers

## From the Lab Director

Gov. Bill Haslam held a series of public events in East Tennessee in December, and his comments related to education are worth highlighting.

Educational opportunities offered to Tennessee students at all levels — and the resulting improvements in academic achievement — directly affect our ability to grow globally competitive businesses here, to provide opportunities for our kids and grandkids, and to recruit top talent to Tennessee. The governor, speaking Dec. 13 to 400 community leaders at the East Tennessee Economic Council's annual meeting, emphasized the importance of strong support for STEM fields — science, technology, engineering and math.

"The STEM disciplines that so many of you are a part of in this room, that's not overhyped," the governor told ETEC members. "That's where the demand is."

There's demand because there's great opportunity.

New manufacturing techniques promise revolutionary change in major industries, including reconsideration of whether production really needs to reside overseas.

Some techniques, such as larger-scale additive manufacturing, are being pioneered with companies at Oak Ridge National Laboratory, and ALCOA's edge in technology and innovation is fueling a \$275 million expansion to meet automotive demand for high-strength lightweight aluminum. In the energy sector, the Tennessee Valley Authority offers a test bed for innovation across a broad energy portfolio. Internationally, nuclear security is a forefront issue in which B&W Y-12 and the Y-12 National Security Complex play a key role, and in numerous other fields — medical technology, high-performance computing, logistics and more — major Tennessee employers have established global reputations for excellence.

Recent progress in Tennessee's educational system should be heralded. U.S. Education Secretary Arne Duncan hailed Tennessee for its gains in the National Assessment of Educational Progress when results were announced in November. Haslam, in his remarks at ETEC's annual meeting, was quick to point out that Tennessee's rise from near

the bottom of 50-state rankings into the 30s still leaves a long road to the academic Top 10. Strong STEM programs should be central to Tennessee's path forward.

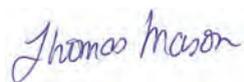
STEM education isn't limited to technical training or advanced equations. The ability to think critically, identify creative solutions and collaborate with colleagues is central to any well-rounded STEM program, and those traits are essential if we hope to attract and retain business investment in our state.

That's why each of our companies supports STEM programs for students from elementary through college age, as well as internships, competitions and scholarships. The FIRST Robotics Competition, sponsored in Tennessee by companies including UT-Battelle, TVA and Alcoa, has grown rapidly by offering high school teams hands-on experience developing and marketing technology. Through the TVA Partners in Education program, employees work with schools throughout the region to engage students in STEM learning activities such as math and science competitions, plant visits, robotics and outdoor environmental projects. The governor's audience at ETEC is pushing STEM into smaller and rural schools through the Lab-in-a-Box program.

And our companies have joined Tennessee in developing the Tennessee STEM Innovation Network, with regional hubs and platform schools that connect educators with scientists and students with workforce mentors.

The world is shrinking. We're competing not only with neighboring states, but with a world hungry for the economic success we in the U.S. risk taking for granted. Leaders of industry, government, schools and communities must make sure quality STEM opportunities are a part of any well-rounded education effort, providing students with essential skills and, most importantly, fueling their curiosity and broadening their opportunities.

Competition is growing. If we work together, we'll win.



Thom Mason




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"New manufacturing techniques promise revolutionary change in major industries, including reconsideration of whether production really needs to reside overseas."

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**Reporter**  
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## Sustainable Campus Initiative honored at White House event

ORNL's Sustainable Campus Initiative has won three awards recently, including one that was presented at the White House.

The GreenGov Presidential Award was presented to ORNL for work with Indian River State College to create a sustainable campus and for the key role in the development of an electric vehicle-charging corridor across the state of Tennessee.

Johnny Moore, DOE site manager at ORNL, along with Melissa Lapsa and Teresa Nichols of the Energy Science and Transportation Division, accepted this award during the White House ceremony.

ORNL also earned DOE's Federal Energy Management Program's 2013 Federal and Water Management Award for exceptional accomplishments in energy, water and fleet management in the federal sector.

An additional honor was the Tennessee Chamber of Commerce and Industry Outstanding Achievement Award for Air Quality. This award recognizes ORNL's sustainable campus initiative holistic approach to the Lab's sustainable efforts such as greenhouse gas management and operational Biomass Steam Plant. 🌱



*Pictured during the GreenGov Presidential Awards ceremony are, from left, Nancy Sutley, chair of the Council on Environmental Quality; Melissa Lapsa and Teresa Nichols of ORNL; Johnny Moore, DOE site manager at ORNL; Jennifer MacDonald, director of DOE's Sustainability Performance Office; and Michael Knotek, DOE deputy under secretary for Science and Energy.*