

SCIENCE

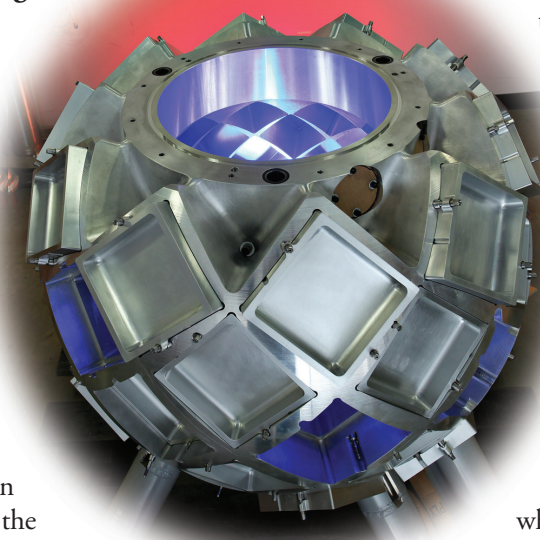
Project's completion gives neutron science community reason to SING

Five of the world's most advanced instruments for neutron scattering research are serving the neutron science community following the completion of the \$68.5 million SING project at ORNL's Spallation Neutron Source (SNS).

The project to design, build and install the five instruments for neutron scattering analysis at the SNS, funded by the DOE's Office of Science, was finished ahead of schedule and under budget. In total, the SNS currently has 15 operational instruments for neutron analysis, including the five SING instruments, and will eventually have 24 instruments arrayed around its neutron-producing target.

"SING's completion gives neutron researchers access to unparalleled tools for examining and understanding the advanced materials that will be key to meeting our energy challenges," said Harriet Kung, director of Basic Energy Sciences (BES) within DOE's Office of Science.


The five instruments under the SING (SNS Instruments - Next Generation) project are the Spallation Neutrons and Pressure Diffractometer, or SNAP; the Fine-Resolution Fermi Chopper Spectrometer, or SEQUOIA; the Single-Crystal Diffractometer, or TOPAZ; the Nanoscale-Ordered Materials Diffractometer, or NOMAD; and the just completed Hybrid Polarized Beam Spectrometer, or HYSPEC, which concluded the project.



Neutrons from the SNS's target are channeled through beamlines to the instruments' detectors, which provide analytical data that enable researchers to determine the atomic and molecular structures responsible for the properties of advanced materials.

The instruments, the first of which entered commissioning in early 2008, are already enabling the research community to take advantage of the SNS's unprecedentedly intense neutron beams. For example, one of the first on line — SEQUOIA — has provided new understanding of the magnetic interaction dynamics behind exotic behaviors in advanced materials and of the dynamic processes in naturally occurring materials, such as muscovite. Another instrument, SNAP, yielded discoveries on the structure of gas hydrates relevant to their potential use in carbon sequestration.

"This exceptional team, which comprised instrument scientists, engineers, designers, technicians, installers, scientific associates, project controls and finance officers, brought this project in ahead of schedule and just under budget," said Ian Anderson, ORNL's associate laboratory director for Neutron Sciences.

Information on the SNS and its instruments, in addition to ORNL's neutron science research, is available on the web at <http://neutrons.ornl.gov>.—Bill Cabbage 

"SING's completion gives neutron researchers access to unparalleled tools for examining and understanding the advanced materials that will be key to meeting our energy challenges."

The TOPAZ detector array tank shown in 2009, before its installation in the Spallation Neutron Source's target building. TOPAZ is one of the SNS instruments under the Office of Science's just completed SING project.

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Oral histories provide insight to Oak Ridge's past



Steve Stow at book signing with writer Robert Norris, author of *Racing for the Bomb: General Leslie R. Groves, the Manhattan Project's Indispensable Man*.

The history of the city of Oak Ridge and its federal facilities dates back almost 70 years. Now an oral history program focused on recording the memories of city residents and DOE employees over those seven decades provides stories succeeding generations can both relive and enjoy.

Says retiree Steve Stow, who helped start the Center of Oak Ridge Oral History program, "Oak Ridge has such tremendous history, and we are fortunate that many people who've lived and worked here are willing to share their stories. About 300 oral histories have already been recorded. The hope is that others who've lived and worked here a long time will agree to be interviewed, as well."

Steve arrived at ORNL in 1980. His interest in collecting historical information dates back to the 1990s and was spurred by the three years he served as manager of the American Museum of Science and Energy, prior to his retirement in 2006.

"DOE is supposed to keep interest in Oak Ridge history alive by getting involved in documenting that history as prescribed in the Historic Preservation Act," Steve said. "The interviews conducted thus far span a wide variety of people from various backgrounds who have at least one thing in common – they lived and/or worked in Oak Ridge."

Steve believes that getting as many Oak Ridgers as possible to tell their stories of life in the Secret City, especially during the years beyond World War II, is critical for the benefit of succeeding generations.

"Each of these oral histories tells a different story and represents material that will be digitized and made available on the Internet. Our program is the most advanced of any of the oral history efforts at any of the DOE facilities nationwide."

Steve is currently a member of the DOE Site Specific Advisory Board, the organization that helped start the oral history program. He is also part of a group of mostly Oak Ridge retirees who spend one morning each week in the ORNL History Room going through old documents and other information related to the Laboratory. "We're always looking for donated papers, documents and artifacts," Steve said.

Although not an East Tennessee native, Steve's 26-years of employment in Oak Ridge provided enough experience for him to appreciate its many different scientific and historic aspects.

In addition to the Center for Oak Ridge Oral History and the Site Specific Advisory Board, Steve is involved with the AMSE Foundation and the Coalition of Oak Ridge Retired Employees. He also serves as a tour guide on the summertime DOE Oak Ridge Public Tour.

"All of this keeps me engaged," Steve said.

For more information about the Oak Ridge oral history program call 865-425-3455, email coroh@cornn.org or go to <http://www.cornn.org/lib-html/ORPL>.

COROH.htm.—Fred Strobl 

"Oak Ridge has such tremendous history, and we are fortunate that many people who've lived and worked here are willing to share their stories."



To help his audience get in the mood, Steve "rocks" this period-appropriate fedora for presentations of the history of the Manhattan Project, done often in concert with fellow retiree Will Minter (not shown).

Single microbial gene linked to increased ethanol tolerance

A team of researchers from DOE's BioEnergy Science Center has pinpointed a single, key gene in a microbe that could help streamline the production of biofuels from non-food sources.

Led by ORNL's Steven Brown, the team identified a key gene responsible for ethanol tolerance in *Clostridium thermocellum*, a microorganism being considered for use in a new biofuel production technique called consolidated bioprocessing, or CBP.

Current methods to make renewable biofuels from lignocellulosic biomass — switchgrass or agricultural waste, for example — require the addition of expensive enzymes to break down raw materials. In a more streamlined approach, CBP uses microorganisms that produce their own enzymes to liberate the plant's sugars and ferment them into ethanol.

"We want the microbe to make more lignocellulosic ethanol, so we're trying to understand the genetic basis behind the process," Brown said. "If we can evolve the strain to be more tolerant to ethanol, the hope is that we can make higher concentrations of ethanol, which would lower biofuel production costs."

Although scientists have studied the *C. thermocellum* microbe for decades, the genetic basis for its ability to tolerate higher concentrations of ethanol had not been determined. Earlier studies indicated that multiple genes, instead of a single allele, likely caused ethanol tolerance.

"Our results were really unexpected," Brown said. "It was deemed very unlikely to be a single gene because it's such a complex trait."

The BESC team located the single gene by sequencing the genomes of two types of *C. thermocellum* — a wild-type strain as a reference and an ethanol-adapted strain. The researchers singled out a mutated gene in the ethanol-adapted strain called alcohol dehydrogenase, the final protein in the microbe's pathway for making ethanol.

"When we put this particular copy of the *adhE* gene into the wild type strain, we were able to generate the mutant phenotype with just this one gene," Brown said.

Further analysis including protein structural modeling provided a more complete picture of the mutant gene.

"It's a very comprehensive study," said BESC director Paul Gilna. "Rather than have just one technique or one approach, we were able to draw upon multiple experts within their fields to contribute a broader set of analyses. It is a great example of how a center such as BESC can bring expertise from multiple disciplines to bear on research questions such as this." —Morgan McCorkle



Researchers at ORNL's BioEnergy Science Center have identified a single gene — represented in this protein structure visualization — that is responsible for ethanol tolerance in *C. thermocellum*. More ethanol-tolerant strains of the microbe could boost ethanol production from woody crops. Image: T Spletstoeser, scistyle.com

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.

- Oct. 6** Fall Golf Tournament
- Oct. 13** On Golden Pond - Oak Ridge Playhouse
- Oct. 22** Abingdon Virginia Creeper
- Oct. 27** Fall Festival
- Nov. 5** UT vs. Middle Tennessee - Football Game
- Nov. 8** Young Frankenstein - Tennessee Theatre
- Nov. 19** UT vs. Vanderbilt - Football Game
- Nov. 24** Little Women, The Musical - Oak Ridge Playhouse



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UT-Battelle donates \$250,000 to the Emory Valley Center



With conceptual drawings in the background, Thom Mason addresses the Emory Valley Center campaign kickoff, flanked by campaign co-chair Dr. Gene Caldwell (left) and honorary chairman Homer Fisher.

UT-Battelle has joined with the Y-12 in donating \$250,000 each to start a capital campaign for the Emory Valley Center in Oak Ridge. The nonprofit center provides rehabilitation, training, and support for 140 adults with mental disabilities.

Emory Valley Center's current facility, the Daniel Arthur Rehabilitation Center, is slated for demolition in 2015. In response, the center has launched a \$4 million drive to raise money for a new building, helped also with a \$500,000 gift from ProVision. The campaign will run for several years.

Lab Director Thom Mason; Darrel Kohlhorst, president and general manager of Y-12 National Security Complex; and Terry Douglass, president and director of ProVision Trust, announced the gifts. UT Senior Vice President Emeritus Homer Fisher served as press conference emcee.

"Our campaign is off to a tremendous start, thanks to these outstanding leadership contributions," said Dr. Gene Caldwell, co-chair of the campaign, who along with co-chair Dottie Thompson has overseen a total of \$1.3 million raised to date for the new Emory Valley Center facility.

In about three years, the original Emory Valley Road buildings that house the Center's programs — the 23,000-square-foot of the Daniel Arthur Rehabilitation Center and the original Emory Valley School building — must be torn down due to structural age and costly maintenance.

In 2008, the Anderson County Commission gave Emory Valley Center \$160,000 to buy 1.5 acres of land adjacent to the Center's administrative offices to construct a new building.

Fund-raising is now seriously under way for this building, with a capital campaign aimed at a \$4 million goal to construct a nearly 30,000-square-foot facility, capable of continuing, enhancing and expanding the Center's capacity to serve disabled citizens.

"We feel tremendously grateful to ProVision, UT-Battelle and B&W Y-12 for the genuine care and commitment reflected in these gifts," said Emory Valley Center President Jennifer Enderson. "We hope other businesses, foundations and individuals will consider the impact of Emory Valley Center toward helping individuals with intellectual and developmental disabilities, and that they will include this campaign in their charitable giving." 🌿

"Our campaign is off to a tremendous start, thanks to these outstanding leadership contributions."—Dr. Gene Caldwell

Fall, y'all

Festival and craft show Oct. 27. Let's celebrate fall, ya'll. Club ORNL will throw its annual fall bash from 11 a.m. to 2 p.m. on Thursday, Oct. 27. Plan to join your co-workers to help kick off the holidays with a free sack lunch and crafts galore.

Calling all Crafters. This Club ORNL event is for ORNL employee and retiree crafters who want to showcase their crafts—and sell them, too. (Please, no special interest groups need apply.) Tables will be set up on the first floor of the Conference Center and in Tennessee Conference Rooms A, B, and C.

Registration begins at 11 a.m. Tuesday, Oct. 11, and ends Friday, Oct. 14. To

register for this event go to this website. (https://share.ornl.gov/sites/clubornl/Pages/2011_FallFestival.aspx)

A map of the table layout and other event details will be sent to those who successfully register. A waiting list will be maintained in case of cancellations. Anyone participating in the festival who will need to be cleared for access to ORNL should contact Roxanne Raschke at raschkera@ornl.gov.

Note: ORNL retirees MUST log in using their XCAMS account and the following syntax:

Username: `extranet\username`

Password: This is the password you created—all lowercase

Everything you need to know about urinary incontinence but were afraid to ask

When it comes to women's health, urinary incontinence isn't a very popular or glamorous subject to explore. Nevertheless, most women struggle with this condition at some point in their lives. In addition, things like treatment costs and just plain old embarrassment mean that few women are willing to discuss this condition with a physician.

Dr. C. Bryce Bowling, director of urogynecology at the University of Tennessee Medical Center, visited ORNL to dispel myths and educate employees about UI.

To understand the symptoms and treatment options for UI, Dr. Bowling explained, it's important to understand the physiology behind the condition. "Think of the bladder as a balloon made of muscle," he said. "Its purpose is to act as a storage unit of sorts. When the bladder is full, a signal is sent to the brain, and properly functioning sphincter muscles relax with the bladder, allowing it to empty. As long as the muscles remain stronger than the pressure from the bladder, accidents do not typically occur."

UI can result from such life situations as childbirth, age, race, weight gain or a person's general anatomy, he explained further. The most common categories of UI are urge UI and stress UI, and sometimes a combination of the two. But, if properly diagnosed, treatment options for UI have proven successful.

URGE INCONTINENCE

Pam, a 48-year-old female in good health, has complained of UI for 4 or 5 years. Though she tries to respond quickly when she senses the urge to urinate, she often doesn't quite make it to a restroom. Oops! Pam suffers from urge incontinence, a condition caused by abnormal contractions of the bladder muscles. In this condition, the sphincter muscles cannot hold, thus involuntary leaks occur. Causes of this condition range from irritation of the bladder, to vaginal atrophy, to stress or age.

Dr. Bowling explains, "With urge incontinence, a person may have a need to urinate suddenly and frequently, sometimes even not long after emptying the bladder.

Triggers can include running water; exposure to cold temperatures; common, repetitive activities (just putting your keys in the door can be a trigger); or urinary tract infections. Medicines and caffeine can also be problematic, as they can increase urine production and bladder contractions."

The good news is that there are treatment options. Kegel exercises, which strengthen pelvic muscles, are often recommended to combat UI. If vaginal atrophy is the culprit, topical estrogen creams taken over a two- to three-month period can cure the problem. Anticholinergic medications can also help; however, serious side effects can occur in patients with dementia or narrow- and closed-angle glaucoma.

If Kegel exercises and medicines prove unsuccessful, Botox is also an option, but, Dr. Bowen warns, botox can cause all contractions to cease, thus resulting in the need for a catheter.

STRESS INCONTINENCE

Carol is a 52-year-old female who leaks small spurts of urine when she coughs, or laughs, or sneezes. She is able to go to the bathroom normally yet is forced to wear pads in order to avoid accidents. Carol is suffering from what's known as stress incontinence.

"Stress incontinence is usually caused by a weakening of the urethra and bladder muscles or increases in intra-abdominal pressure," explains Dr. Bowling. "Pelvic damage from childbirth is also a common cause of stress incontinence. Smoking, obesity, and a loss of tissue elasticity with age are other possible factors.

"Non-surgical treatments for stress UI again include Kegel exercises. Doctors can also try surgery to insert bulking agents into the bladder neck or a fascial sling, both of which procedures over time might need to be repeated."

If you are experiencing one or more of the symptoms described here, risk the embarrassment and talk to your doctor, advises Dr. Bowling. Rather than live with the fear of public embarrassment or accidents, seek treatment and continue to enjoy life.—Stephanie Ritchie



Treatment for UI
has proven successful.
Talk with your doctor
and continue to
enjoy life.

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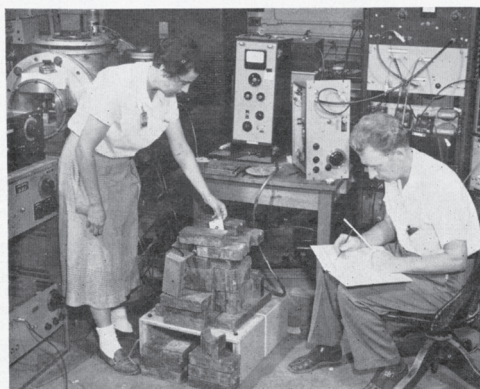
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OAK RIDGE, TENNESSEE

Friday, September 7, 1951



DETECTING RADIOACTIVE DECAY OF THE NEUTRON—The detection is achieved by means of the complicated apparatus shown above. Miss Frances Pleasonton, left, and Dr. A. H. Snell are shown checking the performance of the coincidence circuits. In this photograph, the neutron decay apparatus has been moved away from the pile face to a room with lower radiation background. The coincidence counters have been temporarily built into the pile of lead bricks in the center. Miss Pleasonton is inserting a radioactive source which is used for testing purposes.

Proof of Neutron's Radioactivity Obtained By Physicists At ORNL

Experimental research now being carried out by Dr. Arthur Snell and Miss Frances Pleasonton in the Physics Division has demonstrated beyond doubt that the neutron—one of the fundamental building blocks of which atoms are made—is actually unstable and cannot exist outside the nucleus of an atom for longer than a few minutes. This surprising fact had been predicted theoretically and has now been demonstrated conclusively at Oak Ridge National Laboratory in an experiment which has attracted widespread scientific interest.

Here is the story of the experiment as told by Dr. Snell:

The neutron and the proton have long been considered fundamental building blocks of atomic nuclei, and therefore of all matter. They differ most importantly in one respect: the proton possesses a unit of positive electric charge, but the neutron is neutral. In 1933 two Englishmen (Chadwick and Goldhaber) obtained the first accurate value for the mass of the neutron, and they were surprised to find that the neutron was slightly heavier than the proton. This meant that it would be theoretically possible for neutrons to turn into protons spontaneously through the process of radioactive beta decay. Hundreds of cases of this kind are known; for example, phosphorus 32 (atomic number 15) is slightly heavier than sulphur 32 (atomic number 16) and this enables a spontaneous transformation of phosphorus into sulphur to take place. Would neutrons (atomic number 0) similarly turn into hydrogen (atomic number 1)? Chadwick and Goldhaber predicted that they would.

The investigation of this phenomenon has since then been a challenge for the experimentalist. Because neutrons pass readily through matter, it is impossible to isolate a sample of neutrons in a bottle, to keep a selected number in a given spot so that their beta radiation could be observed by ordinary methods, or to subject them to conventional chemical processing. Furthermore, neutrons react readily with matter, giving a variety of side effects which could easily be confused with and indeed completely hide observable evidence of the radioactivity of the neutron. Very careful experimental distinction would have to be made between side reactions and actual neutron decay in order for the experiment to be successful.

In our experiment, we opened a hole in the 7-foot-thick concrete shield which surrounds the Oak



Dr. T. A. Lincoln

New Staff Physician Finds Oak Ridge Very Interesting

Dr. T. A. Lincoln, who recently became associated with the ORNL Health Division as a staff physician, has found Oak Ridge to be an extremely interesting place and quite unlike anything he had previously seen. What impressed him most, he said, was the novel way in which the residential district was laid out.

Dr. Lincoln's home town, Fergus Falls, Minn., is also an interesting place as it is only 30 miles from the corner of three states, the two Dakotas and Minnesota.

The new staff physician received his M.D. degree from the University of Minnesota in 1949. He received a B.A. degree in 1946 from Macalester College in St. Paul, Minn. Dr. Lincoln's internship was carried out at

RC Starts Course For Grey Ladies

A three-week Red Cross training program for all women interested in joining the Grey Ladies will begin at 7:30 p. m., Wednesday, September 17 in the Red Cross Building located on the Oak Ridge Turnpike. This training program will consist of a series of lectures, held on Monday and Wednesday evening from 7:30 to 9:30, which will describe the function and purpose of the Grey Ladies Organization and other welfare services related to Red Cross. Any woman who completes this training program may become a full-fledged Grey Lady upon the completion of ten hours probationary work in the Oak Ridge Hospital.

The Grey Ladies perform a large number of helpful services at the Oak Ridge Hospital such as visiting hospital patients and running errands for them, operating a loan library, and planning and participating in various recreational activities with the patients.

At the present time the Grey Ladies are particularly interested in securing working girls as new members. Anyone wishing to secure additional information about this organization is asked to contact Mrs. Whiteside, whose telephone number is 5-5641.

"Describes theory behind the atomic energy process in production of atomic reactor at Oak Ridge. Notes that with the production of radioisotopes there we now have the equivalent of tons of radium. Observes that Oak Ridge has done very well as regards security of the project and that, as far as is known, no spy has ever taken anything away from that place of 'mystery, magic and drama.'"

Ralph McGill in Atlanta Constitution 8/18, 8/17.

Technical Meetings

Biology Seminars beginning at 2:30 p. m., Thursday, September 6, in the conference room, building 9207. "Iodine Localization in Anuran Larvae." Dr. J. N. Dent, summer participant. "The Effect of Sodium Hydrosulfite and 2, 3 Dimercaptopropanol on the Sensitivity of Onion Root Tips to Gamma Radiation." Dr. H. P. Riley, summer participant. "Effect of Ultraviolet Radiation on Roots of *Phleum pratense*." Dr. R. T. Brumfield, summer participant.

No Oak Ridge Physics Seminar will be held on Friday, September 14.

Oak Ridge Physics Seminar at 4:00 p. m., Friday, September 7, in the east lounge of Ridge Hall. "Theory of Beta-Ray Activity." Professor S. R. deGroot, of the University of Maryland.

C. S. Harrill On Carbide Camera Club Program

Members of the Carbide Camera Club will hear Mr. C. S. Harrill of ORNL talk on "Home Movie Techniques" at their next monthly meeting set for 7:30 p. m., Tuesday, September 11, at the club's headquarters in the Y-12 North Portal building.

Mr. Harrill, Superintendent of the ORNL Instrument Department, and a past president of the Oak Ridge Cinema Club, will discuss various amateur movie techniques such as scene length, story sequences, titling, 8 mm vs 16 mm, editing, choice of equipment, and other phases.

The monthly print competition for September is black and white pictures of subjects which were taken on the club's Knoxville field trip. The club's darkroom custodian for the coming month is Ed Witt, phone number 8671.

Sixty years ago this month

Taken from *The ORNL News* for September 1951

- Physics Division researcher Dr. Arthur Snell demonstrated beyond doubt that free neutrons are unstable and spontaneously transform themselves into protons through the process of radioactive beta decay.
- ORNL geneticists William and Liane Russell get a well-deserved vacation to spend two weeks in Sussex, England, to visit relatives.
- Construction began on a new laboratory for the ORNL School of Reactor Technology. Dr. Alvin Weinberg will deliver the first lecture in reactor technology.
- The 1951 Oak Ridge Community Chest campaign is off to a good start. The General Office Division hit the 100% participation mark before the drive actually started.
- Dr. Alexander Hollaender, ORNL Biology Division, will fly to Paris, France, to attend the International Light Congress and present his paper entitled "Effectiveness of Ultraviolet Radiation in the Control of Air-Borne Infection."—prepared by ORNL History Room volunteers

From the Lab Director

As we marked last month's 10th anniversary of the terrorist attacks on September 11, 2001, I reflected upon ORNL's contributions to strengthening our national security during the past decade. Across the Laboratory, staff have focused on finding new ways to protect our homeland, counter the proliferation of weapons of mass destruction, and support the U.S. military with innovative science and technology. The results have been impressive.



ORNL staff supported the creation of the U.S. Department of Homeland Security, and the Laboratory's distinctive capabilities are regularly applied to DHS needs. Areas of particular emphasis include critical national infrastructure security and protection; portal monitoring and cargo screening; chemical, biological, radiological, nuclear, and explosive threat detection and response; and understanding and countering cyber threats to our national infrastructure.

“Throughout its history, ORNL has provided solutions to national and homeland security.”

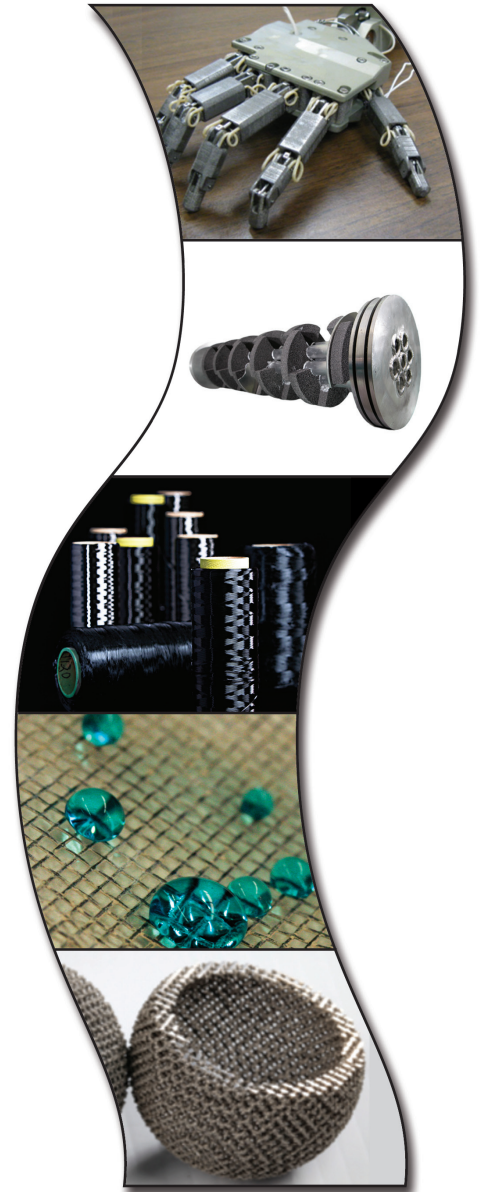
We have leveraged ORNL's unique facilities and expertise in nuclear materials and the nuclear fuel cycle to reduce the risk of nuclear proliferation, meeting the needs of customers including DOE, DHS, and the Defense Threat Reduction Agency. ORNL staff have traveled overseas to secure and protect nuclear materials, keeping them out of the hands of terrorist organizations, and made use of the Laboratory's specialized facilities to improve the detection and characterization of materials and activities associated with WMD production.

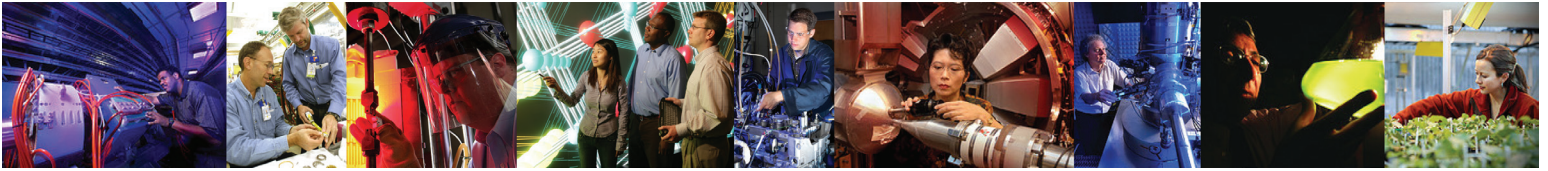
Our support for national defense extends from fundamental science and innovation supporting the Defense Advanced Research Projects Agency to applications of advanced materials, such as superhydrophobic coatings and graphite foam, for satellites, vehicles, and weapon systems. Our distinctive capabilities in systems sensing and analysis have been applied to solve a variety of problems for the Navy and the Marine Corps, and ORNL technology for countering improvised explosive devices is safeguarding soldiers and saving lives. Our work to find green energy solutions in mobile and stationary power and biofuels is increasingly important to the Defense Department, which has set ambitious goals for reducing its use of fossil fuels. A variety of government agencies are taking advantage of our strengths in high-performance computing to accelerate the analysis of potential threats to our national safety and security.

Throughout its history, ORNL has provided solutions to national and homeland security. Working together, we have made valuable contributions to overcoming the threats exposed by the terrible events of 9/11. I look forward with confidence to further ORNL innovations that will make America a stronger and safer nation.

Thomas Mason

Thom Mason





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Checking in from the Arctic

Environmental Sciences Division's Stan Wullschleger and a group of collaborators from ORNL and other national labs traveled around Alaska in August as part of the Next-Generation Ecosystems Experiment (NGEE) project, which focuses on the study of permafrost degradation and ecosystem feedbacks to climate. The team



scoped out potential field study sites near Nome and Barrow and met with community leaders to discuss the upcoming research. ORNL is leading the NGEE project, which includes partners at Los Alamos, Brookhaven and Lawrence Berkeley national laboratories and the University of Alaska at Fairbanks.