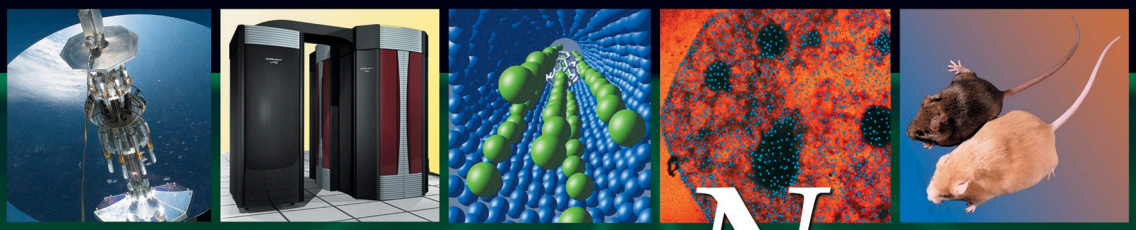
TECHNOLOGY TRANSFER
AND ECONOMIC DEVELOPMENT



Putting Science to Work

FALL 2006
Newsletter

BUILDING
ECONOMIC DEVELOPMENT

ORNL Hosts SBIR Program Energy Summit

The first-ever Department of Energy and Department of Agriculture Small Business Innovation Research Programs Energy Summit was held at ORNL in early July with nearly 120 persons attending. The conference was planned as a way to share information about the SBIR programs of the USDA and DOE. These programs provide approximately $350 million annually to small businesses to support research that will lead to the development of new products.

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Nekkion Crowder displays a marketing data image on the "EVEREST" PowerWall in the Center for Computational Sciences.

PEOPLE IN TTED NEWS

UT Students Now Part of Tech Transfer Organization

ORNL's technology transfer strategy has added a creative new element. In addition to investments in conventional technology commercialization efforts, ORNL is making similar long-term investments in the development of "human capital" needed to sustain a successful tech transfer program. At the University of Tennessee, graduate students in business and engineering work part-time nudging ORNL inventions closer to commercialization. Participants are recruited and mentored by Pat Richardson, director of Strategy and Business Development for Technology Transfer and Economic Development.

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In This Issue:

ORNL Technology Transfer & Economic Development (TTED) 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 throughout the nation.

MESSAGE FROM THE DIRECTOR

Alex Fischer

In reviewing this month's newsletter and the article on our UT MBA partnership, I was asked why we created the program four years ago and why I was passionate about the work that our students do for TTED. In answering that question, let me take a moment of personal privilege.

Little did I know it at the time, but my future career changed on the day that I entered Graduate School at the University of Tennessee. I was meeting with the director of UT's School of Planning, preparing to get my faculty assignment associated with my Graduate Assistantship. I was asked if I'd be interested in filling a recently vacated slot as a graduate intern at the Tennessee Technology Foundation, created by former Governor Lamar Alexander. TTF was established on the "Knoxville/Oak Ridge Technology Corridor" to promote technology-based economic development. There was an apparent need for a staff planner to review architectural design guidelines along the Pellissippi Parkway. I figured it was probably a more relevant experience to my desires to be an urban planner than doing research for a faculty member, so I said sure, where is the Pellissippi Parkway and what's Oak Ridge?

I never imagined that a quick decision would forever change my professional career. Over the ensuing two years, I worked on land-use and zoning issues that were my initial interest, but increasingly I got involved in the early efforts of technology-based economic development in our region. My assignments varied from things like chairing the Pellissippi Parkway Beautification Committee (Marie Compere's brainchild to plant thousands of daffodils along the parkway) to creating the Telecommunications Resource Center (later renamed Technology 2020). Just imagine that we thought we were on the cutting edge in those days when we implemented the first "Fax on Demand" system that would use a new technology, the facsimile, to send "fax" sheets to industrial prospects on properties in our region….but I digress.

More than the interesting and diverse work of the foundation, I met a series of mentors and community leaders who were involved in the Tennessee Technology Foundation. Each of them in his/her own way took time to shape my passions, challenge my thinking and guide my career – then and still today… First and foremost, Dave Patterson. But also Jeff Deardorff, Mike Ragsdale, Herman Postma, Jim Haslam, Pete Craven, Gene Joyce, Bill Arant, Ginny Morrow, Tom Rogers, Tom Ballard, Darrell Akins, and others who were involved with the foundation's earliest work. Over the years, they and many others have taken the time to shape my professional passions and career. But, first and foremost, they, not just with me, but with so many others took the time to invest in mentoring and challenging those early in their careers – we can all learn from that example.

Simply put, I hope we can do the same with the students in our UT MBA program. Sure, we get bright, hard-working staff members who will put their heart and soul into assignments for a few bucks and a tuition waiver to school. But we also get a fresh perspective on our work and new ideas that can improve our efforts. Along the way, I hope they get exposed to a world that they may have never dreamed about that is rich in the discovery of new ideas, technology, and job creation. I am confident they'll get exposed to a potpourri of other professionals and "characters" who, in turn, might mentor them in their own unique ways. And who knows, perhaps someone reading this might turn to the article in this newsletter and find some outstanding talent that could serve your organization as we seek to grow and keep our best talent right here in the Innovation Valley.

As an aside, in the first few months that I showed up at the Technology Foundation, we started keeping a list that ultimately became part of my master's thesis on the impact of high technology on the Knoxville economy. I looked back on it recently, and we had a little over 100 technology-based companies on that first list. A couple of years ago, Knox County Mayor Mike Ragsdale asked us to update the list, and I think we were all surprised to find that it now stands at more than 1,000 companies strong. Not bad progress! Sometimes those of us currently leading efforts and institutions have a tendency to revise our own history based on the here and now. We forget the great debt of gratitude and responsibility to the fore-mentioned pioneers of the "Technology Corridor" and leaders in our region's earliest efforts to leverage the great assets of the Oak Ridge community and our world-class national laboratory.

Safety Reminder

Fall is the perfect time to check your home for fire hazards. Here are a few suggestions.

- Look for piles of newspapers, magazines, boxes, or other combustible materials and remove from your house, garage, or yard to reduce the risk of fire. Recycle them, and you're helping save the environment, too.
- Call a professional to inspect/clean your fireplace and chimney for creosote buildup.
- Have your furnace cleaned and inspected to keep it running trouble-free all winter. Test your carbon monoxide detector regularly.

Best wishes for a safe autumn season from the ORNL Technology Transfer and Economic Development staff.

(BUILDING ECONOMIC DEVELOPMENT continued from page 1)

ORNL HOSTS ENERGY SUMMIT (cont.)

The conference agenda was developed to enable the small businesses to:

- Obtain information about funding opportunities;
- Meet with USDA and DOE SBIR program managers in one-on-one sessions to discuss potential projects;
- Learn about the technology transfer process at ORNL and at the USDA;
- Hear strategies for success firsthand from representatives of small businesses that have benefited from USDA and DOE SBIR program funding;
- Learn of state resources available to assist small businesses in the development of proposals;
- Tour select ORNL research facilities; and
- Meet with ORNL researchers with whom the small businesses may partner on future proposals to the SBIR programs.

For more information about the SBIR Program Energy Summit, contact ORNL's Terry Payne, paynelt@ornl.gov.

Innovation Valley Nano Alliance Update

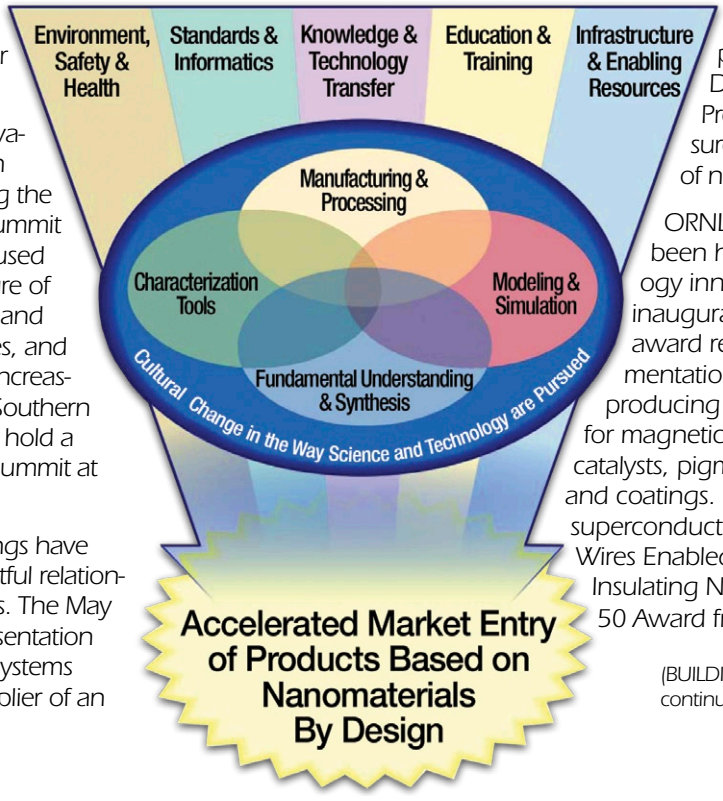
The Innovation Valley Nano Alliance, an initiative undertaken to capitalize on the region's nanoscience research facilities, talent, and intellectual property to create businesses, jobs, and wealth, has become an important economic development partnership for ORNL. It focuses on realizing economic benefits that will be derived from nanotechnology applications.

Technology 2020, organizational host and leader of the alliance, has amassed nearly $1 million from Congressional appropriations and other sources to begin developing a nanotechnology commercialization facility. Location of the facility within the Science and Technology Park at ORNL is under active consideration.

Tech 2020 received an Innovator Award from the Southern Growth Policies Board during the June Southern Innovation Summit conference. The summit focused on creating a Southern culture of knowledge, where learning and innovation are primary values, and in developing strategies for increasing innovation. The board's Southern Technology Council plans to hold a Southern Nanotechnology Summit at ORNL October 10.

Recent Nano Alliance meetings have created opportunities for fruitful relationships with several companies. The May meeting featured a joint presentation by Centerpoint Translucent Systems and Cabot Corporation, supplier of an aerogel used by Centerpoint in a unique insulating skylight. Lux Research, a nanotechnology research and advisory firm, presented the "State of Nanotechnology Commercialization" in June. Following a tour of the Spallation Neutron Source and Center for Nanophase Materials Sciences, Lux advised corporate clients seeking an edge in materials research to "engage Tech 2020 to see how to gain access to ORNL facilities and scientists and to explore the possibility of research outposts at ORNL incubation facilities." At the July meeting, Emory Ford of the Materials Technology Institute gave an overview of the Chemical Industry Vision 2020 Roadmap for Nanomaterials by Design. ORNL senior scientist Meng Dawn Cheng presented an example of roadmap-related work – a project funded by MTI and DOE's Industrial Technology Program for real-time measurement and characterization of nanoparticles.

Emory Ford's Nanomaterials by Design Roadmap.



ORNL researchers also have been honored for nanotechnology innovation. R&D Magazine's inaugural MICRO/NANO 25 award recognized "NanoFermentation," a new approach for producing crystalline powders useful for magnetic media, ferrofluids, toner, catalysts, pigments, water treatment, and coatings. ORNL's high-temperature superconducting wire technology, "HTS Wires Enabled via 3D Self-Assembly of Insulating Nanodots," received a Nano 50 Award from Nanotech Briefs.

(BUILDING ECONOMIC DEVELOPMENT continued on page 4)

AWARDS AND REWARDS

Hsu, Smith, Moorhead Are New Distinguished Inventors

John Hsu

Stephen Smith

Arthur Moorhead

Three ORNL researchers have been honored as Battelle Distinguished Inventors for obtaining 14 or more patents during their careers at the laboratory.

The honorees are:

- **John Hsu**, with 15 patents that deal primarily with electric motors and their associated components and drive packages, energy conversion machines, and thermal management of vehicle systems and components. Hsu works in the Engineering Science & Technology Division.

(BUILDING ECONOMIC DEVELOPMENT continued from page 3)

TENNESSEE VALLEY CORRIDOR AL • KY • TN • VA *Putting Science and Technology to Work*

Summit Speakers Discuss Advancing America's Competitiveness

The Tennessee Valley Corridor's 2006 Summit in Chattanooga was the 16th in a series of regular economic development summits organized by TVC to help strategically link the technology-rich corridor, which runs from North Alabama through East Tennessee into Southwest Virginia and Southern and Eastern Kentucky. Held May 31 through June 1 at the Chattanooga Convention Center, summit workshops covered a variety of topics, including alternative transportation and energy; homeland security; advancing America's competitiveness through a variety of initiatives; and doing business with the Army, Air Force, NASA, NNSA, and DOE.

UT-Battelle/ORNL was well represented on the speaker's podium. **Tom Ballard** (pictured at left), director of Economic Development and Partnerships, moderated a roundtable discussion of technology development. Associate Lab Director Frank Akers and John Doesburg, director of the Homeland Security Programs Office, were both presenters in the homeland security regionalization workshop. ORNL Director Jeff Wadsworth was one of five leaders to discuss advancing America's competitiveness through innovation, discovery, and connectivity. University of Tennessee President John Peterson and Battelle Vice President and General Manager Ben Ritchey discussed advancing our competitiveness through education and energy independence, respectively.

Since its conception in 1995 by U.S. Rep. Zach Wamp, the Tennessee Valley Corridor has built a strong alliance of community, business, education, and government leaders through a series of regular regional economic summits led by the corridor's bipartisan and multi-state Congressional delegation.

(BUILDING ECONOMIC DEVELOPMENT continued on page 7)

Amit Goyal, center, received the Battelle 2005 Inventor of the Year award from Executive Vice President Bill Madia, left, and Carl Kohrt, president and CEO of Battelle Memorial Institute, at the recognition banquet in April.

- **Stephen Smith**, with 14 patents related to pulse transmission and receiving, monitoring of fluid pressures and flow abnormalities in gasses, monitoring machine performance, and performing spectral analysis on alternating currents in motors. Smith also works in the Engineering Science & Technology Division.
- **Arthur "Artie" Moorhead**, with 14 patents relating to processes for fabricating, joining, and strengthening ceramics and other materials. These include development of filler metals for brazing of ceramics, processes and methods for fabricating ceramics and articles from particle-based materials, and methods for joining carbon-carbon composites to metals. Moorhead recently retired from ORNL.

The honorees join an elite group of inventors recognized by Columbus, Ohio-based Battelle from the scientific ranks of its own labs and the federal labs it helps to manage. Battelle has bestowed the honor on 42 inventors, 18 of them from ORNL.

Battelle, which participates in management of five national laboratories, oversees a staff of 19,000 employees and conducts $3.4 billion in annual research and development, resulting in 50–100 patented inventions each year.

(AWARDS and REWARDS continued on page 6)

(PEOPLE IN TTED NEWS continued from page 1)

UT STUDENTS (cont.)

The students work for Richardson on full scholarship paid for by ORNL. Most are pursuing master's degrees in science or business administration. In the $100,000-a-year program, four MBA graduate students work full-time for Richardson in the summer at ORNL and 10 hours a week during the school year. Then they spend one day a week viewing the process up close at the laboratory, with visits from Richardson one afternoon a week at the UT campus in Knoxville. A fifth student is assigned to ORNL's economic development program. Thirteen students have participated in the two-year program. One, Alex DeTrana, now works as an ORNL licensing executive in the tech transfer group. "A great catch," said Richardson.

The rigorous program is designed to support the laboratory's broader commercialization efforts. Each student meets with individual ORNL inventors, examines invention disclosures, conducts a preliminary market analysis, and identifies potential companies that might be interested in licensing the new technology. The assignments involve studying marketing databases and developing strategies. A committee of experts reviews and critiques the students' preliminary market analyses. The students have completed 86 marketing studies this year.

Other projects seek to catalogue ORNL capabilities and position new technologies for emerging commercial markets. Students have examined all of the laboratory's invention disclosures since the early 1990s that today would be classified as nanoscience or nanotechnology. The result was an illustration showing ORNL's nanotech invention disclosures of the past 15 years according to time of origin in different market sectors such as biology/life sciences, electronics, energy, materials, processing and sensors and analytical tools. "Equipped with this information, we then looked at projects at ORNL's new Center for Nanophase Materials Sciences to see how many fit into each market sector," Richardson said.

The decision to incorporate students into ORNL's technology transfer program reflects the growing partnership between the laboratory and the University of Tennessee. The program also signals a belief that developing and sustaining a culture of commercialization at the laboratory is an endeavor that must be viewed in terms of decades rather than months. Given the early returns on investment, the partnership with UT appears promising for the laboratory's future.—*Story by Carolyn Krause, courtesy of the ORNL REVIEW.*

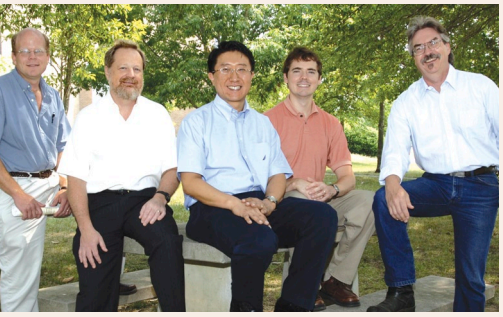
MBA students, L to R, are Dan Miller, Karen Genung, Chad Riggs, Pasquale Ferrari, and Quincy Styke.

HSL (above)

LandScan (below)

MIST

NanoFermentation



TMA 6301/4701

Trane CDQ

AWARDS and REWARDS continued from page 5)

ORNL Wins Six R&D 100 Awards

Researchers and engineers at ORNL have won six R&D 100 Awards, presented by R&D Magazine in recognition of the year's most significant technological innovations. With this year's awards, ORNL's national lab-leading total increases to 128, second only to General Electric.

Hybrid Solar Lighting (HSL) System, developed by Jeff Muhs, David Beshears, Duncan Earl, and Curt Maxey of ORNL Engineering Science & Technology and by Sunlight Direct, uses a roof-mounted solar collector and fiber optics to transfer sunlight to hybrid fixtures containing electric lamps. The system dims the electric lights in bright sunlight and turns them up as clouds move in or the sun sets, resulting in a dramatic improvement over conventional approaches to bringing sunlight into buildings. The system reduces energy usage for lighting and cooling because it can block ultraviolet and infrared heat.

LandScan Global Population Database, developed by Eddie Bright, Phil Coleman, Amy King, Budhendra Bhaduri, and Ed Tinnel of Computational Sciences & Engineering, is a high-resolution population distribution model. Its 1 km^2 resolution is 25 times higher than that of the next-best database. LandScan has become the standard for estimating population at risk and is useful for coordinating disaster response, humanitarian relief, sustainable development, and environmental protection. Thousands of organizations in the United States and worldwide use the database for scientific analyses and policy-decision support. LandScan was instrumental during rescue and relief efforts following the 2004 Indonesian tsunami.

Metal Infusion Surface Treatment (MIST) – developed by researchers from C3 International assisted by ORNL Materials Science & Technology staff – can infuse up to 51 elements into the surface of metals and alloys and secure them with a thin-nanostructure coating. Metalworking tools and catalytic devices have been treated, resulting in increased lifetime or higher performance of the products, and the process can be performed on site. In tests on cutting tools, MIST has yielded lifetimes 10 times better than conventional coatings. The treatment has potential applications in improved spark plug and catalytic filter function and in fuel cells.

NanoFermentation – developed by Tommy Joe Phelps of Environmental Sciences; Lonnie Love of Engineering Science & Technology; Adam Rondinone of Chemical Sciences; former ORNL researcher Bob Lauf, a consultant; and post-doctoral research fellows Yul Roh, Chuanlun Zhang, and Ji-Won Moon – is a new approach for producing extremely fine, uniform, and highly crystalline powders for magnetic media, ferrofluids, xerographic toner, catalysts, pigments, water treatment, and coatings. The inventors believe that making tailored nanomaterials available in economic quantities will stimulate the development of new applications and aid the nanotechnology field.

TMA 6301 and **TMA 4701** were developed using a computer-aided design methodology by Govindarajan Muralidharan, Vinod Sikka, Phil Maziasz, Neal Evans, Michael Santella, and Christopher Stevens of ORNL Materials Science & Technology, Duraloy Technologies, and Nucor Sheet Mill Group. These heat-resistant cast austenitic stainless steels feature improved durability and lifespan at higher operating temperatures. Use of the methodology reduces the time required for developing new alloys from 6–10 years to about 3 years. Alloys will be used in equipment in the steel, chemical, and petroleum industries, resulting in energy and cost savings.

Trane CDQ – developed by Jim Sand, formerly of ORNL Engineering Science & Technology, in collaboration with the Trane Company – is an air conditioning/dehumidification device that controls building temperature and humidity. It controls ambient air to a 45–60% relative humidity, which is important for libraries, schools, offices, and hospitals. Medical institutions, including St. Vincent's Hospital in Alabama and Franklin Memorial Hospital in Maine, have installed the device. Unlike other air conditioning/dehumidifying units, the CDQ effectively controls humidity without adding heat to the system.

(BUILDING ECONOMIC DEVELOPMENT continued from page 4)

Kline Joins Innovation Valley Partners

Glenn Kline, an experienced investor, venture-fund manager, and expert in spinning out lab technologies, has joined Innovation Valley Partners (IVP) as general partner in Knoxville.

As managing partner at Academy Funds in North Carolina, Kline focused on commercializing technology from the major local research institutions in that state. He led investments in some 30 portfolio companies, including start-ups in life sciences, semiconductors, advanced materials and information technology – focus areas of IVP and its affiliate fund Battelle Ventures.

"Since Battelle Ventures and IVP leverage their relationships with Battelle Memorial Institute and the national laboratories it manages or co-manages for DOE, Glenn's research lab experience was a critical factor," said Battelle Ventures General Partner Jim Millar. He noted that Princeton, N.J.-based Battelle Ventures had overseen IVP operations since the latter's inception in 2005 but was committed to hiring an investment professional to work in Tennessee.

Glenn Kline

Innovation Valley Partners is the $35-million affiliate fund of Battelle Ventures, L.P., a $150-million fund that invests in early-stage technology companies nationwide. Backed by business leaders in Knoxville, Innovation Valley Partners proportionately participates in each Battelle Ventures' investment. For more information, see www.innovationvalleypartners.com.

AWARDS and REWARDS continued from page 6)

Key Contributor and Patent Awards

The Technology Transfer and Economic Development Directorate held its annual Key Contributors and Patent Awards celebration in June, presenting 65 individual awards for ORNL researchers. Each named inventor on a patent that was issued or a copyright request that was approved during FY 2005 was recognized for his or her work and awarded $750. This year's awards included 18 issued patents and six approved copyright requests.

Among the awardees were "veteran" inventors **Stephen F. Smith, Vinod K. Sikka, Amit Goyal, James W. Klett, Russ Knapp Jr., Thomas Thundat,** and **Elias Greenbaum**. In the copyright category, LandScan authors **Edward A. Bright, Phillip R. Coleman,** and **Amy L. King** also received an award for the LandScan 2002-2003 High-Resolution Global Population Data Set.

Several new categories of "key contributors" were recognized this year as part of TTED's ongoing efforts to recognize ORNL staff members who contribute to the success of our technology transfer program. Our 2005 Invention Disclosure Review Committee members – **Bem Culiat, Arvid Pasto, Ken Tobin,** and **Robin Graham** – received awards, as well as graphic artist **Dave Cottrell**, who provides ongoing support to our patent agents by creating complex designs and illustrations in patent applications.

In recognition of the fact that licensing an ORNL technology to a company requires a team effort, TTED also recognized 24 individuals, ranging from lab technicians to administrative support staff, with awards for their "behind-the-scenes" support to their research groups during the licensing effort.

To round out the evening, three new "Distinguished Inventors" were inducted into the Battelle Distinguished Inventor category, commemorated by a plaque in the flagpole lobby, by reaching the career milestone of having 14 patents. New Distinguished Inventors are **Artie Moorhead, John S. Hsu,** and **Stephen F. Smith.** (See page 4.)

At the celebration, L to R, Associate Lab Director Lee Reidinger, Technology Transfer Program Director Casey Porto, "veteran" inventor and honoree Eli Greenbaum, and TTED Director Alex Fischer.

TECHNOLOGY TRANSFER AND ECONOMIC DEVELOPMENT

UPCOMING EVENTS

October 10	Southern Nano Summit, Oak Ridge National Laboratory
October 10–11	Musculoskeletal New Ventures Conferences, FedEx Institute of Technology, University of Memphis (Tenn.). For more information: www.mnvc.org
November 1–2	State Science and Technology Institute Annual Conference, Oklahoma City. For more information: www.ssti.org/conference06.htm
November 8–10	Southeastern BIO Investor Forum,InterContinental Buckhead Hotel, Atlanta. For more information: www.sebio.org/investorforum/2006
November 27–December 1	Aviation Security Technology Symposium, Omni Shoreham Hotel, Washington, D.C. For more information: www.sskies.org/symposium.htm

OAK RIDGE National Laboratory | TECHNOLOGY TRANSFER AND ECONOMIC DEVELOPMENT

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Technology Transfer and Economic Development
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831-6196

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For information, questions, and comments, contact us by one of the following: E-mail: *ORNLmeansbusiness@ornl.gov*
Web site: *www.ornl.gov/tted*
Toll-free number: 866-221-2527