"Commercialization of the intellectual property and new technology developed in our research labs has become a matter of the highest priority for the University System of Ohio."
— Chancellor Eric Fingerhut.

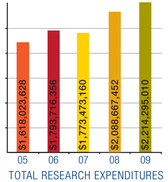
DATA_HIGHLIGHTS

Total Research Expenditures	$2,214,295,010
Number of Invention Disclosures	1,000
Total Patents Filed	564
Total Number of License Agreements Executed	174
Number of Start-up Companies Formed	28
License Income Received	$44,901,836

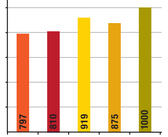
The Ohio Technology Transfer Officers Council (TTOC) provides a forum for all Ohio's academic, medical and government research institutions to share information, insight, best practices and experiences in an open and candid environment. The primary goals of the council are to improve the institutional technology transfer function within each organization, to enhance inter-institutional collaboration, and to elevate the role, visibility and proficiency of technology transfer throughout the state of Ohio.

The FY 2009 TTOC Report highlights the impact technology transfer is having on the state of Ohio. In FY 2009, the 18 reporting institutions increased the number of invention disclosures by 12.5 percent, filed 564 new patent applications, and entered into 174 new license agreements. This includes 28 new startup companies and a total of 136 active startup companies.

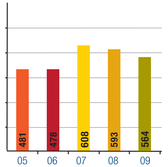
In this report, TTOC proudly shares with you some of our successes that illustrate how research-generated technology is boosting the economy, creating new jobs and improving the human condition. We encourage you to take a few minutes and review the data and stories in this year's report that highlight how academic research and technology transfer are contributing to a better and more productive society in Ohio.



TOTAL RESEARCH EXPENDITURES



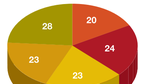
INVENTION DISCLOSURES



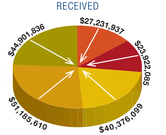
TOTAL U.S. PATENT APPLICATIONS FILED

TOTAL NUMBER OF LICENSES/OPTIONS

START-UP COMPANIES FORMED



LICENSE INCOME RECEIVED



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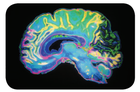
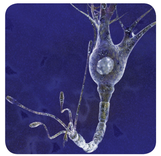




THE UNIVERSITY OF TOLEDO

UNIVERSITY OF AKRON

UNIVERSITY OF AKRON

Mithridion, Inc.

Mithridion, Inc. is a biopharmaceutical company that discovers and develops drugs for central nervous system (CNS) disorders, with an initial focus on Alzheimer's disease (AD) and schizophrenia. Through the company's research and development efforts, as well as its merger with Cognitive Pharmaceuticals Ltd., a **University of Toledo** spin-off, in June 2008, Mithridion is developing a pipeline of CNS drug candidates.

Mithridion has just announced the results of Phase 1 study of MCD-386, the company's leading drug candidate for treating AD. Compared to xanomeline, a previously regarded best agonist drug candidate, MCD-386 was shown to be superior and may have an improved adverse event profile. Additionally, preclinical results suggest that MCD-386 may have important and unique disease-modifying properties, which not only helps replace deficient cholinergic neuronal activity and improve memory and cognition, but also reduces or prevents the loss of brain cells in AD by preventing the formation of neurotoxic amyloid beta.

Currently, Mithridion is developing a controlled release formulation with the dual objectives of extending the duration of action and avoiding elevated peak concentrations, while maintaining the MCD-386 concentration above the therapeutic level.

The project described was supported in part by NIH SBIR grant AG20454 and the NIH Rapid Access of Interventional Development (RAID) Program. In addition, Mithridion has raised $7.4 million of angel and venture funding to date.

Akron Research Commercialization Corporation

Silver-based compounds have long been known in medicine, although their use to treat infections has largely been eliminated with the advent of modern antibiotics. However, there has been renewed interest in the use of silver for its broad-spectrum antimicrobial activity. Recently, the use of silver-based compounds in medicinal applications has gained additional favor, as they are therapeutically effective without the severity of side effects caused by other active metals.

Dr. Wiley J. Youngs and his team at **The University of Akron** have conducted cutting-edge research on silver-based pharmaceutical candidates. They have identified silver n-heterocyclic carbene complexes that have shown efficacy in treating bacterial lung infections, pneumonia, and cystic fibrosis. The first U.S. patent application, US 2007/0021401, on Metal Complexes of N-Heterocyclic Carbenes as Radiopharmaceuticals and Antibiotics, was published in early 2007, with several related inventions currently pending.

The University of Akron has assisted Youngs in the commercialization of his technology through a startup venture known as Akron Research Commercialization Corporation, now doing business as Nebusil. Their first product offering in 2007, coined Silvamist™, is an inhaled pharmaceutical candidate for the treatment of respiratory disorders and lung infections. The company is currently in the process of applying for Investigational New Drug (IND) status for Silvamist™ with the FDA.

For continued research and development in this area, an academic and industry Center for Silver Therapeutics Research has been established and headquartered at The University of Akron. Subsequent early-stage research has shown that some of these silver-based complexes may also demonstrate utility as chemotherapeutic anticancer agents. In addition, these compounds offer the advantage of reduced toxicity over other potent anticancer drugs such as the platinum-based cisplatin. Cisplatin is the chemotherapeutic agent used to successfully treat Lance Armstrong's testicular cancer, and helped support his amazing recovery from advanced stages of metastatic cancer.

Akron Polymer Systems

The University of Akron (UA) faculty Dr. Stephen Cheng, dean of the College of Polymer Science and Polymer Engineering, and Dr. Frank Harris, distinguished professor emeritus of Polymer Science, invented an advanced polymeric material, that, when converted to film, enabled large liquid crystal displays (LCDs) to be viewed from all angles for the first time. They created a company, Akron Polymer Systems Inc. (APS), to produce and commercialize these new polyimide materials for applications ranging from optical displays to aerospace to medical devices.

Theirs is a story of successfully transferring technology from the laboratory to the market. Harris and Cheng have 16 U.S. patents at UA, several in the area of negative birefringent polymer films for optical display applications. In the early stages of their academic research, this technology was licensed to big business for commercialization. The patented technology is used today for large screen LCD TVs and displays in aircraft cockpits.

In 2002, the University of Akron Research Foundation (UARF) assisted the professors to successfully commercialize their knowledge of polymer chemistry and photonics through university startup, Akron Polymer Systems Inc., an Akron-based corporation. Initially, the company used the UARF pilot plant to scale up synthesis of their polymers. Currently situated as a startup company in Omnova Solutions facility, APS broke ground on a newer and bigger facility, closer to the campus and facilities at The University of Akron.

UNIVERSITY OF CINCINNATI

UNIVERSITY OF DAYTON

The new space will encompass about 16,000 square feet, which is about three times larger than their current facility.

Today, the company manufactures proprietary polymers for high-performance displays for customers around the world, and has exceeded $2 million dollars in annual sales. In addition to optical films, they now work on other high-performance polymers for missile nose cones, biomedical devices and fuel cells. They have spurred job growth in the area, including employment of a staff that includes 11 PhDs from UA and Kent State University, and a full-time administrator. Harris is the chief executive officer and continues to manage the company. Cheng serves as the chief technical officer.

Harris and Cheng also give back by counseling entrepreneurial faculty inventors who are considering starting their own companies. Their advice is to leverage their area of scientific expertise; find good partners for collaboration; and to be persistent, but also patient, as commercialization never happens as quickly as hoped.

Make Brighter, Full-Color Electronic Readers?—Brilliant!

Electrofluidic Display Technology developed at the **University of Cincinnati** puts electronic book readers ahead by a wide margin. For the first time, "e-paper" will achieve the brilliance of printed media.

Thinking about getting an e-reader but not sure if you like the screen? An international collaboration of UC, Sun Chemical, Polymer Vision and Gamma Dynamics has announced Electrofluidic Display Technology (EFD), the first technology to electrically switch the appearance of pigments in a manner that provides visual brilliance equal to conventional printed media.

This new entry into the race for full-color electronic paper can potentially provide better than 85 percent "white-state reflectance," a performance level required for consumers to accept reflective display applications such as e-books, cell-phones and signage.

"If you compare this technology to what's been developed previously, there's no comparison," says developer Jason Heikenfeld, associate professor of electrical engineering in UC's College of Engineering. "We're ahead by a wide margin in critical categories such as brightness, color saturation and video speed."

This work, which has been under way for several years, is now publicly available in the May 1, 2009 issue of Nature Photonics, "Electrofluidic displays using Young–Laplace transposition of brilliant pigment dispersions."

Because the optically active layer can be less than 15 microns thick, project partners at PolymerVision see strong potential for rollable displays. The product offerings could be extremely diverse, including electronic windows and tunable color casings on portable electronics.

Furthermore, because three project partners are located in Cincinnati (UC, Sun Chemical and Gamma Dynamics), technology commercialization could lead to creation of numerous high-tech jobs in southwest Ohio.

To expedite commercialization, a new company has been launched: Gamma Dynamics (www.gammadynamics.net) with founding members of this company being John Rudolph (formerly of Corning) as president, Kenneth Dean (of Northwestern University) as CTO, and Heikenfeld as principal scientist.

"This takes the Amazon Kindle, which is black and white and could make it full color," Heikenfeld says. "So now you could take it from a niche product to a mainstream product."

NanoSperse adding jobs, production capacity

Art Fritts says the market for nanomaterials wasn't completely clear when he launched his fledging company in 2004.

Luckily for Fritts and NanoSperse, the value has become crystal clear since then. In July, 2009 the Dayton-based firm moved from production space at the **University of Dayton** Research Institute (UDRI) to an 8,000-square-foot production facility at the National Composite Center in Kettering. Production capacity? A million pounds of material per year.

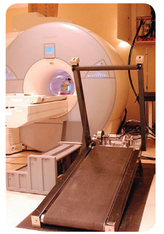
The move has prompted an increase in payroll, too. The company, which ended 2009 with two employees, now has eight and is expected to at least double that number within the next two years, says Fritts, NanoSperse's president.

NanoSperse has made its way commercializing a unique method of distributing nano-size carbon particles throughout materials to improve durability, reliability and functionality of composites for the defense, aerospace, and industrial marketplaces. The technology was developed at the University of Dayton, and Fritts — with 30 years in the polymer industry — started NanoSperse to commercialize it.

Fritz says that the material is tailor-made for a desert environment by becoming the actual surface of the treated part, eliminating the need for more traditional coatings. He adds that the composite can be expected to hold up three to five times longer than traditional coatings. The company is now producing the material for aerospace uses and shipped its first big order in July 2009.

Fritts says the relationship with UDRI was a godsend for the young company because it allowed NanoSperse to fill orders immediately while learning how to scale production to bigger orders — and to work with cross-industry teams as part of the Ohio Third Frontier's Research Commercialization Program.

KENT STATE



THE OHIO STATE UNIVERSITY

Centennial Research Park Welcomes AlphaMicron

AlphaMicron was founded in 1997 by former faculty members of Kent State's Liquid Crystal Institute.The company designs and manufactures high-tech military and consumer products. Its technologies are being applied to products that include ski goggles, motorcycle visors, auto-dimming mirrors, flight deck goggles, adaptive windows, shutters and luxury eyewear.

AlphaMicron's new location in Centennial Research Park accommodates the needs of its growing manufacturing operations and expanding staff. Prior to its relocation, AlphaMicron occupied a 12,000-square-foot space on Martinel Drive in Kent. The company now has 30,000 square feet in its new facility and employs 35 people.

The high-tech company's grand opening celebration included select guests Gov. Ted Strickland, Congressman Tim Ryan, **Kent State University** President Lester A. Lefton and Kent Mayor John Fender. Afterward, AlphaMicron employees led guests on a tour of the newly renovated facility.

"We're extremely pleased to have such a promising, high-tech company as an anchor tenant in our research park," says Greg Wilson, Kent State's associate vice president for university relations, economic development and strategic partnerships. "AlphaMicron is an exciting company with Kent State roots that creates innovative liquid crystal-based products. It is helping to fuel technology-based economic development, providing growth for the region and the state."

"It's great for AlphaMicron to launch its next phase of growth in Northeast Ohio and remain in the city of Kent. This is in line with our goal to help the region in strengthening existing and emerging technology ventures and maintaining our close relationship with our colleagues at the Liquid Crystal Institute at Kent State University," said Dr. Bahman Taheri, AlphaMicron CEO.

AlphaMicron has invested $1.4 million to date in renovation work to transform a former bus garage into its new permanent home.

The company began production recently and anticipates that new hires will be made as production capacity expands in the new space.

New Technology provides the best images yet

Each year, American cardiologists perform more than 10 million treadmill exercise stress tests to evaluate patients with coronary heart disease. After walking on a treadmill, a patient's heart is imaged using ultrasound or other techniques.

Magnetic Resonance Imaging (MRI) offers clearer images of the human heart than these methods — but the magnets of the MRI and the treadmill's motor and materials don't mix.

Until now.

The Ohio State University researchers have created an MRI-compatible treadmill, which uses a hydraulic power system and other nonmagnetic materials. The treadmill allows cardiologists to take an MRI image of the heart 60 seconds after exercise — at a time of peak stress. This can provide physicians with valuable information to plan a course of treatment and ultimately save a patient's life.

The research team is led by Orlando Simonetti, associate professor of internal medicine and radiology at OSU's Richard M. Ross Heart Hospital, and includes Dr. Subha Raman, cardiologist; John Arnold, professor of engineering; and Eric Foster, graduate student in mechanical engineering. They created a company, EXCMR Ltd., for the production and marketing of the device.

OSU's Technology Licensing and Commercialization Office has been a part of their efforts since an early stage. The office staff have helped the research team start the company and license the intellectual property, as well as secure funding from state and local agencies.

The researchers are conducting clinical trials at the OSU Medical Center and plan to setup manufacturing facilities and increase the number of employees in the company.

"It's amazing how much support there is at Ohio State," said Simonetti of the research, technology licensing and commercialization process. "The university is beginning to recognize the importance of this kind of activity among faculty and to encourage it. It seems to be a winning situation all around."

BOWLING GREEN STATE UNIV.

MIAMI UNIVERSITY

CrossHair Technologies Inc.

Some events change people and some people change events, but the January 15, 2009, ditching of Charlotte-bound U.S. Airways Flight 1549 into the Hudson River near New York City, shortly after the aircraft slammed into an unavoidable flock of Canada geese a few minutes after the plane's departure from New York's LaGuardia Airport, caused Frank Murray, president and CEO of CrossHair Technologies Inc., a **Bowling Green State University** spinoff company, to change his business plan. While Frank was impressed with the instant response and heroic effort of Captain Chesley "Sully" Sullenberger and his crew in saving the lives of all 150 passengers that day, he knew there had to be a better way of recognizing a bird threat and avoiding it.

Frank founded CrossHair Technologies Inc. with Robert Vincent, PhD, professor of geology in 2007, to take advantage of the commercialization potential of a new invention that Vincent had discovered while in an oil field performing spectrographic analysis. Vincent asked his colleague and soon-to-be joint inventor, Maruthi Sridhar, PhD, research scientist at BGSU, to take a spectral scan of a friendly yellow Labrador that was on the field that day. The unexpected and intriguing results of that scan led Vincent to experiment with other mammal hair examples, including a couple of cats and even human hair.

An exciting outcome followed from Sridhar's analysis of the hair scan spectral data. It was discovered that a recognizable mammal hair absorption band existed and that there was a possibility not only of identifying but also of discriminating between mammal hair types. Vincent, who was not a stranger to entrepreneurial endeavors (having owned a geology focused company at one time, and having started Blue Water Satellite Inc., an earlier established BGSU spinoff company formed to commercialize another technical invention of his, which focused on satellite remote sensing of lakes and streams for toxic algae blooms), knew that he needed to get patent protection for the his new invention, "The Mammal Hair Detector."

With guarded enthusiasm, Vincent contacted and discussed his new invention with fellow Rotarian and entrepreneur Frank Murray of St. Marys, Ohio. Both men thought of many applications where mammal hair detection could be a tremendous asset. Within a few days, Vincent brought Frank to the Office of Technology Transfer and Services and introduced his friend as wanting to license the technology. Both Frank and Vincent believed that they could start a company based on the new detection technology, develop a working prototype, acquire financial backing and manufacture and sell the detection device to the various market segments they had identified.

The re-thinking of the initial target market may have ensured the future for the new company. Both Murray and Vincent were convinced that their spectral scanning device could be reconfigured to specifically detect birds, either in the air or on the ground. From the date of the "Miracle on the Hudson" forward, Frank and Vincent thought of creating airport- and aircraft-based detection systems. CrossHair Technologies Inc. is now directing its efforts to creating a prototype airport bird detection and avoidance system. They know the market is there and that there is a national sense of both awareness and urgency that will support their endeavor. This new BGSU spinoff company, CrossHair Technologies Inc., has a new market focus: they're in business to save lives.

redLantern Degree Audit Reporting System

More than 3.7 million college students in the United States and Canada can tell if they're on the right path to graduating, thanks to software developed and marketed by a team at **Miami University**. This software is offered at more than 300 colleges and universities across the United States and Canada.

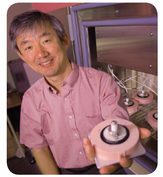
In 1983, Miami University developed an internal degree audit system to provide students with a tool for helping them track their coursework to degree completion. After requests from other institutions interested in using the degree audit software, a separate unit within the university known as DARS was created in 1985 and began licensing the degree audit software to colleges and institutions nationwide.

By 2005, Miami University was earning more than $600,000 per year in licensing revenue from DARS, which peaked at over $1.1 million in 2007.

In the summer of 2008, DARS unveiled a new organization name, redLantern. The name change helped give a more comprehensive name to the Miami University auxiliary that provided multiple educational software solutions in addition to the degree audit reporting system.

On March 4, 2009, Miami University sold the assets of their redLantern operations for a gross purchase price of $3M. redLantern, LLC, was formed with 20 employees as a separate entity under the same ownership as CollegeSource Inc. The cooperative efforts of CollegeSource and redLantern bring together two of the most respected and innovative software solutions among the higher education market. In 2009, redLantern relocated from Oxford, Ohio, to a newly acquired and renovated facility in Cincinnati, Ohio, and now has 30 employees. New license revenue is projected to top $1 million in 2010.

THE UNIVERSITY OF TOLEDO



OHIO UNIVERSITY

CLEVELAND STATE UNIVERSITY

Xunlight Copropration

Xunlight Corporation is a venture-backed advanced technology company that specializes in the development of high-performance, flexible and lightweight solar modules. Founded in 2002, the company licensed technology from **The University of Toledo** and began business operations in the University operated business incubator. Unlike the rigid and heavy conventional solar panels, Xunlight is revolutionizing the development of a light weight flexible thin-film silicon-based photovoltaic solution, which allows streamlined installation for a variety of large and small solar module applications.

Xunlight makes the silicon solar modules in sheet-like fashion on a proprietary high speed roll-to-roll manufacturing process. The process deposits solar energy-gathering material on a three-foot wide, one-mile long sheet of stainless steel material that moves on the production line and makes 720 square feet per hour. The device has been hailed by the industry watchers as a low-cost solution to large-scale production.

Since 2002, Xunlight has received over $29.6 million in government grants and loans and $42.5 million from venture capital funds in the U.S. and Europe. Currently, the manufacturing facility has the annual capacity to make panels capable of generating 25 megawatts of electricity, enough to power 25,000 homes. Xunlight, which is up to 110 employees, has sold commercially manufactured solar modules for a few test sites, including a billboard in New York's Times Square and an array of large-area flexible solar panels at the University of Toledo Scott Park Campus of Energy and Innovation. The company's panels have recently received approval from Underwriters Laboratories.

Diagnostic Hybrids and EZ Asphalt

The Ohio University Technology Transfer Office helps inventors improve world health and quality of life, develop new sustainable resources and clean energy, and provide improved societal and cultural benefits. Two recent examples include Diagnostic Hybrids and EZ Asphalt.

Having executed both a legacy license agreement and foundation investment with the university, Diagnostic Hybrids Inc. manufactures tests for a wide range of respiratory and infectious diseases, including swine flu and HIV, to improve world health and quality of life. In January 2010, DHI was sold to Quidel for $130 million, and Ohio University's equity sale was approximately $40 million. Following the sale, DHI continues to be headquartered in Athens, OH and has 220 employees locally, representing a significant source of high-tech jobs in Southeast Ohio.

Billions of dollars each year are spent to repair roads and vehicles due to cracked asphalt pavements. To deal with this pressing societal problem, associate professor Sang-Soo Kim, Ph.D., PE, invented the Asphalt Binder Cracking Device (ABCD), a device which accurately measures asphalt binder strength and cracking temperature, mimicking real-life road conditions. Using ABCD, the low temperature thermal cracking can be prevented by selecting proper asphalt for the climate. EZ Asphalt was spun out of the Russ College of Engineering and Technology and currently incubates at the Ohio University Innovation Center, a 36,000 square foot facility with high tech equipment. EZ Asphalt has an exclusive license to patented ABCD technology for manufacturing and sales of the test device.

Harvesting Wind Energy

When many people think of wind farms, they picture turbines rotating above large swatches of farmland out west.

But imagine wind turbines attached to water storage tanks on urban apartment buildings, to skyscrapers, and topping the pylons of bridges.

It may seem far-fetched, but thanks to the work of Dr. Majid Rashidi from **Cleveland State University**, this could become a reality.

Rashidi, the Betty L. Gordon Distinguished Professor of the Mechanical Engineering Department and the chair of the Engineering Technology Department, is researching the conversion of wind energy into electricity at places where the wind speed is relatively low.

In urban areas, freestanding, windmill-style turbines cannot generate much power, as the wind speeds are too slow. But Rashidi's innovation is to attach turbines to round or spiral-shaped structures, which increase the wind's speed as it approaches the turbines. Thus, the turbines can turn and generate electricity.

A functional prototype of Rashidi's wind tower design has been installed on the Plant Service Building at Cleveland State University, and the institution has been assigned two patents for this technology, with two more pending.

The design is modular, can be built vertically, and features different sizes of turbines for the targeted power needs. In addition, the design can be retrofitted to existing structures, such as farm silos or the urban water tanks mentioned previously.

While Rashidi has received patents and accolades — such as the 2010 NorTech Innovation Award — his ultimate goal is to mass-produce the technology so that it can be used worldwide. And CSU technology transfer staff members are proud to be a partner in this effort.

The Technology Transfer Officers Council – a 21-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.

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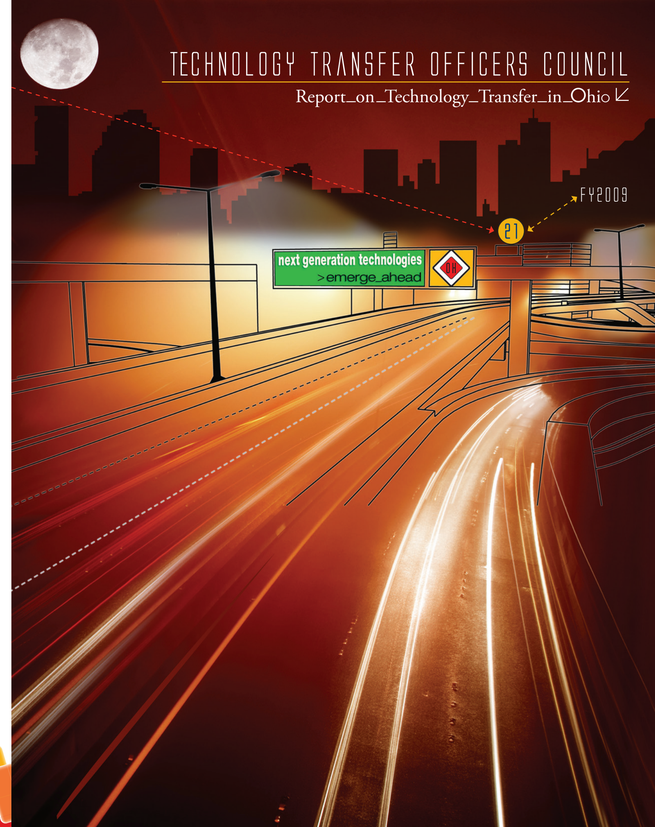
Data in this report are representative of 18 of the public and private TTOC members.

THE UNIVERSITY OF TOLEDO 1872

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