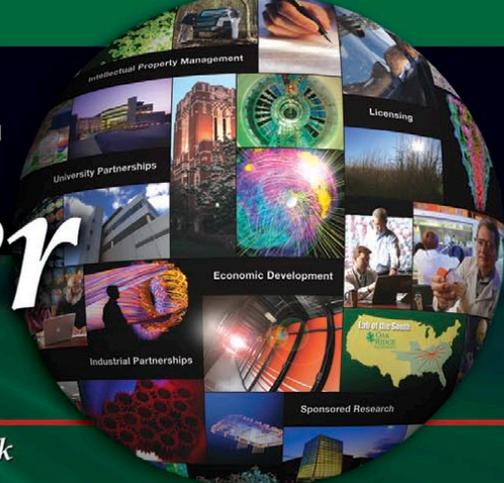


Newsletter



Putting Science to Work

DOING BUSINESS WITH ORNL

ORNL, Industry Collaboration Puts Spotlight on Solar*

Four manufacturers of solar energy components are working with Oak Ridge National Laboratory to address some of their biggest challenges.

Through individual cooperative research and development agreements (CRADAs), the companies hope to advance solar cell materials and processing technologies. The \$880,000 effort is funded by the American Recovery and Reinvestment Act through the US Department of Energy's Office of Energy Efficiency and Renewable Energy.

"By leveraging our expertise in materials science and manufacturing, ORNL will assist these partners with their individual solar manufacturing challenges and address opportunities to produce high-efficiency devices at substantially lower cost," said Craig Blue, director of ORNL's Energy Materials Program.

Solar cell manufacturing encompasses a broad range of disciplines, including crystal growth, continuous thin-film deposition, thermal annealing, barrier coating, joining and scribing techniques, and online quality control measures.

For these CRADAs Mossey Creek Solar (Jefferson City, Tennessee) is producing low-cost, high-quality silicon wafers with significant reductions in waste material and energy consumption. Global Solar Energy (Tucson, Arizona) is developing scalable nonvacuum deposition techniques for thin-film copper indium gallium diselenide, a direct-bandgap material for solar cells. Ferro Corporation (Independence, Ohio) is creating inks and pastes to be used for highly conductive layers in thin-film solar cell applications. Ampulse (Golden, Colorado) is developing an efficient roll-to-roll manufacturing process to deposit thin-film silicon. The industry cost share for the projects exceeds 50 percent of the total cost.

Through DOE's Industrial Technologies Program, ORNL issued a competitive solicitation to industry for proposals addressing key problems related to solar cell manufacturing. These projects, which ORNL expects to complete within 6 months, were selected following a technical and programmatic review process.

"These short-term focused projects are designed to provide proof of principle for innovative approaches to reducing the cost of solar cell manufacturing," said Chad Duty, ORNL program manager for Solar Technologies. "This is a unique and timely opportunity for ORNL to work with industry and set the course for a new generation of solar energy technologies."

(DOING BUSINESS WITH ORNL continued on page 7)

PREPARING FOR THE FUTURE

CASL Celebrates Opening of Headquarters

The Consortium for Advanced Simulation of Light Water Reactors (CASL), DOE's first energy innovation hub, was dedicated on May 3, 2011. Doug Kothe (pictured right), CASL's director, made the opening remarks and introductions at the ORNL ceremony. Attending the

(continued on page 2)



The ORNL Partnerships Directorate seeks to foster economic development and the growth of business and industry by making available the most innovative equipment, the latest technology, and the expertise of ORNL researchers to technology-based companies and research universities throughout the nation.

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MESSAGE FROM THE DIRECTOR



Tom Ballard

One of the frequently cited quotes about technology transfer is that it is a contact sport. Simply stated, this means that it requires a great deal of one-on-one interaction to produce the win-win agreements required for success. This is true for the entire portfolio of activities for which the Partnerships group at ORNL has responsibility, including relationships with industry and economic development organizations as well as licensing, and these activities are displayed very well throughout this current issue of our newsletter.

One example is our recent Bridging the Gap (BTG) event, a concept built on the platform of our former Global Venture Challenge (GVC), in which we were able to give exposure to some of our technologies while also hosting a business competition for college students. BTG is a joint venture between two Partnerships divisions, Industrial and Economic Development and Technology Transfer and the Center for Entrepreneurial Growth at Technology 2020. Collectively, the three groups worked many hours to identify our most ready-for-market technologies, packaged them in a venture capital presentation format, and presented them to about 60 entrepreneurs and investors who attended the event. Is BTG a better model than GVC? Time will tell, but several negotiations are already under way that are either directly or indirectly related to BTG.

Another set of articles focuses on licensing—from new agreements with Carpenter Technologies and TextOre to the recently announced Startup America initiative and DOE Secretary Chu's commitment to 100 options with startup companies. Our top priority is to ensure that ORNL technologies reach the market, and initiatives like Startup America and the 100-options project will help us reach that goal.

We also spotlight significant work that a Partnerships team has done to support the new \$125 million DOE nuclear modeling and simulation hub at ORNL—the Consortium for Advanced Simulation of Light Water Reactors—and another team's work to launch a consortium of startup companies and well-established global players focused on low-cost carbon fiber composites.

Regardless of the example, the work of the Partnerships team truly is a contact sport as we establish relationships, nurture those budding relationships into strong alliances, and ultimately create the win-win situations that allow us to successfully meet DOE's technology transfer mission. Let us know if you want to be one of the new partners cited in a future newsletter.

PREPARING FOR THE FUTURE (continued from page 1)

CASL Celebrates Opening *continued*

event were DOE Under Secretary for Science Steven Koonin and DOE Assistant Secretary for Nuclear Energy Pete Lyons along with representatives from ORNL and each of the other nine core CASL partner



organizations: Electric Power Research Institute, Idaho National Laboratory, Los Alamos National Laboratory, Massachusetts Institute of Technology, University of Michigan, North Carolina State University, Sandia National Laboratories, Tennessee Valley Authority, and Westinghouse Electric Company.

The dedication coincided with the opening of CASL's unique physical and virtual one-roof collaboration facility, the Virtual Office, Community, and Computing (VOCC), at the ORNL headquarters. VOCC provides a state-of-the-art collaboration space to support innovation and scientific collaboration among onsite and geographically separated partners and contributing members through both physical and electronic venues.

CASL will receive up to \$122 million over 5 years. Its 5-year vision is to develop a virtual reactor simulation tool with predictive capability, coupling state-of-the-art fuel performance, neutronics, thermal hydraulics, and structural models with existing system/safety analysis tools.

The Partnerships Directorate is responsible for providing partnership and alliance management and leadership for the Commercialization Council, which will oversee the rapid dissemination of information and intellectual property created within the CASL program.

More information about CASL is available at www.casl.gov/.

FUNDING IN ACTION



ARPA-E Hosts Summit, Invests \$130M in Energy Projects

The Advanced Research Projects Agency–Energy (ARPA-E) held its second annual Innovation Summit at the Gaylord Convention Center near Washington, DC, February 28 through March 2. The 2011 summit welcomed more than 2,100 attendees from 49 states and more than 20 countries to engage with energy innovators, technology entrepreneurs, venture investors, corporations, start-up companies, policy makers, universities, and national laboratories. Participants were treated to presentations by more than 90 energy experts and keynote speakers, including Secretary of Energy Steven Chu and Ray Mabus, Secretary of the Navy.

ARPA-E is designed to be an agile, dynamic innovation engine, making research investments in breakthrough energy technol-

ogies and thus facilitating commercialization of transformative products in the marketplace. The program seeks to leverage the federal investment by attracting private-sector venture financing for marketable technologies. By February 2011 six ARPA-E-funded companies had raised greater than \$100 million in private-sector investment in fewer than 12 months. In 2010, the agency's first year of existence, ARPA-E funded 121 transformative, high-risk, high-reward energy projects in energy storage, carbon capture, grid technology, materials, alternative transportation fuels, and building efficiency with a total of \$363 million. In 2011 ARPA-E was budgeted \$180 million by Congress and has since issued \$130 million in five calls for proposals: materials for solar, alternatives to rare earth materials, thermal energy storage, grid technologies, and alternative fuels for transportation.

EDUCATIONAL OUTREACH



First Class Graduates from AMTEC Program

On March 11, 2011, the first class graduated from Roane State Community College's

Advanced Materials Training and Education Center (AMTEC), located at the Halcyon Commercialization Center at ORNL. Having completed the requirements of the 4-month curriculum, these 20 students are now qualified for technician-level employment in the advanced materials industry. Advanced materials can be used to create lightweight, durable, and energy-efficient products. Automobile manufacturing, construction, and solar energy are just a few of the many fields that use such materials.

"Everybody wants to be a leader, and everybody wants to blaze a new trail," guest speaker Jamie Nelson, training and logistics manager for Toho Tenax America, told the graduates during the ceremony at the college's Oak Ridge campus. "You have done that. You have opened up a new door. What a proud moment it is for us all to see you at this point."

Graduation speakers also included State Representative John Ragan; State Representative Kelly Keisling; Nolan Nevels, director of the AMTEC; and Gary Goff, president of Roane State.

"Congratulations to you. We are very, very proud of you," Goff said during his address to the students. "It took a large partnership to make this happen," he added, referring to the combined support for the program from a Community-Based Job Training Grant from the US Department of Labor and grant partners ORNL; Toho Tenax America, Inc.; CoorsTek, Inc.; Protomet Corporation; USEC, Inc.; Confluence Solar, Inc.; Knoxville–Oak Ridge Innovation Valley; the Tellico Reservoir Development Agency; the Tennessee Solar Energy Association; the Tennessee Department of Labor and Workforce Development Local Workforce Investment Areas 3 and 4; the Community Reuse Organization of East Tennessee; Ametek, Inc.; and Babcock & Wilcox.

For more information about the AMTEC program, including how to apply, visit www.roanestate.edu/amtec.

(EDUCATIONAL OUTREACH continued on page 7)

Pictured are (front row, l to r) Suzanne Arehart, Zachary Womack, Dan Jones, John Keith, and David Howard; (second row, l to r) Jerry Denson, Duane Largent, Mark Vanwittenburg, Ben Graves, and Nicholaus Bowling; and (back row, l to r) Randy Raley, Ted Sharp, Matthew Jarvis, Kevin Mitchell, Michael Grindle, and Marc Bortolussi. (Not pictured are Cory Bailey, Barry Friedmann, Jon Franklin, and Kelli Lauderdale.)



PARTNERSHIPS INITIATIVES

Oak Ridge Carbon Fiber Composites Consortium Launched



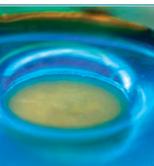
The Oak Ridge Carbon Fiber Composites Consortium was recently established to allow both large and small businesses and universities across the United States to become involved in the lab's work toward developing new, low-cost sources of carbon fiber composites. ORNL's efforts build on more than a decade of leadership in carbon fiber research and development (R&D) and a recent \$34.7 million DOE award to ORNL to design, construct, and operate the Carbon Fiber Technology Facility, which will include a pilot plant capable of producing 25 tons of new low-cost carbon fiber materials.

"We have hosted visits by nearly 100 companies over the past year and a half," explained Tom Rogers, ORNL's director of Industrial Partnerships and Economic Development, when asked about the purpose behind the new consortium. "Many of those company representatives expressed strong interest in staying engaged with us and helping the lab accomplish its DOE goal of successfully transferring these new low-cost fibers into commercial-scale use in applications such as vehicles and wind energy."

The consortium will allow member companies to serve on an industry advisory board, work with ORNL staff on key technical issues, and provide critical feedback to ORNL regarding market-driven technology development and deployment opportunities.

Partnerships has also developed a commercialization strategy for the lab's carbon fiber and composites R&D work and has assisted Roane State Community College in establishing the Advanced Materials Training and Education Center at the Halcyon Center on the ORNL campus.

For more details about the consortium and information on how to become a member, please see www.cfcomposites.org or contact Dan Miller at millerdw@ornl.gov or 865-574-3640.



Superhydrophobic Symposium Enables Information Exchange

ORNL recently presented a symposium on superhydrophobic materials that got everyone talking—literally. Held at the lab and hosted by Chad Riggs, Tom Rogers, and Mike Paulus of the Partnerships Directorate, the symposium focused on the ABCs (application, bonding, and coating) of superhydrophobic materials and provided an opportunity for industry representatives and ORNL researchers and inventors to discuss this widely applicable technology.

"Bringing together various components of a new product development/supply chain enables faster and more successful commercialization of the technology," said Alex DeTrana, a commercialization manager in the Partnerships Directorate at ORNL who participated in the event. "The symposium was a catalyst for those types of interactions that never would have occurred otherwise."

Partnerships invited representatives from industries including manufacturers of recreational goods,

glass, military and nonmilitary clothing and fabric, paint and coatings, and building materials as well as coatings makers to gather with ORNL scientists for the symposium. This mix of participants allowed the coatings manufacturers to interact with the potential users of their materials and the scientists to learn about industrial applications of their technology. After presenting an overview of the superhydrophobic technology, John Simpson, the principal investigator behind it and member of the Measurement Science and Systems Engineering Division at ORNL, led a roundtable discussion with more than 25 coating experts. Then participants were free to break out into smaller groups for more detailed discussions.

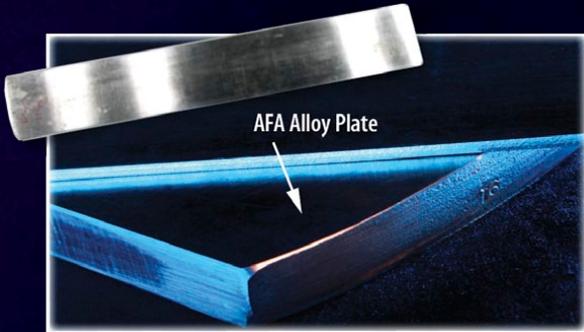
Veloxflow, the first licensee of the technology and a coatings provider for municipal water and waste pipes, was one participant that definitely benefited from the event. The company is making a superhydrophobic powder for use in its own field, but it needed coatings specialists to help integrate the powder into its process. The symposium gave company representatives



Chad Riggs, Tom Rogers, and Jennifer Caldwell review the large number of attendees and refine their licensing strategy.

SPOTLIGHT ON PARTNERSHIPS

ALUMINA-FORMING AUSTENITIC ALLOY LICENSED TO CARPENTER TECHNOLOGY CORPORATION



The ORNL-developed alumina-forming austenitic stainless steel alloy, now licensed by Carpenter Technology Corporation, delivers superior high-temperature and corrosion resistance at a much lower cost than conventional nickel-base alloys.

Metal alloy manufacturer Carpenter Technology Corporation has licensed an alumina-forming austenitic stainless steel alloy developed at ORNL. This new alloy, developed by Michael Brady, Yukinori Yamamoto, Phil Maziasz, Michael Santella, Bruce Pint, Chain T. Liu, and Zhaoping Lu, is unique in that the composition allows for alumina scales to form on the exterior of the steel, providing significant oxidation resistance. It also displays excellent creep strength at high temperatures (700 to 800 degrees Celsius). While some of these characteristics may

be found in existing alloys, this new one can be produced at a lower price than the older ones, which require high amounts of nickel.

“Any application in which high temperatures or corrosive environments are encountered could be a potential application of this technology,” said Tim Armstrong, Carpenter Technology vice president for research and development.

Potential applications include recuperators and heat exchangers, downhole drilling, and chemical processing equipment and materials. The agreement with Carpenter allows for the sale of the alloy in a variety of bulk forms that have been vacuum melted.

Carpenter Technology Corporation, based in Wyomissing, Pennsylvania, develops,

manufactures, and distributes cast-wrought and powder-metal stainless steels and specialty alloys including high-temperature (iron-nickel-cobalt base), stainless, corrosion-resistant, controlled-expansion alloys; ultra-high-strength and implantable alloys; tool and die steels and other specialty metals; and cast-wrought titanium alloys.

The ORNL research was supported by DOE’s Fossil Advanced Research Materials program and ORNL’s SEED program. The scale-up and commercialization efforts have been funded by the DOE Energy Efficiency and Renewable Energy (EERE) Industrial Technologies Program and the EERE Commercialization and Deployment program.

At table, ORNL Director Thom Mason (l) and Carpenter Technology’s Vice President for Research and Development Tim Armstrong (r) sign a licensing agreement for an alumina-forming austenitic stainless steel alloy developed at ORNL. Standing are the alloy development team members, ORNL’s Phil Maziasz, Zhaoping Lu, Michael Brady, and Bruce Pint, with Alex De Trana, ORNL commercialization manager. Team members not pictured are Jim Keiser, Chain Liu, Mike Santella, Vinod Sikka, Dave Stinton, Ian Wright, and Yukinori Yamamoto.



Superhydrophobic *continued*

the opportunity to network with such specialists as well as to connect with other potential licensees with whom Veloxflux could contract to produce powder. While many licensees may choose to build their own powder-producing facilities, others could partner with companies such as Veloxflow to either purchase existing material or have powders created to their specifications. Such partnerships would make deployment of the technology across diverse fields faster, easier, and less expensive.

Other attendees achieved similar results through interacting with new potential partners and developing a supply-chain path for connecting to this and other new technologies developed at ORNL. Lab scientists also benefitted by gaining an understanding of how industry uses coating technology. Such events are critical pieces to meeting the ultimate goal of helping the lab better position itself for smoother and more successful transfers of technology to industrial partners for commercialization.

PARTNERSHIPS INITIATIVES (continued from page 5)

BRIDGING THE GAP



INAUGURAL CONFERENCE SUCCESSFUL DATES SET FOR 2011

Partnerships hosted the first-ever Bridging the Gap (BTG) technology commercialization conference at ORNL on April 5–6. The event, which underscored ORNL's commitment to translating its world-class science and technology research into market-ready applications, was attended by more than 50 entrepreneurs and investors from across the country. BTG featured presentations on six of the most promising technologies available for license; an inspirational keynote address from Steve Hane, the CEO of Ampulse, Inc.; and opportunities for attendees to interact with lead-



Keynote speaker Steve Hane

ing researchers from nine different research and development areas, from energy storage to advanced manufacturing.

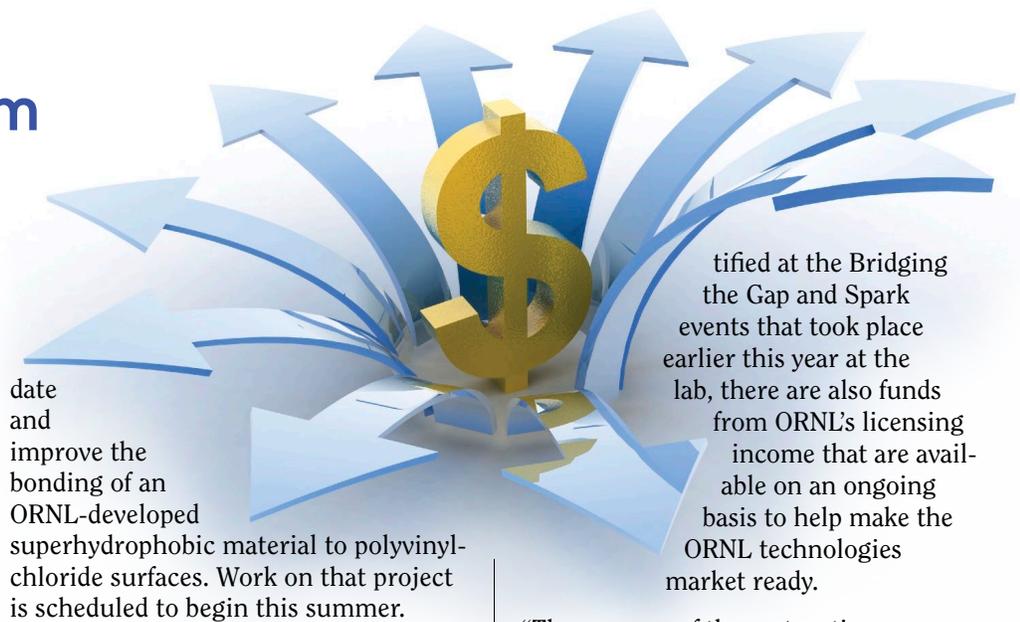
A survey of attendees indicated very strong support for the event: 100 percent of the respondents asked to be invited to similar events in the future, and many offered positive suggestions on ways to make the event even more productive. One investor was very impressed with the technology presentations: "Their consistency, cogency, and attention to potential applications made them an exceptionally useful exercise for us as investors, and they place Bridging the Gap among some of the better tech transfer and commercialization events," he said.

Mark your calendars for the second annual ORNL BTG conference slated for March 7–8, 2012.

Bridging the Gap Maturation Program

Although ORNL is one of the nation's premier leaders in the development of new science and technologies, it often needs to adapt or demonstrate the effectiveness of new technologies before they can be commercially marketed. To help address the challenges involved in successfully marketing ORNL technologies, Wendolyn Holland, DOE senior advisor to the assistant secretary, and Tom Ballard, ORNL director of Partnerships, announced the availability of a maturation program with funding of \$210,000. The money, pooled from DOE's Office of Energy Efficiency and Renewable Energy Technology Commercialization Fund and ORNL's royalties, is being made available on a competitive basis to support ORNL research and development and advance technologies through partnerships while simultaneously supporting start-up businesses and entrepreneurship.

ORNL scientist John Simpson and ORNL licensee Velox Flow submitted the first winning project, a collaboration to vali-



date and improve the bonding of an ORNL-developed superhydrophobic material to polyvinylchloride surfaces. Work on that project is scheduled to begin this summer.

The Partnerships team is reviewing several other applications for potential support. Funding decisions will be based on the commercial potential for the proposed use of the technology, the feasibility of the proposed work, and the availability of researcher time to complete the project.

While this money was set aside specifically to support technologies iden-

tified at the Bridging the Gap and Spark events that took place earlier this year at the lab, there are also funds from ORNL's licensing income that are available on an ongoing basis to help make the ORNL technologies market ready.

"The purpose of the maturation program is to make the final investments necessary for lab technologies to be attractive to commercial partners," said Mike Paulus, ORNL director of Technology Transfer. "If a prospective partner tells us they will license and commercialize a technology if the lab can provide a working prototype or answer a specific technical question, then we want to support that effort."

DOING BUSINESS WITH ORNL (continued from page 1)



Asylum Research Introduces Innovative ESM Imaging

Asylum Research, the technology leader in scanning probe microscopy and atomic force microscopy (SPM/AFM), has announced the new electrochemical strain microscopy (ESM) imaging technique for its Cypher and MFP-3D AFMs. Developed by ORNL and Asylum, ESM is an innovative SPM technique capable of probing electrochemical reactivity and ionic flows in solids at levels below 10 nanometers, for the first time allow-

ing scientists to peer into the smallest of structures and observe their behaviors. ESM is also the first technique that directly measures ionic currents, providing a new tool for mapping electrochemical phenomena on the nanoscale. The ability to probe electrochemical processes and ionic transport in solids will be invaluable for a broad range of applications for energy generation and storage ranging from batteries to fuel cells. ESM has the

potential to aid advances in these areas through major improvements over other conventional technologies: the resolution to probe nanometer-scale volumes and the inherent ability to decouple ionic from electronic currents with imaging capability extended to a broad range of spectroscopy techniques reminiscent of conventional electrochemical tools.

(ASYLUM & DOING BUSINESS WITH ORNL cont'd. on page 8)

EDUCATIONAL OUTREACH (continued from page 3)

VW Scholars

A welcome luncheon for the 2011 class of the Volkswagen (VW) Scholars Program was held in June. This program sponsors ORNL internships for upper-division and postgraduate students interested in careers in the automotive industry, and the class of 2011 will be ORNL's second. This year's VW scholars are Emily Buckman, Dominic DePaoli, Chad Kimsey, Dustin Mason, Gregory Miller, Daniel Soskel, Emily Stark, Teresa Barone, and David Smith. The ORNL mentors for this year are Claus Daniel, Chad Duty,

Paul Ewing, and Bob Norris. The VW Scholars Program is managed by Oak Ridge Associated Universities (ORAU), a nonprofit organization that manages ORNL's internship and fellowship programs.

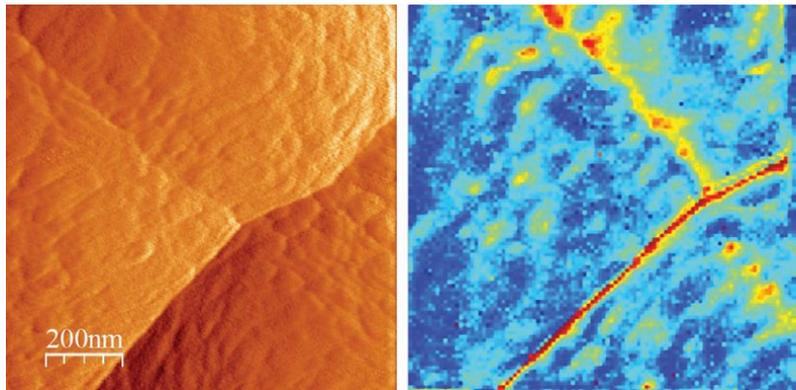
Included in the photo are Guenther Scherelis, general manager-communications, Volkswagen Group of America-Chattanooga Operations; Tom Ballard, director of Partnerships; Marisa Moazen, postgraduate recruiter/program manager of Science Education Programs at ORNL, Oak Ridge Institute for Science and Education; and Wayne Stevenson, vice president and director of science education, ORAU.



DOING BUSINESS WITH ORNL (continued from page 7)

 **Asylum Research** continued

Commented Roger Proksch, president of Asylum Research, “Progress in energy storage and conversion will be greatly facilitated by the ability to study batteries and fuel cells at the level of several nanometers. ESM provides functional imaging of electrochemical phenomena in volumes millions to a billion times smaller than conventional current-based electrochemical techniques. This new technique opens the pathway to understanding energy technology and ionic devices on the level of individual grains and defects, thus bridging macro-



Topographic (l) and ESM (r) images of an amorphous silicon anode in a thin-film battery structure with an effective ESM resolution of about 10 nanometers.

(continued on page 9)

TextOre Receives License for Award-Winning Discovery Engine

 TextOre Inc.’s licensing of ORNL’s Piranha is enabling the Virginia-based company to introduce a powerful search and mining tool capable of processing large amounts of text data from the Internet.

Piranha, a knowledge discovery engine that won an R&D 100 Award in 2007, is an intelligent-agent-based technology that will allow TextOre to analyze text data with unprecedented speed and accuracy. The software sorts huge numbers of text documents into groups that are easily processed. Coupled with an enterprise-level engine called Raptor, also developed at ORNL, Piranha can provide information from across an entire organization or any large collection of data.

“The system can find similar documents to a document of interest, remove duplicated documents such as identical news stories from different sources, and automatically classify documents by topic,” said Tom Potok of ORNL’s Computational Sciences and Engineering Division, who led the development team.

Because of the scalability of the agent architecture and better algorithms, Piranha runs 100 times faster than other search

engines and can work with continuously changing data sets. It has already been used by the US military and Department of Homeland Security to analyze large sets of streaming data.

CEO Robert Stewart envisions the acquisition of Piranha helping TextOre add jobs in software development, sales, and marketing for the new suite of products to be created. And with these new products, the company expects to compete on a global scale. “All of the tools being developed between TextOre and Oak Ridge National Laboratory are multilingual and capable of searching, clustering, and mining data in any language from large repositories of data around the world,” Stewart said.

“The relationship with Oak Ridge National Laboratory will allow TextOre to rapidly accelerate our product development and bring these highly advanced technologies to the global market faster,” Stewart said.

Pictured are (front, l to r) Robert Stewart, CEO of TextOre Inc., and Tom Ballard, director of ORNL Partnerships, and (back, l to r) David Sims and Barbara Beckerman of ORNL; Oyvind Berentsen of Abile AS; Jim Treadwell and Knut Sundfjord of TextOre; Jeff Nichols, ORNL associate laboratory director of Computing and Computational Sciences; and Mark Elmore, Robert Patton, Wade McNair, and Tom Potock of ORNL.



DOING BUSINESS (continued)

scopic functionalities and atomistic mechanisms. This in turn will lead to improved energy storage solutions—batteries with extremely high energy densities and long lifetimes and fuel cells with very high energy densities and efficiencies.”

“Traditionally, scanning probe microscopy techniques allowed measurement of electronic currents and short- and long-range forces,” added Sergei Kalinin, senior research staff member in the Center for Nanophase Materials Sciences at ORNL and coinventor (with Nina Balke and Stephen Jesse) of ESM. “ESM extends this capability to measure ionic currents and has already been demonstrated for a variety of Li-ion cathode, anode,

and electrolyte materials, as well as oxygen electrolytes and mixed electronic-ionic conductors. The ubiquitous presence of concentration-molar volume coupling in electrochemical systems suggests that this technique is in fact universal for solid state ionic imaging—from batteries and solid state to memristive electronics.”

Stephen Jesse added, “Perhaps even more importantly, the use of band excitation and DART engines allows measurements to be performed on rough surfaces of realistic electrochemical materials, making ESM useful for real materials and devices.”

ORNL, CLIMATEMASTER PARTNER TO EVALUATE IHP PERFORMANCE



Engineers at ORNL are working with ClimateMaster, a major manufacturer of geothermal heat pump systems to monitor the performance of one of the company’s newest high-efficiency products.

The ClimateMaster integrated heat pump (IHP) uses a single ground-source heat pump (GSHP) unit to provide heating, cooling, and hot water. Two-ton IHP prototypes were installed in November 2010 in each of two model houses built in Oak Ridge, Tennessee, by ZEBRAAlliance, a public-private project working to develop and popularize sustainable building technologies. A third unit will be installed in another house in Oak Ridge in the summer of 2011, said ClimateMaster spokesman Shawn Hern.

Each unit will operate for at least a year. ORNL monitors the power usage, capacities, and efficiencies of the prototype units and provides the monitoring data to ClimateMaster. A commercial two-speed GSHP and a GSHP water heater were operated in the same houses for a year to establish an energy consumption baseline, which is being compared with data from the IHPs.

“We’re looking for efficiency gains over current technology,” said Hern. “Most space conditioning units provide only heating and cooling. We’re looking at the building as a whole—after you reduce your space conditioning requirements, the next largest energy user is

hot water. We’re trying to address both those end uses in one highly efficient unit.”

Data from the field tests have already helped identify some areas for attention that might not be captured in a typical field trial because of the high level of detail ORNL can provide, Hern said. “It’s definitely been a good partnership for us.”

ORNL operates the premier US research facility dedicated to technologies to improve the energy efficiency and sustainability of buildings. It partners with private industry to develop and evaluate building and equipment technologies and bring them to market. ZEBRAAlliance (for Zero Energy Building Research Alliance) was founded by ORNL and Schaad Companies, a Knoxville-based builder specializing in green building techniques. It also includes the Tennessee Valley Authority and several industry partners. ClimateMaster is the world’s largest manufacturer of geothermal and water-source heat pumps. All of its products are manufactured in the United States.

Among the energy-efficiency technologies in this house in the Wolf Creek subdivision is a ClimateMaster high-efficiency integrated heat pump.



AWARDS AND RECOGNITION

Inventors Recognized at Ceremony



Partnerships' own Mike Paulus receives his Battelle Distinguished Inventor award from Tom Ballard (l) and Thomas Zacharia (r).

ORNL Deputy Director for Science and Technology Thomas Zacharia, Partnerships Director Tom Ballard, winners, and others gathered on April 8 to honor ORNL's 2010 award recipients by adding their plaques to ORNL's wall of past honorees. Seven of those recognized were recipients of Battelle's Distinguished Inventor awards for 2009 and 2010: Lynn Boatner, Charles Britton*, Gilbert Brown, Eli Greenbaum*, Howard Haynes, Phil Maziasz, and Mike Paulus.

Being named a Distinguished Inventor is an extraordinary honor. As members of Battelle's laboratory community, ORNL researchers are eligible for the award, which was developed to recognize Battelle's history of innovation and the scientists behind it. To receive it an inventor must have at least 14 patents executed during his or her career at Battelle.

Also honored at the event were the eight R&D 100 Award winners for 2010 who added their plaques to the ORNL wall of fame.

**2009 recipient*



Lynn Boatner



Charles Britton



Gilbert Brown



Eli Greenbaum



Howard Haynes



Phil Maziasz

(AWARDS AND RECOGNITION continued on next page)

SAFETY REMINDER

Fire Ants Are Growing Threat in Tennessee

Imported fire ants were accidentally introduced from South America in 1918. Today, they are common in most of the southern half of the United States. Fire ants live in large numbers in mounds and respond very aggressively when their nest is disturbed by attacking in large numbers. Their stings are fiery, itchy, and painful; worse, each ant can sting repeatedly. Victims experience pain, swelling, and redness at the sting site followed by a pus-filled blister and a red welt about twice the size of a normal freckle. Approximately 1 percent of those stung experience a whole-body allergic reaction with severe and even life-threatening symptoms. Mild reactions (inflammation and itching) can be relieved with

- cool compresses,
- oral antihistamines, and
- corticosteroids.

Seek medical attention for multiple stings or if any more serious allergic symptoms occur from a fire ant bite. The best advice for preventing fire ant stings is to know what fire ant mounds look like and avoid them.



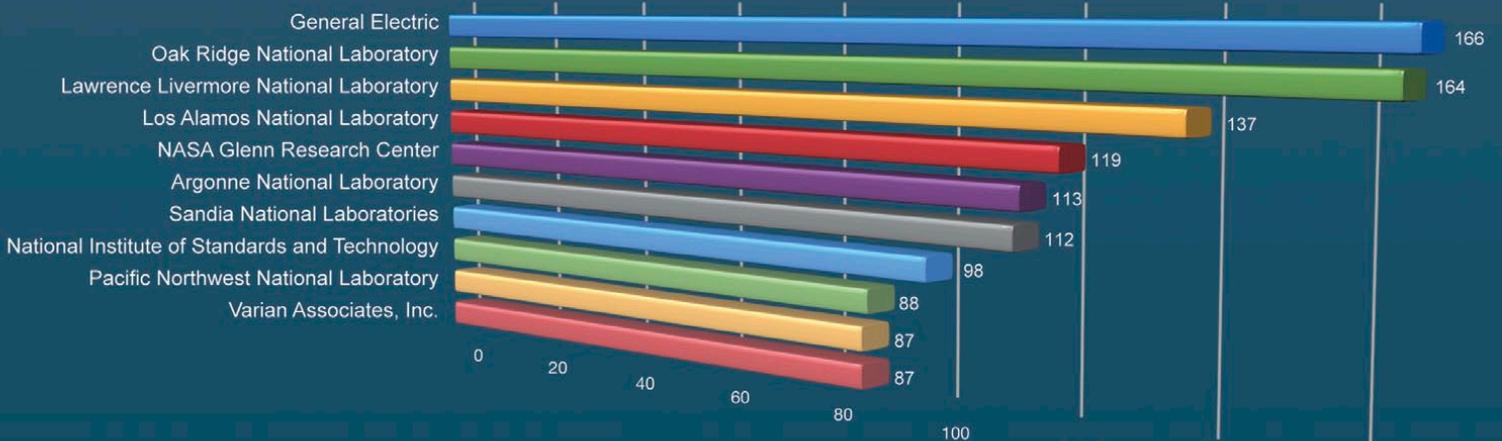
AWARDS AND REWARDS (continued)

2011 R&D 100 Awards for ORNL

This year ORNL scientists and engineers received seven of *R&D Magazine's* R&D 100 Awards, bringing the total number won to 164, more than any other national lab. These awards honor the 100 most outstanding advances in technology for the year. As in years past, the winning technologies this year included innovations submitted by teams of ORNL and industry partners.

- **Mesoporous Carbon for Capacitive Deionization Electrodes for Desalination.** Frederic W. Seamon III, Campbell Applied Physics in Rancho Murieta, CA, with Sheng Dai, Richard Mayes, David DePaoli, Costas Tsouris, James Kiggans, Jr., Craig Blue, Charles Schaich, and Xiquing Wang, ORNL
- **NextAire Packaged Gas Heat Pump.** Southwest Gas in Las Vegas, NV, and IntelliChoice Energy in Phoenix, AZ, with Ed Vineyard, Abdolreza Zaltash, Randall Linkous, Isaac Mahderekal, Randall Wetherington, and Patrick Geoghegan, ORNL
- **CermaClad Cladding Technology.** MesoCoat of Euclid, OH, and EMTEC, of Springfield, NJ, with Craig Blue, Art Clemons, Nancy Dudney, Chad Duty, David Harper, Adrian Sabau, Vinod Sikka, Ron Ott, and John Rivard, ORNL
- **New Stainless Steel Alloy Tooling for High Temperature Presses That Form Aircraft Components.** Roman Pankiw, Don Voke, and Alberto Jablonski of Duraloy Technologies in Scottsdale, PA, with Govindarajan Muralidharan, Phil Maziasz, Neal Evans, Mike Santella, Chris Stevens, Jackie Mayotte, Ed Kenik, Vinod Sikka, and Ken Liu, ORNL
- **Multiresolution Adaptive Numerical Environment for Scientific Simulations.** Robert Harrison, George Fann, Judith Hill, Diego Galindo, Jun Jia, and Rebecca Hartman-Baker, ORNL

- **Nano-Optomechanical Hydrogen Safety Sensor Based on Nanostructured Palladium Layers.** Nickolay Lavrik, Panos Datskos, Scott Hunter, Barton Smith, ORNL, with Michael Sepaniak and James Patton, University of Tennessee–Knoxville, Department of Chemistry
- **Self-Assembled, Ferromagnetic-Insulator Nanocomposites for Ultrahigh-Density Data Storage.** Amit Goyal, Junsoo Shin, Claudia Cantoni, and James Thompson, ORNL



R&D 100 Awards: historic totals for 2009–2011. With more R&D 100s than any other national lab, ORNL's only competition for the most awards overall is General Electric.



Licensing



Intellectual Property



Sponsored Research



Industrial Partnerships



Economic Development

UPCOMING EVENTS

August 8-10

Tennessee Valley Solar Solutions Conference, Nashville, TN.
www.tnsolarsolutions.org/index.htm

September 22-23

2011 Governor's Conference on Economic and Community Development, Nashville, TN. www.tn.gov/ecd/whatsnew/

November 30-December 2

AURP 2011 International Conference: Developing the Culture of Innovation and Entrepreneurship, New Orleans, LA.
www.aurp.net/index.php?option=com_content&view=article&id=52

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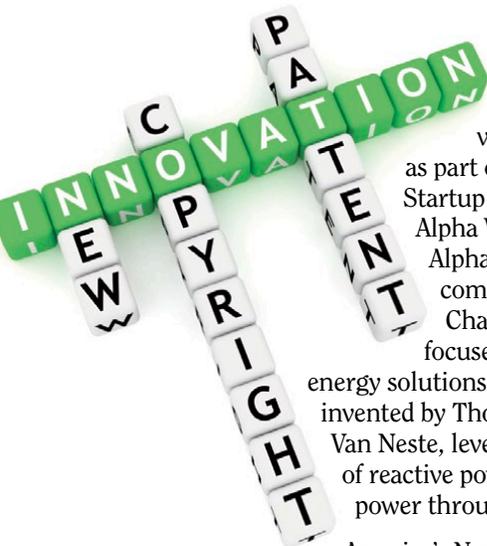
Electronic Delivery Option

Want to stay in the Partnerships loop while reducing the stack of mail on your desk? Go to our updated website at www.ornl.gov/partnerships to view the newsletter online and sign up to receive it via e-mail.

PROVIDING UNIQUE OPPORTUNITIES

America's Next Top Innovator Challenge

STARTUP AMERICA



ORNL executed its first patent option agreement under the DOE America's Next Top Innovator Challenge (developed as part of the federal government's Startup America Initiative) with Alpha V, Inc., on June 5, 2011.

Alpha V, an early-stage start-up company headquartered in Chapel Hill, North Carolina, focuses on developing innovative energy solutions. The optioned technology, invented by Thomas Thundat and Charles Van Neste, leverages the phenomenon of reactive power to transmit electrical power through the surface of the earth.

America's Next Top Energy Innovator Challenge, which began May 2, 2011, runs through December 15. The challenge gives entrepreneurs the opportunity to obtain option agreements to license groundbreaking technologies developed by the national laboratories with reduced paperwork and cost—the start-up-friendly cost is \$1,000, which represents an average savings of \$10,000 to \$50,000 in upfront fees.

Since becoming the managing contractor for ORNL in 2000, UT-Battelle has emphasized promoting entrepreneurship and supporting start-up companies. UT-Battelle supports and continues to fund the Center for Entrepreneurial Growth (www.tech2020.org/ceg_about.html). With more than 1,200 patents in fields including energy and engineering, material science, biology and environment, and computer science, ORNL is well positioned to support and participate in this unique initiative, whose goal, as stated by Secretary of Energy Steven Chu, is to "...unleash America's innovation machine and win the global race for the clean energy jobs of the future." Entrepreneurs who complete the process and demonstrate progress toward executing their business plan and commercializing the technology will have the opportunity to be showcased at the 3rd Annual ARPA-E Energy Innovation Summit in 2012, which will bring together leading technology start-ups and clean energy investors from around the country.

ORNL has a searchable database of its entire portfolio of licenses at www.ornl.gov/partnerships. DOE also has a searchable database of energy-related technologies from all of the national laboratories at its Energy Innovation Portal, techportal.eere.energy.gov/.