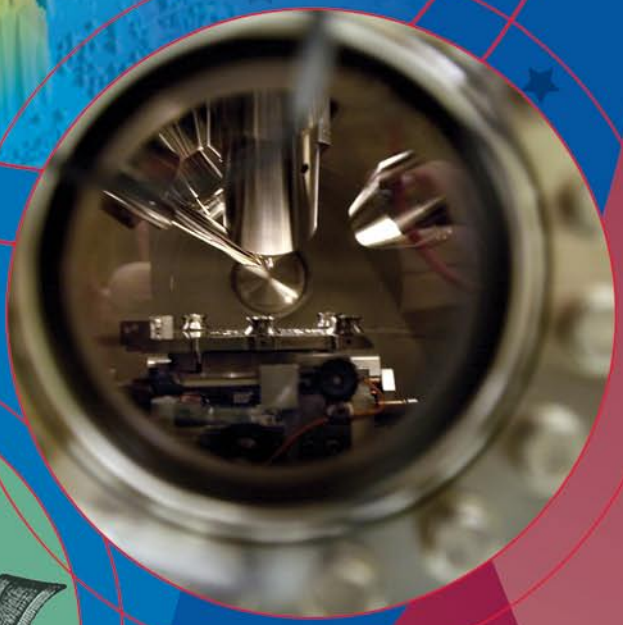
FULL CIRCLE:
A REPORT ON
TECHNOLOGY TRANSFER IN OHIO
FY 2006



Daniel Kory
University of Toledo
2006 TTOC Chair

Anne Chasser
University of Cincinnati
2007 TTOC Chair

Technology transfer—the procedure of moving novel ideas and technologies from the laboratory to the marketplace—helps guarantee that Ohio's citizens will not only have access to the latest technology and services, but will also enjoy the economic and environmental benefits derived from the commercialization of new ideas.

Technology transfer is a circular process involving world-class research, investment in intellectual property, identification of commercial pathways, negotiation of licenses, or the formation of new companies—which create jobs and revenues that cycle back to further support society and the research enterprise.

As recently as seven years ago, the Ohio Senate passed Bill 286, which permitted university faculty to personally participate in the commercialization of their discoveries. That legislation was a major incentive for the researchers themselves to get involved in creating companies to develop new products and services. Researchers have become entrepreneurs.

Bill Gates, one of the United States' most famous entrepreneurs, once said: "If you give people tools, and they use their natural ability and their curiosity, they will develop things in ways that will surprise you very much beyond what you might have expected."

Tools, ability and curiosity—and of course, investment—are paying off in Ohio.

Ohio's public and private universities and research institutions have partnered with each other, and with industry, to create better and safer paint and building materials, advance heart-imaging technology, develop new vaccinations, improve diabetes testing and enhance bioterrorism-sensing equipment, to cite just a few examples.

These same institutions invested nearly $1.8 billion on research in 2006. In the last five years, Ohio companies have invested close to $898 million in university research. These kinds of investments lead to technology transfer success.

In 2001, for example, reporting institutions disclosed 449 inventions. In just five years, that number has nearly doubled to 810. Last year, reporting universitites in Ohio filed 478 patent applications, and 92 patents were issued. More to the point, licensing income increased to nearly $24 million.

But probably most visible, and often more important to the state's economy, are the start-up companies that create high-paying jobs. Since 2001, 58 start-ups have located in Ohio, and in 2006 alone, Ohio's research institutions were involved in the birth of 24 new businesses.

This is exciting news. But Ohio researchers have the potential to do much more.

Ohio universities and research institutions are already making a difference in our great state and around the world. But commercializing technologies is expensive, and research institutions can't do it alone.

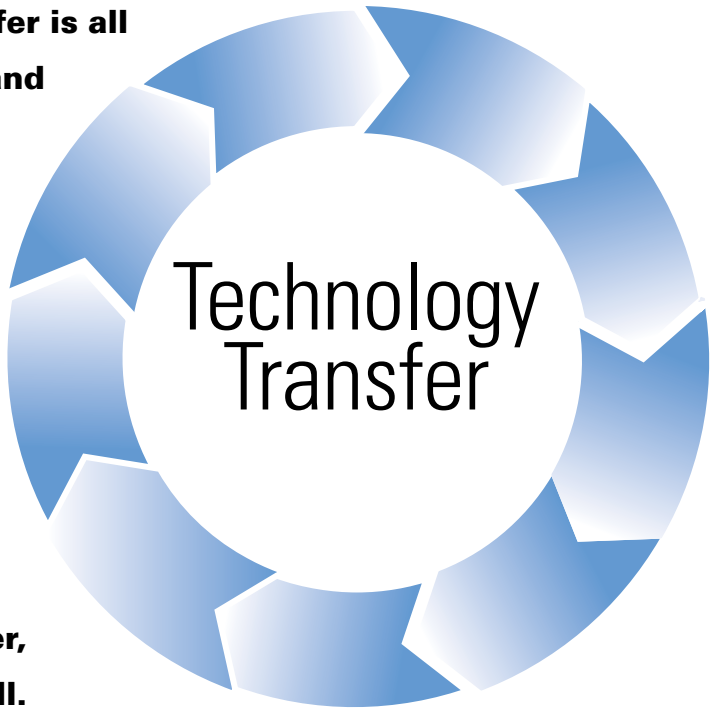
Taking the knowledge they develop to market also requires a strong investment from the state and industry, so it's important that we close that loop between discovery and reinvestment.

In this report, the Ohio Technology Transfer Officer's Council (TTOC) proudly shares with you some of our successes that highlight persuasively how research-generated technology is boosting the economy, creating new jobs and improving lives.

"Ohio universities need to be at the core of technology commercialization. The key priority is to create new business enterprises to maximize the wealth benefit potential for the state. In all of this, collaboration is the name of the game."

Ohio Board of Regents Chancellor Eric Fingerhut
at the March 29, 2007, TTOC meeting

Sharing the knowledge derived from research and development is what technology transfer is all about. Yet strong research programs and disclosure of findings alone are not enough to succeed in moving new technology to the marketplace. Additional resources must be available—from the state and industry—so inventions can grow to generate revenue, which in turn may be reinvested into more research, further strengthening the process. Whether researcher or citizen-consumer, technology transfer success benefits all.



TECHNOLOGY TRANSFER IS GOOD FOR OUR STATE

Thanks to the Bayh Dole Act of 1980, universities own inventions they make with federal funding. Universities are allowed to partner with industry to translate research into products benefiting the public. University research has helped create whole new industries, such as biotechnology and photovoltaics. Nationwide, university technology transfer creates billions of dollars of direct benefits to the U.S. economy every year.

"Numerous studies have shown that anchors of fast-growing, technology-oriented economies are major research universities interacting with a robust technology-oriented private sector… Studies by the U.S. Department of Commerce's Office of Technology Policy and others have found that all areas of technology-based economic development in the U.S. have strong concentrations of both university and private research. A Milken Institute study found that research centers and institutes are "undisputedly the most important factor in incubating high-tech industries."
—State Science and Technology Institute

"The Bayh-Dole Act (Public Law 96-517) has made substantial contributions to the advancement of scientific and technological knowledge, fostered dramatic improvements in public health and safety, strengthened the higher education system in the United States, served as a catalyst for the development of new domestic industries that have created tens of thousands of new jobs for American citizens, strengthened States and local communities across the country, and benefited the economic and trade policies of the United States."
—Sense of Congress resolution passed by the U.S. House of Representatives on Dec. 6, 2006

Source: Association of University Technology Managers

IDCAST: Focused on Technology Commercialization

Utilizing two programs, the Ohio Sensor Company Assisted Research Program (OSCAR) and Mobilizing Ohio's Sensor Technology (MOST), IDCAST directly addresses what it takes to move technology from the imagining stage of the technology commercialization framework to incubating and on to demonstrating.

Collaboration is key to successful research and technology transfer programs. It's that spirit that brought five of Ohio's universities together to form the Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST).

In December 2006, this partnership received a $28 million Wright Center of Innovation award from the state to establish a center of excellence in advanced sensing technology in Ohio.

IDCAST was designed to rapidly facilitate the commercialization of sensing technology with Ohio companies and entrepreneurs. With their focus on remote and chemical/biological sensing for the safety and security, environmental, biomedical and aerospace markets, IDCAST collaborators have committed over $100 million of cost share. Just as important is what the group is able to bring to companies by taking a fresh look at technology commercialization.

Utilizing two programs, the Ohio Sensor Company Assisted Research Program (OSCAR) and Mobilizing Ohio's Sensor Technology (MOST), IDCAST has set aside $6.8 million to bring technology to market. Both these programs directly address what it takes to move technology from the imagining stage of the technology commercialization framework to incubating and on to demonstrating.

The $2 million OSCAR program addresses the needs of companies to have applied research performed at the IDCAST universities in order to bring a sensor product to market. Statistically about 90 percent of research performed in universities is funded by the federal government. Federal funding agencies do not base their topic selection and funding decisions on the needs of industry. OSCAR does.

For every two hours of research a company funds at an IDCAST university, OSCAR will pay for one hour. This provides the companies a direct savings of 33 percent on sensor research, which can make a substantial difference in their business. It's also easy to see how OSCAR's $2 million will be leveraged into substantial sensor research efforts across the state.

The $4.8 million MOST program allows companies, universities, federal labs or teams of any combination to apply for funding. With this program, for every hour funded by the applying organization, MOST will also fund one hour. As a result, start-up companies can double the money they have to bring the product to market.

There are some strings attached to the OSCAR and MOST programs. First, any program funded will have to create jobs in Ohio in three to eight years—no jobs, no money. Second, because of requirements set by the state of Ohio in making the award, OSCAR and MOST funding can essentially be used only for direct cost. Third, the funds provided by OSCAR and MOST are released when milestones toward creating jobs in Ohio are met. So it is not just a matter of spending the money; the fund-

ing is directly tied to the accomplishment of tasks required to successfully achieve the goals set for economic impact in Ohio. Fourth, if you use the OSCAR and MOST funds, a 1 percent royalty will be required on all sales.

Where will the technology come from? The IDCAST universities have fully agreed to work cooperatively in the commercialization of sensor technology. Also, the Air Force Research Laboratory's Sensors Directorate, through a partnership intermediary agreement with the Wight Brother's Institute, is also making its technology available to IDCAST for commercialization.

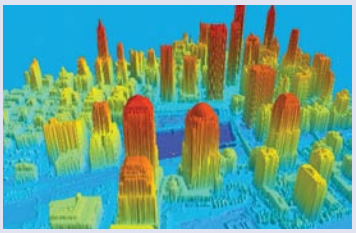
IDCAST has recruited companies that have specific interest in commercializing sensor technology. The companies, along with university technology commercialization specialists, form the basis of the IDCAST commercialization team, which will help in vetting the technology and determining whether it merits IDCAST investment. These commercialization partners, which range from large to hands-on, two-person companies, get the first look at technology that IDCAST has to offer.

IDCAST has also taken steps to help those entrepreneurs. Thanks to the city of Dayton, IDCAST is establishing a Collaborative Research Center (CRC). The 20,000-square-foot CRC facility will house university, private and federal labs that will perform sensor research. It is IDCAST's goal that the CRC become a truly collaborative research facility, with a "Semicon Valley" environment. To help launch the CRC, every collaborator that was part of IDCAST at the time of the award will receive free rent for three years, and even after ten years will only pay $8.25 a square foot, plus lighting and heating. In addition, any entrepreneur wanting to take an IDCAST technology and form a start-up company will receive the same terms.

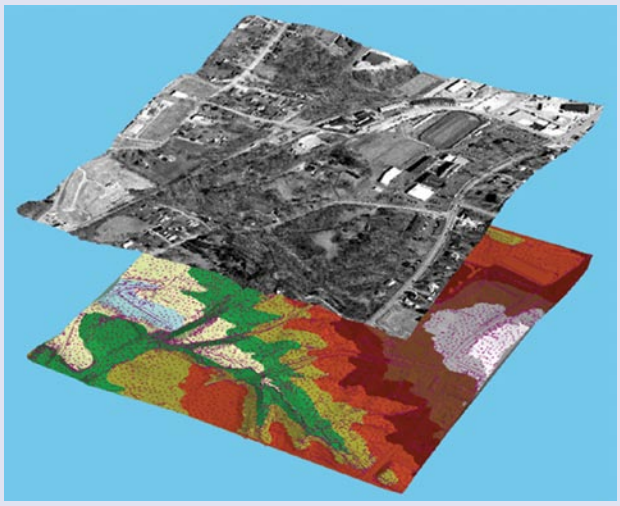
Facilities, cutting-edge technology and funding for the development gap between the lab and the market—it's easy to see why IDCAST is generating so much excitement.

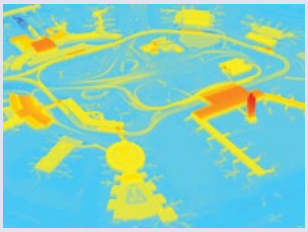
Something big is happening in Ohio … We can sense it!

For every two hours of research a company funds at an IDCAST university, OSCAR will pay for one hour. This **provides the companies a direct savings of 33 percent on sensor research**, which can make a substantial difference in their business.



It is not just a matter of spending the money; the **funding is directly tied to** the accomplishment of tasks required to **successfully achieve the goals set for economic impact in Ohio**.





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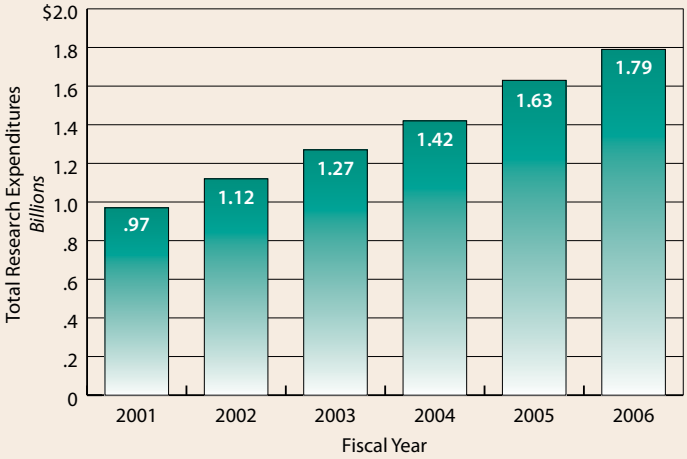
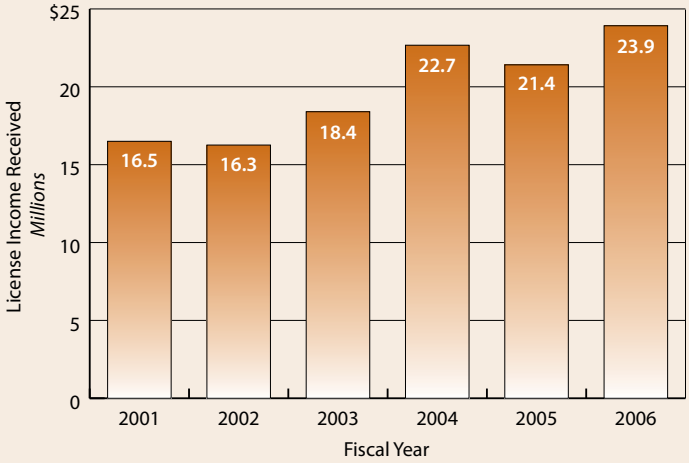
Data Highlights

Translating research outcomes to the marketplace continues to pay off for the citizens of Ohio. Investment from the state and industry plays an important role in supporting the process of successful commericalization, which brings in new dollars to fund further innovations.

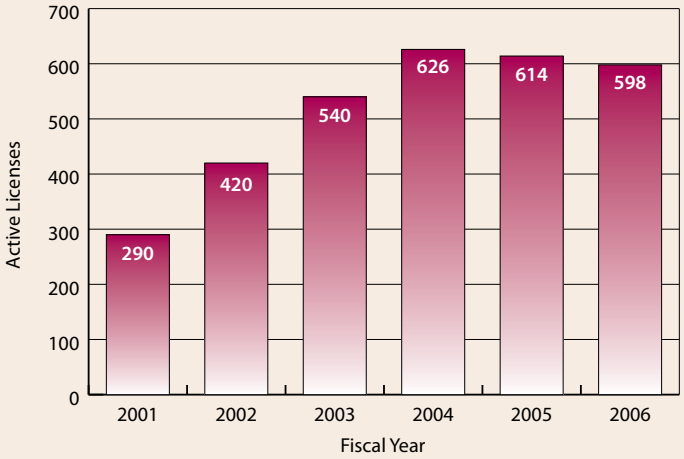
Total Research Expenditures by Ohio Universities and Research Institutions



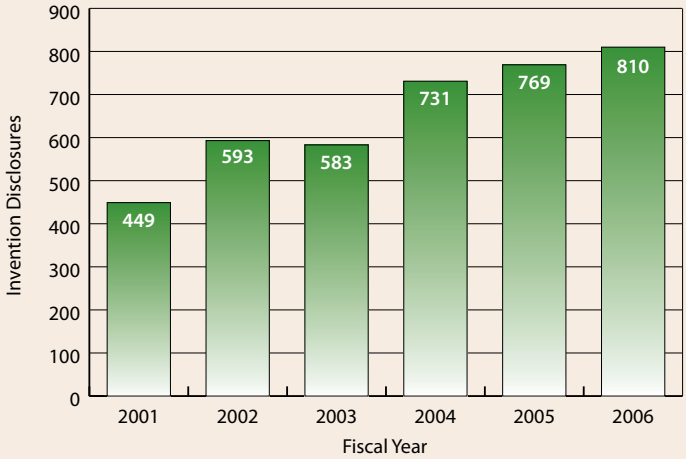
Licenses Income Received by Ohio Universities and Research Institutions



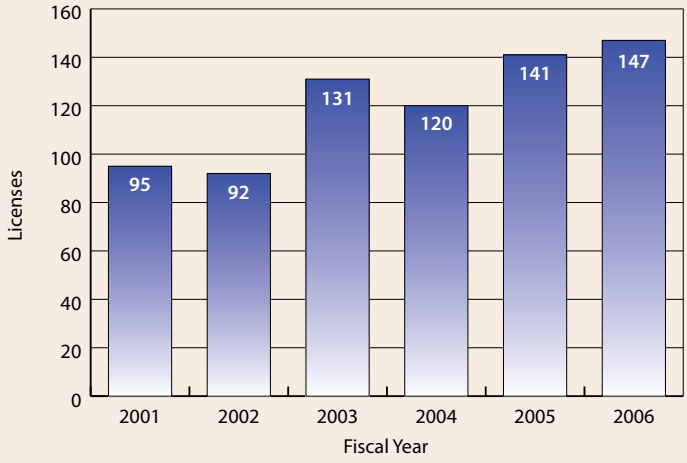
Running Total of Active Licenses and Options Executed by Ohio Universities and Research Institutions



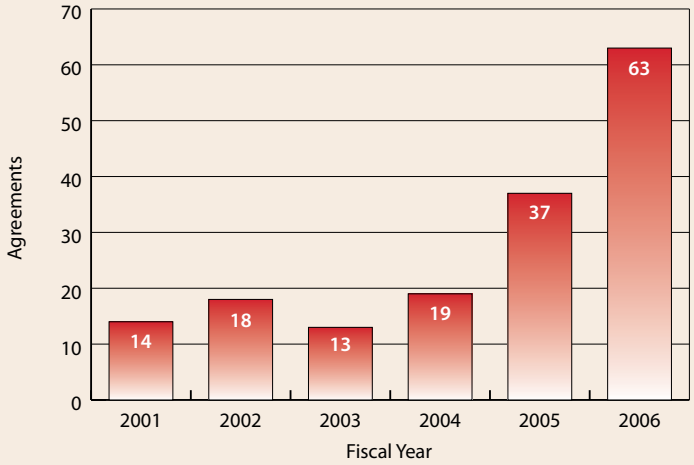
Number of Invention Disclosures Received by Ohio Universities and Research Institutions



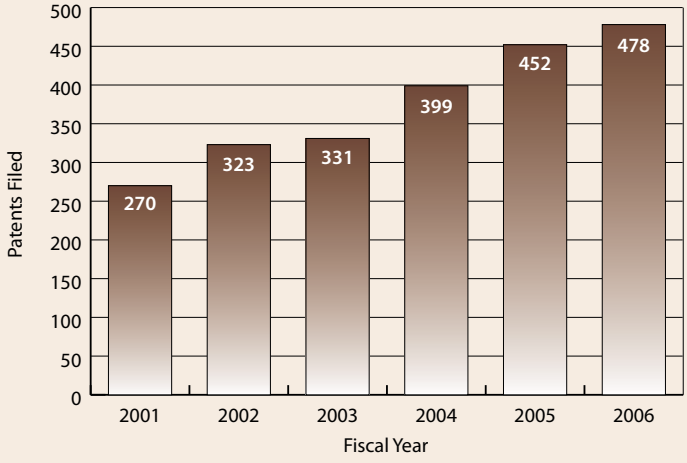
Total Number of Licenses Executed by Ohio Universities and Research Institutions



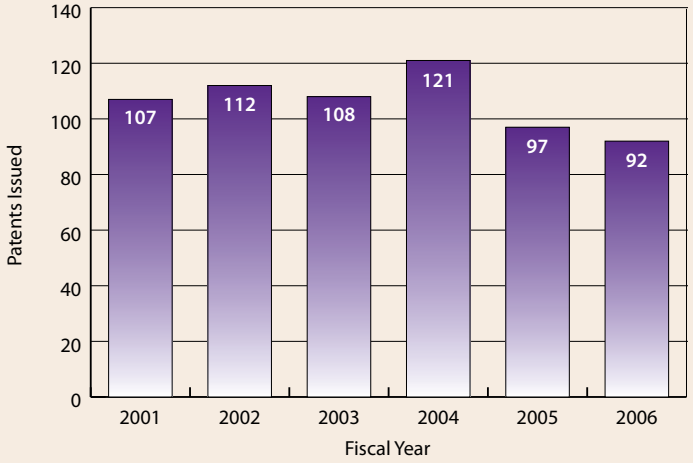
Licenses and Options Executed with Ohio Companies



Total U.S. Patents Filed by TTOC Members at Ohio Universities



Total U.S. Patents Issued to Ohio Universities and Research Institutions

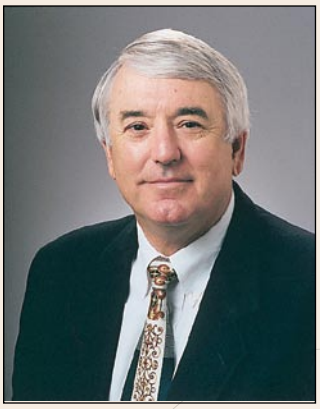


Data: Technology Transfer Officers Council

Dissatisfied with the rate at which licensees commercialized their innovations, professors Frank Harris and Stephen Cheng of the University of Akron's (UA) polymer science department created their own company to produce and commercialize new polymers for applications ranging from aerospace to medical devices.

Theirs is a story of successfully transferring technology from the laboratory to the market. Harris and Cheng hold 15 patents at UA, several in the area of polymer films for display applications. Their licensed technology is used today for large-screen LCD TVs and LCDs in aircraft cockpits.

They didn't know what to expect five years ago when they pooled their knowledge of polymer chemistry and photonics to establish Akron Polymer Systems (APS), an Ohio corporation. APS now has eight employees—seven PhDs and a full-time administrator—and manufactures proprietary polymers for high-performance displays for customers around the world. The company has also used the University of Akron Research Foundation pilot plant to scale up synthesis.



aps Akron Polymer Systems

advice to other entrepreneurs
—stick with it

Harris continues to actively manage the company, which now exceeds $1 million dollars in annual sales. He and Cheng also give back by counseling other UA faculty inventors who are considering starting up their own companies.

"Our advice to other entrepreneurs," says Harris, "is to do what we did—stick with it, even if all the original reasons for starting the company don't pan out. We also point out that a major reason we are successful is the reputation we have in our scientific fields. This has helped tremendously in establishing our business."

Harris and Cheng "walked the talk."

"We made a few invalid assumptions during our start-up," says Harris. "For example, a hoped-for contract didn't materialize. But we persisted and landed other business, so that we now have the luxury of choosing between many attractive opportunities."

The University of Akron

It all started with a dilemma about how to build a better teapot, and ended with a patent application for a new process.

A team of researchers at Bowling Green State University's School of Art, College of Technology and department of biology developed a process for creating original, fine art ceramic objects using a unique modification of current rapid-prototyping technologies. This technology has significant implications in both the ceramic and digital art fields, as well as far-reaching applications in industrial and commercial markets.

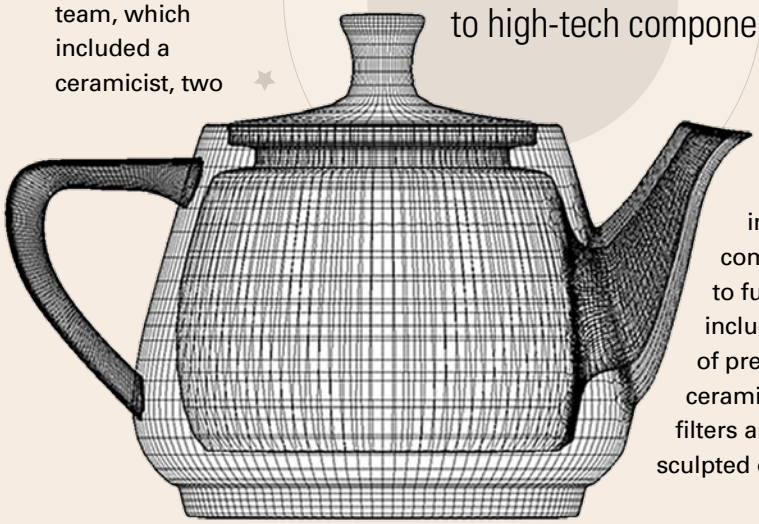
The innovation began when a graduate student in digital arts became curious about the College of Technology's 3D rapid prototyping machine. He began constructing 3D teapot models in software for use on the machine, and quickly saw the limitations of the traditional starch-and-plaster modeling material. So he focused on finding a solution in ceramics, and School of Art faculty joined in to solve the problem. The research team, which included a ceramicist, two digital artists and a biology graduate student with a strong chemistry background, developed various experimental "recipes," and a scientific testing method began to evolve.

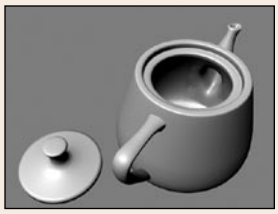
The researchers used computer applications to interpret digital 3D objects as cross-sections. They "printed" each cross-section sequentially in physical space to a physical substrate until the virtual object was rendered tangible. However, the objects produced were frequently limited in their uses because the qualities (physical or thermal tolerances) of the physical substrate were often too fragile to be useful in most real-world situations.

Current solutions to this limitation involve prototyping negative molds to use in the creation of durable, ceramic positives. The new process developed at Bowling Green allows for original, durable ceramic positives to be directly rendered from a digital file without the use of a negative mold, and then to be glazed and fired in a kiln. The team has successfully invented specific ceramic recipes and binders for use in a Z Corp rapid-prototyping machine, producing a 3D print of a full-scale teapot. The object was successfully fired, and the result was a fully functional, durable ceramic teapot.

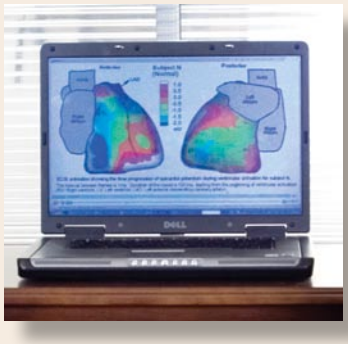
Besides its implications in the fine arts, the technology also has applications in the ceramics industry, from high-tech specialized components used in space exploration to functional tableware. Possible uses include direct rendering of a wide variety of precision, inert and heat-resistant ceramic parts, including insulators, gaskets, filters and engine parts, and even bricks with sculpted or inscribed faces.

new processes with **far-reaching applications** —from functional tableware to high-tech components





BGSU®
Bowling Green State University



Collaboration between Case Western Reserve University, its primary health care affiliate, University Hospitals Case Medical Center, and two venture development companies has resulted in the birth of a new company that will offer noninvasive imaging of the heart's electrical activity.

Case co-invested with JumpStart and Draper Triangle Ventures to develop a distinctive new electrical application mapping technology—electrocardiographic imaging—which is the focus of CardioInsight, a Cleveland-based company launched last year.

JumpStart is a venture development organization that assists high-growth start-ups within the region, and Draper Triangle Ventures specializes in financing high-tech start-ups.

CARDIOINSIGHT TECHNOLOGIES INC.

An initial investment of $750,000 is being used to construct an advanced prototype of the company's device, conduct additional clinical studies and develop the company's business plan.

"We're pleased at the validation of our technology as represented by this investment," says Warren Goldenberg, CardioInsight's chief executive officer. "The funding will allow us to conduct additional clinical trials and to map out a strategy for regulatory approval and market entry."

According to Jay Katarincic, a managing director at Draper Triangle, "The CardioInsight technology has the potential to enable physicians to diagnose and treat arrhythmias and other heart problems related to electrical function without performing an invasive procedure.

"The current gold standard for gathering this type of data is an electrophysiology study," Katarincic says, "which is invasive, expensive, time-consuming and risky. CardioInsight's approach offers a more effective option and addresses a potentially significant market."

a **more effective** option to diagnose and treat heart problems with a **noninvasive procedure**

CardioInsight founders Charu Ramanthan and Ping Jia, who both earned doctorates in biomedical engineering from Case, collaborated on the project with several Cleveland-area research institutions. The new technology was developed in the laboratory of Yoram Rudy, formerly a professor of biomedical engineering at Case and now director of the Cardiac Bioelectricity and Arrhythmia Center at Washington University, St. Louis.

Initial human trials of the device were conducted at University Hospitals of Cleveland. Case and JumpStart collaborated to refine the company's business plan, recruit Goldenberg as interim CEO and introduce Draper Triangle to the company.

The technology and its potential market were also assessed by BioEnterprise, a regional bioscience business formation, recruitment and acceleration initiative founded by the Cleveland Clinic, University Hospitals, Case Western Reserve University and Summa Health System.

CASE
CASE WESTERN RESERVE UNIVERSITY

Paints containing chromates—600,000 metric tons of it annually—are commonly used to protect metal-against-metal corrosion.

The problem is that the U.S. Environmental Protection Agency (EPA) has identified chromates in the hexavalent state of oxidation as both toxic and carcinogenic. Chromate exposure, the EPA says, causes a range of health problems, such as ulcers, irritation of the nasal mucosa, holes in the nasal septum, skin ulcers, allergic reactions, and nasal and lung cancer.

Paints are formulated with high-molecular-weight polymers for good anticorrosion properties. These polymers require solvents that are volatile organic compounds (VOCs). During curing and drying of the paint, these VOCs evaporate, posing an occupational safety hazard.

The "self-healing" property of chromate, however, has made it difficult to replace.

Now, thanks to a very inventive University of Cincinnati (UC) professor, anticorrosion processes are becoming a lot less risky.

Wim van Ooij, a professor in materials science at UC, invented a technology and helped launch a company, Ecosil Technologies, to meet the growing need for replacement of chromate and phosphate systems in metallic treatment lines.

Van Ooij's invention is a one-step, very-low-VOC anticorrosion primer system that totally eliminates chromates, yet performs as well as chromate-containing paints. He has successfully demonstrated that mixtures of organo-functional silanes (silicon analogues) and waterborne resins can be applied directly to metals as self-priming primers. A plasma-treated pigment package in van Ooij's primer slowly releases a corrosion inhibitor and mimics the "self-healing" property of chromates.

Van Ooij serves as chief technology officer for Ecosil, where he and his colleagues are bridging the gap between laboratory research and practical implementation for UC and expanding their technology portfolio. Van Ooij has already filed 100 invention disclosures at UC and in 2005 received the university's Emerging Entrepreneur Award.

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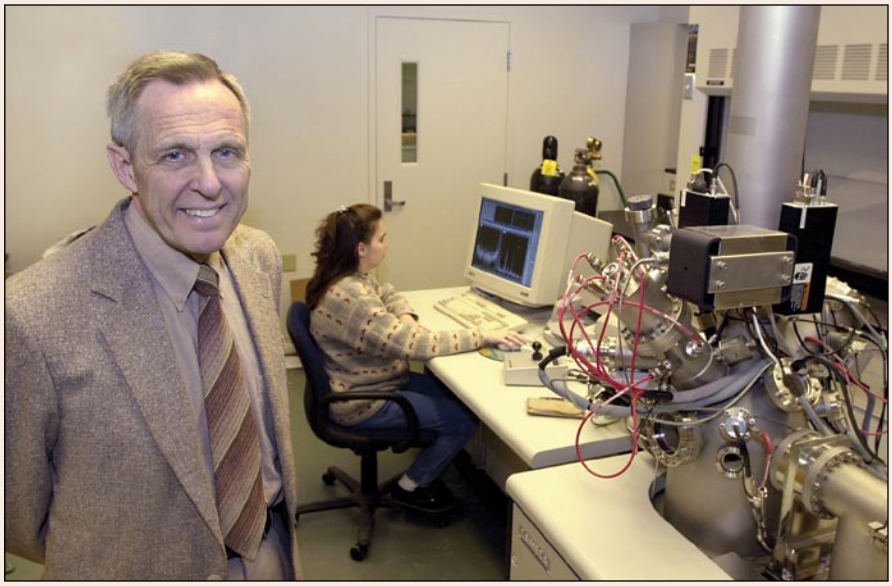


UNIVERSITY OF Cincinnati

It is estimated that hundreds of thousands of lives will be saved each year thanks to a vaccine developed at Cincinnati Children's Hospital Medical Center and now marketed internationally by GlaxoSmithKline.

lives will be saved each year thanks to a vaccine developed at Cincinnati Children's and now marketed **internationally**

The drug, Rotarix, is used against rotavirus, a major cause of childhood diarrhea that is believed to cause over 600,000 deaths each year, mostly in developing countries.

In 1989, researchers Richard Ward and David Bernstein at Cincinnati Children's Hospital Research Foundation began studying this disease and ultimately developed a vaccine. After completing phase-1 clinical testing, the vaccine was licensed to Avant Immunotherapeutics.

Following successful phase-2 studies, in 1997 Avant sublicensed the vaccine to GlaxoSmithKline. Rotarix satisfactorily completed phase-3 trials and other regulatory requirements and is now being sold by Glaxo in Central and South America, Europe and several other markets. It will also be submitted for regulatory approval in the United States.

Both the GAVI Alliance, a public-private partnership that promotes children's access to vaccines in poor countries, and the World Health Organization recently endorsed Rotarix for distribution in developing countries.

The excellence of Cleveland State University's sensor-based research was recognized by the state of Ohio's Third Frontier Program with $23 million in funding for the Wright Center for Sensor Systems Engineering.

The market for sensor-based applications is wide and diverse, dependent primarily on its end applications. Advances in sensor systems will enable industrial automation and process control companies to tap into growing markets, including the food processing and beverages market ($4 billion in 2004, with an expectation of $7 billion in 2010); automotive markets ($5.5 billion in 2004, with an expectation of hitting $9.5 billion in 2010); and even dairy markets ($1 billion in 2004, doubling to $2 billion by 2010).

Consumer electronics companies can expect to grab $22 million in smart-sensor system revenues by 2010. For test and measurement companies that transition to smart sensors, an opportunity to earn a share of the expected $104 million in revenues by 2010 is a near-term reality.

Advances will enable industrial automation and process control companies to **tap into growing markets**

The center brings together small and large companies and industry, NASA, the Air Force Research Laboratory and university researchers, including those at Case Western Reserve University, the University of Akron, the University of Dayton, Kent State University, Wright State University, the University of Cincinnati and Ohio State University.

Cincinnati Children's Hospital Medical Center

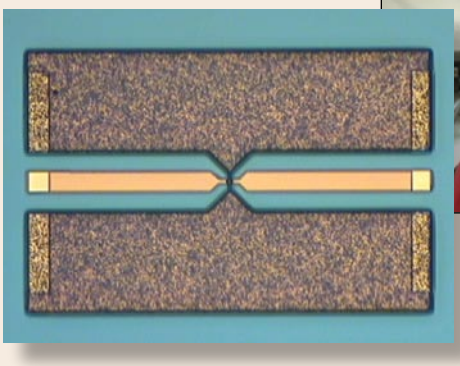
Cleveland State University

The University of Dayton (UD) and the Inventis Group, a Mason, Ohio, technology commercialization company, have teamed to spin-out and commercialize a patented enabling system that will significantly improve wireless and radio frequency data (RF) communications.

Known as tunable varactor technology, the system was developed by Guru Subramanyam, associate professor of electrical and computer engineering at UD, which funded the project. Subramanyam worked with the sensors and materials and manufacturing directorates at the Air Force Research Laboratory to perfect the technology.

Simple in design, Subramanyam's tunable varactor offers powerful benefits compared with existing technologies in the areas of wireless co-site interference, RF spatial filtering, RF sensing, and replacement technology for RF microelectromechanical system (MEMS) switches. And having the advantages of no moving parts, lower voltage requirements, being "off" in the no-power state, and working 1,000 times faster than comparable RF switching devices, the technology was granted a patent in just 22 months.

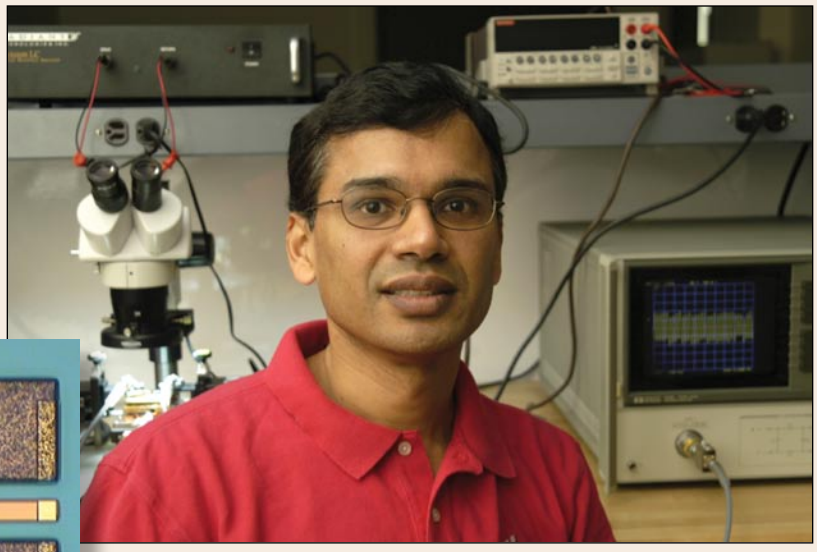
Analog Bridge, a spin-out, start-up company founded by Inventis to market Subramanyam's technology, expects it to displace many current state-of-the-art technologies in several sectors, including telecom, semiconductors and security, and have specific opportunities in RF MEMS and radio frequency identification (RFID) markets. In security, it can be used to facilitate the development of high-density, chemical and biological sensors that do not require external power sources.



Analog Bridge is working with several venture capital groups to secure $2.5 million in funding to develop additional product lines, and in the process create new high-tech jobs in Ohio.

a system that will **significantly improve** wireless and radio frequency data communications

Subramanyam's technology is one of several portfolio technologies highlighted in the recently awarded Ohio Third Frontier Commission program to establish an Institute for the Development and Commercialization of Advanced Sensor Technology—a Wright Center of Innovation to bring sensor technology to market.



UNIVERSITY of DAYTON

liquid crystal biosensor technology which can **detect bioterrorism agents and pathogens** in food and water

In recent years Kent State University's Office of Technology Transfer and Economic Development has helped launch 13 new local companies, all established thanks to faculty expertise and university-related research.

In 2006, for example, the co-licensing of liquid crystal biosensor technology, developed jointly by Kent State and Northeastern Ohio Universities College of Medicine (NEOUCOM), generated two new companies, Oringen and Pathogen Detection Systems.

The companies were formed specifically to commercialize the technology, which can detect bioterrorism agents and pathogens in food and water. It can also be used in military and environmental applications for homeland security, as well as for human medical applications.

The companies have committed to locating in Kent, Ohio, and surrounding areas, bringing with them the prospect of new jobs and economic growth for Northeast Ohio.

"From its inception, this biosensor program has been a prime example of collaboration on several levels," says Gregory Wilson, associate vice president for economic development and strategic partnerships. "From joint invention of the technology at Kent State and NEOUCOM, to collaborative marketing and licensing by the two institutions led by Kent State's Office of Technology Transfer and Economic Development, it was a true partnership."

Inventors who contributed to the biosensor cluster of inventions, now jointly licensed to Oringen and Pathogen Detection Systems, include Christopher Woolverton, Oleg Lavrentovich, Tomohiro Ishikawa, and Steve Signs, all of Kent State; Steven Schmidt, Summa Health System and Kent State; and Gary Niehaus and Kathleen Doane, NEOUCOM.

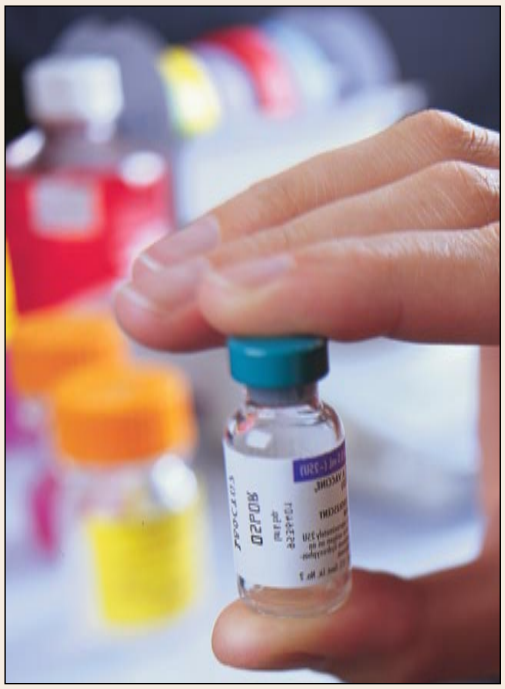
Other local start-up companies facilitated by Kent State's Office of Technology Transfer and Economic Development include AlphaMicron, CoAdna Photonics, Kent Displays and Kent Optronics.

KENT STATE UNIVERSITY

Columbus-based biopharmaceutical company OncoImmune Inc. is developing new life-saving drugs for diseases that have no current effective treatment, including multiple sclerosis, tuberous sclerosis and cancer.

The company, which has four full-time and six part-time employees, expects to initiate human clinical trials for tuberous sclerosis in 2007 and for multiple sclerosis in 2008. The company was spun out of Ohio State University in 2000 and has exclusive worldwide rights to proprietary technologies from Ohio State University and the University of Michigan.

Multiple sclerosis is a progressive, debilitating autoimmune disease that can result in death. It represents a $2 billion U.S. market and a $5 billion worldwide market. OncoImmune's multiple sclerosis drug, based on a novel, patent-pending gene target (CD24), will treat early- and late-stage patients and will complement existing therapies. There is no effective treatment for late-stage multiple sclerosis patients, who comprise almost half of the 400,000 patients in the United States and the more than 2.5 million patients worldwide. OncoImmune plans to partner with others to move its multiple sclerosis drug through the Food and Drug Administration (FDA) approval process.



Tuberous sclerosis is a rare genetic disease that affects 50,000 U.S. patients, including 1- to 2-year-old infants. Patients develop benign brain tumors or tubers that cause severe and frequent seizures, learning disabilities, autism and other central nervous system problems. Occurring in about one in 6,000 of the population, tuberous sclerosis represents a $200 million U.S. market and a $350 billion worldwide market. There are about 50,000 tuberous sclerosis patients in the United States and 1 million cases worldwide.

OncoImmune discovered that rapamycin (sirolimus), an FDA-approved cancer drug, restores the function of the TSC-1 and TSC-2 genes, offering a potential treatment. The company expects to move the novel formulation to market for tuberous sclerosis and cancer.

Selected to participate in the 2006 University Start-Ups National Showcase, OncoImmune has received funding from the National Institutes of Health and the state of Ohio and recently secured series-A venture capital.

a Columbus-based biopharmaceutical company—spun out of Ohio State University—is **developing new life-saving drugs** for diseases that have no current effective treatment

THE OHIO STATE UNIVERSITY

Regular blood-sugar measurement is an integral part of treating an increasing population with diabetes. Now, thanks to a professor at the University of Toledo (UT), the painful finger prick may be a thing of the past.

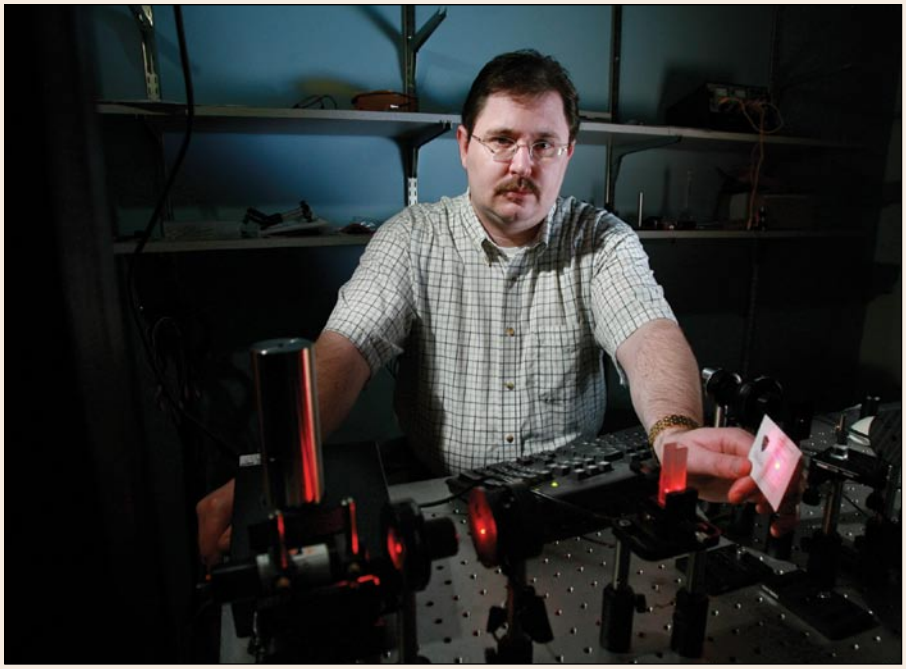
a professor's invention —a product that should **make life a little bit better for millions** of people

Brent Cameron, UT associate professor of bioengineering, has invented a device that measures glucose levels by shining a beam of light through the external periphery of the eye. In addition to eliminating the discomfort of drawing blood, the device would also reduce the biohazardous waste associated with the current testing method. UT has licensed exclusive rights to this new technology to Freedom Meditech, which will now begin the development process and ultimately seek Food and Drug Administration approval.

"Efforts to find a noninvasive glucose measuring system have been ongoing for more than a decade," Cameron says, "but recent technology advances have helped create a product that should be able to make life a little bit better for millions of people."

That end product, a device the size of a pair of binoculars, is the result of more than a decade of research by Cameron.

Biotechnology spin-off companies are becoming a trend for UT. A study released Sept. 20, 2006, by the Milken Institute, an independent economic think tank, identified UT as seventh among all academic institutions in North America, Asia and Europe in terms of the number of biotech start-up companies per research dollar spent.



"Many may think of Toledo as a manufacturing town, but the research our faculty conduct here is cutting-edge in any number of areas," says Dan Kory, UT director of intellectual property and patent technology. "Brent Cameron's research is just one example of inventions and creations by UT professors that fundamentally improve the way people live."

THE UNIVERSITY OF TOLEDO 1872

Supported by funding from Wright State University and the Research Challenge, an idea that will aid biomedical research and the treatment of human diseases has evolved into a new biotechnology company that offers the potential of hundreds of new regional jobs.

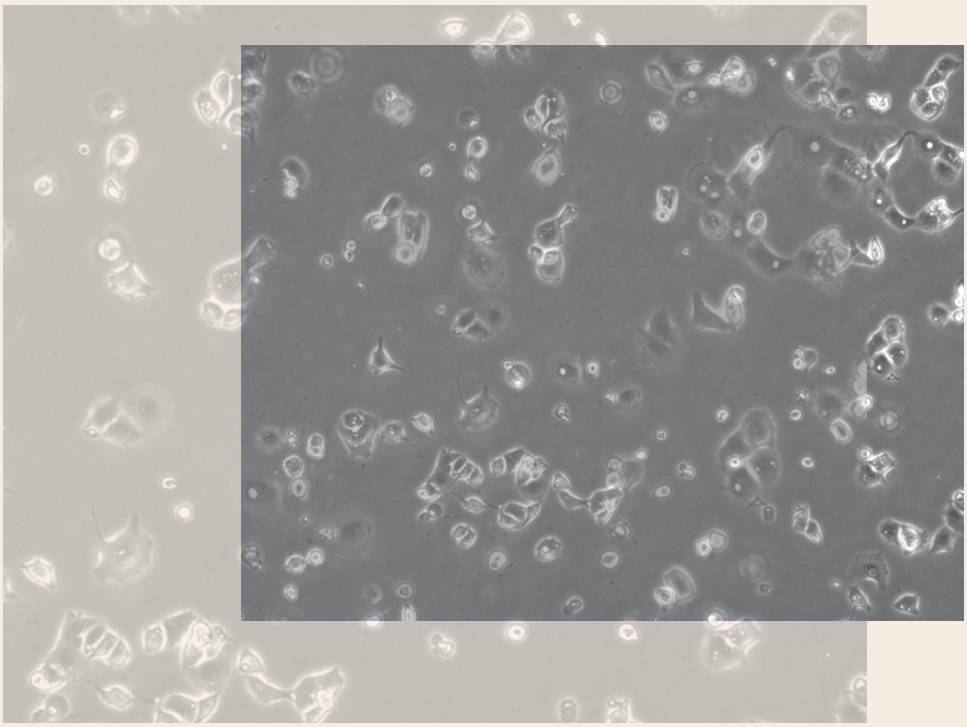
The company, Apoptrol, is the brainchild of Thomas Brown, associate professor of neuroscience, cell biology and physiology in the Boonshoft School of Medicine and College of Science and Mathematics at Wright State. Apoptrol specializes in developing small peptide molecules specifically for the inhibition of cell death, in conjunction with a second biological function, dual-function inhibition (DFI).

Target areas for cell death inhibition include organ transplantation, stroke, neurological disorders such as Alzheimer's and Parkinson's disease, eye problems such as macular degeneration, retinitis pigmentosa, and cataracts, type 1 diabetes and spinal cord injury.

The idea for the company came to Brown in June 2003. It materialized three years later when Brown's technology transfer concept was reviewed and awarded $37,000 with a milestone payment of nearly $13,000 for one year from the Ohio Research Challenge Fund for Technology Commercialization.

Brown worked with Daniel Ketcha, from Wright State's chemistry department to submit the invention disclosure. Jay Thomas, vice president for research, and William Sellers, director of technology transfer, provided guidance in establishing the start-up company. They were joined in the work-up to provisional patent filing by David Cool, of the department of pharmacology and toxicology, and Eugene Hern, former associate director of research and sponsored programs at Wright State.

an idea that will aid the treatment of human diseases **has evolved into a new biotechnology company**



WRIGHT STATE UNIVERSITY

The Technology Transfer Officers Council was formed to enhance collaboration among institutions across the state—public and private. In fact, many of Ohio's greatest technology transfer success stories are a testament to these partnerships.

But there is a difference in the way public and private institutions operate, and where their resources come from. Even when most metrics are comparable, private institutions often see higher license income.

Public Institutions

Total Number of Licenses/Options Executed	62
License Income Received	$4.1 million
Number of Invention Disclosures Submitted	397
Total U.S. Patent Applications Filed	240
U.S. Patents Issued	59
Start-up Companies Formed	13
Number of Licenses/Options Executed with Ohio Companies	42

Public numbers are representative of the following reporting institutions: Bowling Green State University, Cleveland State University, Kent State University, Ohio State University, University of Akron, University of Cincinnati, University of Toledo, Wright State University

Private Institutions

Total Number of Licenses/Options Executed	85
License Income Received	$19.7 million
Number of Invention Disclosures Submitted	418
Total U.S. Patent Applications Filed	238
U.S. Patents Issued	33
Start-up Companies Formed	11
Number of Licenses/Options Executed with Ohio Companies	21

Private numbers are representative of the following reporting institutions: Case Western Reserve University, Cincinnati Children's Hospital Medical Center, Columbus Children's Research Institute, The Cleveland Clinic Foundation, University of Dayton

The **Technology Transfer Officer's Council (TTOC)**—a 20-member group of private and public research institutions—was organized under the auspices of the Ohio Board of Regents to provide a forum for Ohio's academic, medical and government research institutions to share information, insight and best practices to improve institutional technology transfer and to enhance inter-institutional collaboration.

Air Force Institute of Technology
Heidi R. Ries, PhD
(937) 255-3636 ext. 4544
heidi.ries@afit.edu

University of Akron
Kenneth (Ken) Preston, JD
(330) 972-8254
kpreston@uakron.edu

Bowling Green State University
Cynthia (Cindy) Price, PhD
(419) 372-2481
pricec@bgnet.bgsu.edu

Case Western Reserve University
Joseph Jankowski, PhD
(216) 368-6837
jxj44@case.edu

Central State University
Gerald (Gerry) T. Noel, Sr.
(937) 376-6216
gnoel@centralstate.edu

University of Cincinnati
Anne Chasser
(513) 558-5653
anne.chasser@uc.edu

Cincinnati Children's Hospital Medical Center
Joseph (Joe) Fondacaro, PhD
(513) 636-7695
jdfonda@cchmc.org

The Cleveland Clinic Foundation/ CCF Innovations
Chris Coburn
(216) 445-4008
coburnc@ccf.org

Alan Bentley
(216) 444-6752
bentlea@ccf.org

Cleveland State University
Joseph (Joe) Jasper, Jr., JD
(216) 687-9228
j.jasper@csuohio.edu

Columbus Children's Research Institute
Amy Roscoe, MHA
(614) 722-2705
roscoea@ccri.net

University of Dayton
Larrell Walters
(937) 229-3515 ext. 1
larrell.walters@udri.udayton.edu

Kent State University
Gregory (Greg) Wilson
(330) 672-0704
greg.wilson@kent.edu

Miami University
Jeff Potteiger, PhD
(513) 529-3734
potteija@muohio.edu

NEOUCOM
Walter E. Horton, Jr., PhD
(330) 325-6290
wehj@neoucom.edu

The Ohio State University
Jean E. Schelhorn, PhD
(614) 292-2462
schelhorn.1@osu.edu

Ohio University
James Rankin, PhD
(740) 593-0370
rankinj@ohio.edu

Shawnee State University
Michael Field, PhD
(740) 351-3472
mfield@shawnee.edu

University of Toledo
Dan Kory, PhD
(419) 530-2286
dan.kory@utoledo.edu

Wright State University
William Sellers, PhD
(937) 775-2709
william.sellers@wright.edu

Youngstown State University
Peter J. Kasvinsky
(330) 941-3091
pjkasvinsky@ysu.edu

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Data in this report is representative of the 13 public and private TTOC members who submitted information.

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http://regents.ohio.gov/rgp/ttoc