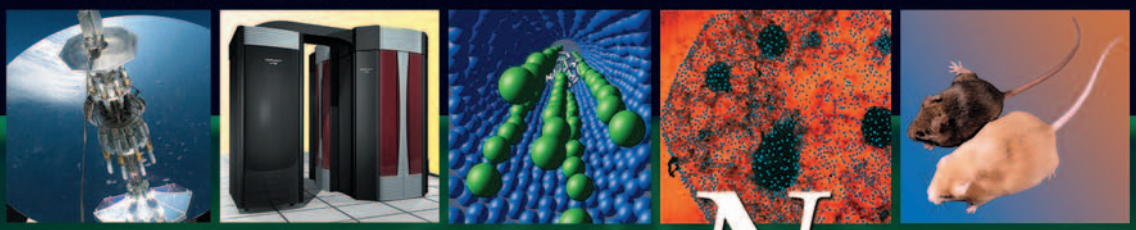
TECHNOLOGY TRANSFER
AND ECONOMIC DEVELOPMENT



Putting Science to Work

FALL 2004
Newsletter

BUILDING
ECONOMIC DEVELOPMENT

Knox County Jobs and Technology Fund

When Mike Ragsdale became mayor of Knox County, Tennessee, two years ago, one of his areas of focus was on achieving "economic results." Under Mayor Ragsdale's leadership, the county has been engaged in several new initiatives that focus on job growth, with an emphasis on technology.

One of those initiatives is the Knox County Technology and Jobs Fund (KCTJF), which will allocate $400,000 to be matched with revenues from the private sector to create new, high-paying technology jobs. Through a partnership with Technology 2020's financial subsidiary, Southeast Community Capital; the Community Reuse Organization of East Tennessee (CROET); and three local banks, KCTJF will provide loans to early-stage businesses in Knox County and the surrounding 14 counties. The fund will emphasize loans to qualified disadvantaged businesses and/or technology-based companies.

Knox County Mayor Mike Ragsdale, here on the University of Tennessee campus, has pushed for regional economic development with a technology and jobs fund.

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DOE Continues to Have Large Economic Impact in Tennessee

Department of Energy operations in Oak Ridge continue to contribute significantly to the economy in Tennessee. That fact was one of several findings of a recent study directed by Dr. Matthew Murray of the University of Tennessee's Center for Business and Economic Research.

Some of the key findings for fiscal year 2003 included the following:

- Spending by DOE and its contractors led to an increase of $3.2 billion in the gross state product.

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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

Technology advances have fueled over 50% of our nation's gains in gross domestic product (GNP) in the last half century. Technology breakthroughs will undoubtedly continue to boost our nation's and region's economy. Tennessee representatives and Atlanta representatives of the Federal Reserve Board gathered in Oak Ridge earlier this fall to explore these impacts and to understand where future opportunities lie. They left with a new appreciation of technology as one of the key drivers in the southeastern U.S. economy.

As we close out 2004, we have seen a record level of income for the office of Technology Transfer and Economic Development. This is a testimony not only to the efforts of our staff, but to the strong technologies emerging from ORNL. We are truly "putting science to work" throughout many aspects of the economy.

Members of the Federal Reserve Board toured ORNL, including its supercomputing facility, in October.

In this edition of the newsletter, we celebrate the economic development impacts of ORNL and the Department of Energy facilities in Oak Ridge and the ways that economic development partners are investing to take advantage of the great resources found in Oak Ridge. The impacts are large and far-reaching. Knox County Mayor Mike Ragsdale's efforts to invest in technology-based job activities in the region constitute just one example. Equally aggressive have been the efforts of Chattanooga Mayor Bob Corker and Hamilton County Mayor Claude Ramsey as they have worked tirelessly to provide economic development linkages with ORNL. Cocke County Mayor Illiff McMahan has engaged ORNL in existing industry strategies for his community based in part on Oak Ridge resources. The stories on Alabama Governor Bob Riley's Black Belt Action Commission and the Western North Carolina partnership with the Biltmore Institute are good examples of how other regions and states are leveraging ORNL resources.

As we enter 2005, I look forward to Casey Porto's joining our staff as our director of commercialization. Casey's experiences in leading the commercialization efforts at Case Western and Carnegie Mellon will bring a good perspective as we continuously seek to improve our efforts in Oak Ridge. We look forward to a good year and strong relationship with all of our partners.

Mary R. Fischer

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Knox County Jobs (cont.)

With this fund, Knox County will be able to leverage the region's technological resources to help sustain dozens of promising technology companies and support the successful transformation of the region's economy through technology-based jobs. The goal is to bridge the gap between the startup and the mature, ongoing technology company.

Knox County also is actively involved in *Jobs Now!* and a business incubator project on the University of Tennessee–Knoxville (UTK) campus. *Jobs Now!* is a $10 million collaborative effort of the East Tennessee Economic Development Agency, the Oak Ridge Economic Partnership, the Blount Partnership, and the Knoxville Area Chamber Partnership to enhance the region's economy over the next five years. First-year results include 4985 new jobs and $356 million in capital investments.

The $2 million UTK business incubator facility will involve a funding partnership among Knox County, the Tennessee Valley Authority, the Knoxville Utilities Board, UT, the state of Tennessee, and the U.S. Department of Commerce Economic Development Administration. Knox County made the initial pledge for the incubator with a $250,000 capital commitment.

These Knox County investments are intended to take advantage of the research being conducted at ORNL and UTK to create new, private-sector jobs, thereby providing a long-term economic boost for both the county and the region.

DOE's Economic Impacts (cont.)

- Total personal income generated in Tennessee by DOE-related activities was nearly $1.7 billion.
- DOE spending supported 54,555 full-time jobs in the state, equaling 3.8 additional jobs created for each DOE job.
- DOE-related spending generated $66.7 million in state and local sales tax revenue.

Gerald Boyd, manager of DOE's Oak Ridge Office, credited the economic growth of the DOE programs to the leadership of the Tennessee congressional delegation and strong support from DOE's

Office of Science and other DOE programs. He also cited the expanded partnership that has been developed with the state, both through UT's role in the management of ORNL and through the state's funding of joint institutes at ORNL in computational sciences, biology, and neutron sciences.

The future outlook for Oak Ridge and continued economic growth for the region is very bright, Boyd said. "This is a unique time in the history of Oak Ridge, with the construction of new facilities such as the Spallation Neutron Source and the Center for Nanophase Materials. There is more growth going on here in terms of new facilities and new construction than at any other DOE site."

Future expansion of opportunities in technology transfer will also strengthen the local and regional economy. Boyd said: "The spin-off and transfer of the technologies developed by the Oak Ridge workforce creates even more economic opportunity through multiple public-private partnerships, attracting new programs and new missions — and new and expanding private sector companies."

DOE's role is crucial to sustaining and encouraging economic growth, said Boyd. "My goal is to make Oak Ridge Operations an even stronger economic engine to spur economic growth for the region. We want Oak Ridge to become the nation's premier location for national and homeland security, nano-technology, biological sciences, and high-speed computing."

Dr. Matthew Murray (standing), UT professor of economics; UT Chancellor Loren Crabtree; and Gerald Boyd, DOE ORO manager, discuss DOE's positive economic impacts on Tennessee at a June 29 press conference.

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PEOPLE AND EVENTS IN TTED NEWS

Porto to Head Technology Commercialization at ORNL

At the beginning of January 2005, Catherine "Casey" Porto, associate vice president for technology transfer and executive director of Case Technology Ventures at Case Western Reserve University, will become director of technology commercialization for ORNL.

Porto came to Case Western in February 2002 after six years in technology transfer at Carnegie Mellon University. While at Case Western, she oversaw the establishment of a new technology transfer infrastructure, as well as a substantial expansion of the staff. In the year that ended June 30, 2004, the technology transfer office completed 18 license deals, created four startup companies based on university technologies, and generated $11 million in licensing revenues.

Casey Porto, new TTED director of technology commercialization.

"Casey Porto's skill and experience will help us put ORNL technology together with industry to create jobs in Tennessee, boost the economy, and find solutions for some of the world's toughest problems," Alex Fischer, TTED director, said. "Her technology transfer work at Case Western has garnered national attention. We are excited to have her onboard to help manage the migration of ORNL technology from the laboratory to the marketplace."

In the last four years, ORNL-developed technology has directly contributed to the startup of 43 companies, representing 200 new jobs, $15 million in revenue, and $10 million in new capital investments in 2003.

OUR TECHNOLOGIES

Isotron and ORNL to Develop Cancer Treatment Technology

Officials of Isotron, an Alpharetta, Georgia–based company, signed a licensing agreement with UT-Battelle on November 11, 2004, to market a promising ORNL-developed cancer treatment technology. The treatment applies the radioisotope californium-252 to battle certain hard-to-treat cancers.

The treatment, called neutron brachytherapy, enables physicians to deliver a highly concentrated dose of californium-252 neutrons to the site of a tumor instead of having to treat the tumor with conventional gamma rays, which often are not as effective. ORNL's High Flux Isotope Reactor is one of the few sources of californium-252.

Cancers most resistant to the conventional treatments include brain tumors; melanoma; sarcoma; certain types of prostate cancer; locally advanced breast cancer; cervical cancer; and cancer of the head, neck, and mouth.

The key to success in this method is the miniaturization of the californium-252 source, which allows physicians to insert the radioisotope through a catheter directly to the tumor site. Researchers in ORNL's Nuclear Science and Technology Division, working under a three-year cooperative R&D agreement with Isotron, miniaturized the wire that delivers the californium-252 and overcame a number of technical challenges to develop a method for making the source capsules that are attached to the wire, which is a hot-cell operation. Isotron's method combines the radioisotope source with a remote, automated storage and delivery system that utilizes the latest imaging, surgical, and patient treatment planning techniques.

(OUR TECHNOLOGIES continued on page 5)

Isotron's Manfred Sandler (left) and TTED Director Alex Fischer sign the neutron brachytherapy licensing agreement.

AWARDS AND REWARDS

MicroCAT Wins Top Award in Regional FLC

ORNL's MicroCAT X-ray micro-computer tomography technology for biological research received the Project of the Year Award during this year's Southeastern Federal Laboratory Consortium (FLC) meeting in Orlando, Florida, in October. MicroCAT, a small X-ray CT scanner very similar to the devices used to diagnose human illnesses, is used to image the skeleton and internal organs of laboratory mice to detect and analyze genetic mutations.

With MicroCAT, researchers no longer have to rely on visible genetic markers and physical examinations to discover the presence of mutations. The device thus drastically reduces the time and effort required to analyze mutant mice; it also

ORNL Signs New License Agreements

ORNL is putting science to work through an aggressive program to provide technology-based solutions through the licensing of our intellectual property. We currently have more than 100 active licenses with organizations ranging from startups to Fortune 100 companies and academic institutions. We view the execution of a license as marking the beginning of a relationship, not the end. We work closely with our licensees, particularly early-stage companies, to ensure the successful commercialization of our technologies.

In the last six months we have signed 13 new licenses with the following organizations: Allied Defense Solutions, Inc.; August Technology Corporation; Diversified Biotech, Inc.; EASI-Educational Resourcing; Isotron, Inc.; ITT Industries, AES; Makai Ocean Engineering, Inc.; National Geographic Maps; NucSafe, Inc.; Sparta, Inc.; Stratus Consulting, Inc.; and SuperPower, Inc.

Two ORNL researchers observe the scanning of a live mouse in the MicroCAT. The apparatus provides three-dimensional images with ten times the resolution of conventional imaging systems.

means that since mice do not have to be destroyed in order to dissect internal organs, researchers can study the development of a mutation over time and generations.

The MicroCAT technology, developed as a collaboration between ORNL's Mammalian Genetics and Monolithic Systems Development Groups, was licensed to ImTek, Inc., in 1998 for commercialization. ImTek was recently acquired by CTI Molecular Imaging, Inc., a leading provider of positron emission tomography (PET) equipment and molecular imaging biomarkers and services. ImTek's expertise in imaging systems used on laboratory animals in medical research, and specifically its development and manufacture of MicroCAT, was cited as the motivation for the $3.75 million acquisition.

Other Regional FLC Awards

In addition to MicroCAT, four other ORNL technologies earned Southeastern FLC awards at the October meeting. Excellence in Technology Transfer Awards were presented for the AquaSentinel real-time water supply protection monitor and the photo-molecular comb biomolecular separator. Earning Honorable Mentions for Excellence in Technology Transfer were the Laboratory's MicroTrap microscale ion trap mass spectrometer and the miniature californium-252 neutron source for cancer therapy (see article on page 4).

(OUR TECHNOLOGIES continued from page 4)

NucSafe Licenses ORNL Neutron Detection Technology

On October 12, 2004, NucSafe, Inc., and ORNL entered into an exclusive licensing agreement for a new type of neutron detection technology that could be a significant weapon in the battle against terrorism. ORNL's boron siloxane technology, developed jointly with the Y-12 National Security Complex, is unlike any other neutron detector on the market in that it can be formed into any shape. Because of this versatility, it is suitable for many more applications than conventional detectors.

Inspection devices based on this technology could greatly enhance our ability to screen cargo on planes, trucks, and trains and at ports for nuclear devices and so-called dirty bombs. NucSafe CEO Rick Seymour says that the boron siloxane technology "has the potential of significantly altering how we think about inspections. Smaller, faster, and more inconspicuous devices will permit thorough inspections without impacting the need to move the cargo quickly."

Alex Fischer, ORNL's director of Technology Transfer and Economic Development, adds that "the commercialization of this technology will help provide the nation with a new measure of safety, security, and protection against terrorist attacks."

NucSafe, founded in 1999, develops, manufactures, and sells a variety of neutron and gamma detectors to a wide range of customers, including various agencies within the U.S. government. The core of its business is its scintillating glass fiber, licensed from Pacific Northwest National Laboratory. NucSafe is located in Oak Ridge and also has a manufacturing facility in Corbin, Kentucky.

(OUR TECHNOLOGIES continued on page 6)

Officials sign an exclusive licensing agreement for the boron siloxane neutron detector. From left to right: Randy Spickard, BWXT Y-12; ORNL's Alex Fischer; Rick Seymour of NucSafe; and Gerald Boyd, U.S. Dept. of Energy.

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September Tennessee Valley Venture Forum

UT-Battelle was a major sponsor of Technology 2020's recent Tennessee Valley Venture Forum, held September 23–24 in Chattanooga. Thirteen of the region's most promising companies presented their business plans to an audience of more than 250 people, including representatives of 29 venture capital firms. Four licensees of ORNL technology—Navigational Sciences, Protein Discovery, Tarrallax Wireless, and FemtoGen—made presentations at this year's conference.

As a part of the conference, TTED Director Alex Fischer made a special presentation to institutional investors about ways they can work with ORNL, including understanding key technology trends, performing due diligence, and licensing technologies either in their existing portfolio companies or by starting new companies.

The breakfast meeting at the recent Tennessee Valley Venture Forum.

Technology 2020 is a public-private partnership designed to leverage the technology resources within the Tennessee Valley region to create a stronger entrepreneurial environment. More information can be found at http://www.tech2020.org/.

TTED Advising Alabama's Black Belt Action Commission

In August, Terry Payne of ORNL's Economic Development Program participated in the first meeting of Alabama Governor Bob Riley's Black Belt Action Commission in Montgomery, Alabama. This commission has been formed to recommend actions that can be taken to improve the economies in Alabama's 15 "Black Belt" counties. ORNL is serving as an advisor to the commission and many of its subcommittees and has made numerous suggestions focused on sustainable economic development for the region.

The Black Belt, so-called because of the region's dark soil, is a band of largely rural counties stretching across the south-central portion of Alabama. The area has long had high rates of poverty, illiteracy, illegitimacy, and economic stagnation. The Black Belt Action Commission is to propose and work toward

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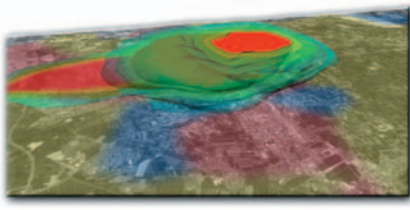
(OUR TECHNOLOGIES continued from page 5)

Our Technologies in the News

The following paragraphs provide a brief overview of some of the technologies being developed at ORNL.

National Security: Analyzing an Overwhelming Mass of Evidence



National security could be enhanced with a system that quickly sorts and evaluates spatial and geographic information captured in enormous volumes of images. An ORNL-developed system combines the Laboratory's expertise in a number of areas and addresses the problem of having too much information for trained personnel to analyze. With the ORNL system, security experts would have access to a dynamic data archive plus methods to quickly analyze the information using intelligent software agents, geospatial modeling, feature extraction, and image and pattern recognition. This system, combined with ORNL's unparalleled LandScan population database, provides national security personnel with a powerful tool for safeguarding the nation.

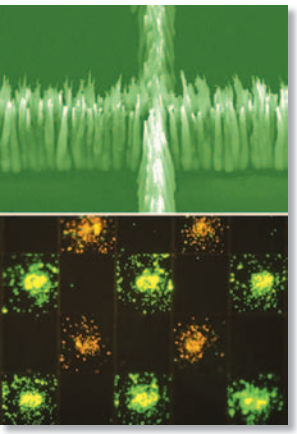
Buildings: Better Flood-Proofing

Flooding causes more damage to buildings throughout the United States, particularly residential buildings, than any other single natural event. In field tests conducted jointly with Tuskegee University in Alabama, ORNL researchers have found that home owners can minimize future flood damage to their homes through repair or renovation using flood-damage-resistant materials and methods. Some currently available but nonstandard building materials were found to have desirable flood-damage-resistant properties. Other, more conventional materials were

found to perform better than expected. The studies suggest that the complete replacement of water-damaged building materials may not always be necessary.

Biology: Mimicking Nature

Nanoscale synthetic cell membranes developed at ORNL move researchers one step closer to creating artificial cells and manmade interfaces that could one day be used to treat diseases and perform other tasks at the cellular level. In a paper to be published in an upcoming issue of *Nano Letters*, researchers at ORNL and the University of Tennessee outline a system of microarrays of vertically aligned carbon nanofibers. Using advanced fabrication methods, researchers can control the length, diameter, shape, position, orientation, and chemical composition of the nanofibers. The nanofibers can be arranged to create tiny fluid-filled membrane structures that enable rapid diffusion-based mixing. The silicon-based fabrication techniques allow integration with electronic devices that would make possible communication between manmade devices and solution-based reaction systems.



Refrigeration: Frostless Heat Pump

ORNL and the Tennessee Valley Authority are testing an electric ratepayer's dream—a "frostless" heat pump that produces warmer air than conventional air-source heat pumps, especially during the defrosting cycle, and at lower overall cost. Recent testing in several East Tennessee homes resulted in greater thermal comfort by eliminating the "cold blow" experienced with conventional heat pumps as well as more efficient operation. Further home testing this fall and winter is expected to confirm that the gained efficiency results in lower electric bills.

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Black Belt Commission (cont.)

solutions that will improve the quality of life in the region.

The Department of Energy's Oak Ridge Office also participated in this effort by attending the October 21 meeting of members of the Alabama Department of Economic and Community Affairs.

Alabama Governor Bob Riley (right) and TTED's Terry Payne at the first meeting of the Alabama Black Belt Action Commission.

Technologies from ORNL, Sister DOE Labs, Making a Difference in Western North Carolina

A partnership between ORNL and the Institute at Biltmore to support entrepreneurs and economic development in western North Carolina is making progress just a few months into the initiative. The Western North Carolina Center for Technology Commercialization, funded by a Department of Energy award of $340,000, makes available more than 500 energy efficiency technologies developed at ORNL, Pacific Northwest National Laboratory, the National Renewable Energy Laboratory, and Clemson University. The partnership should enable the licensing of some of the technologies to startup companies in the region and make financial, legal, and other resources easily available.

WNC CTC
WNC CENTER FOR TECHNOLOGY COMMERCIALIZATION

"These entrepreneurs will be getting some the best technologies in the nation, plus the support they need to increase the chances of success," said Bob Quinn, ORNL's former director of technology commercialization. "We're especially interested in opportunities to bundle these technologies into packages and take advantage of their synergistic value."

Ultimately, the goal is to develop marketable products, jobs, and wealth to help offset the more than 5,000 manufacturing jobs that have been lost since early 2003 in western North Carolina. More information about the center can be found at http://www.wncctc.org/ or http://www.strategicplan.org/.

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