2008

UNIVERSITY OF MICHIGAN

annual report
on technology transfer, industry research and economic development

YEAR ENDING JUNE 30, 2008

MESSAGE FROM THE VICE PRESIDENT FOR RESEARCH

The Engaged University

To address the economic and societal challenges faced by our state, region and nation, the University of Michigan is focused on deploying our research discoveries and our talents as never before. Times such as these, when the economic foundations of our region are rapidly transitioning from a manufacturing to a knowledge-based economy, require bold actions with a commitment to meet the challenge.

We've made significant strides this year in delivering on our commitments by:

+ focusing our research strengths to address major issues facing mankind and the nation
+ continuing to incentivize and make it easier for faculty to move their best ideas rapidly into commercially available applications
+ expanding outreach to our industry and community partners through such initiatives as the newly launched Business Engagement Center.

We hope this report will convey the scale of the inventive capacity of the University of Michigan, and our commitment to delivering economic and social benefits to the people of our state and beyond.

STEPHEN R. FORREST
Vice President for Research, University of Michigan

MESSAGE FROM PRESIDENT COLEMAN

"The innovative work of University of Michigan researchers and scientists is vital to the future of our state and nation. Our impact must be broad, because the future of American competitiveness depends vitally on transforming the Midwest. We are committed to being a university that helps shape a strong Michigan economy through discovery, invention and technology." MARY SUE COLEMAN | President, University of Michigan

Tech Transfer Engagement

We take pride in reporting on our activities and performance for this past fiscal year.

In Fiscal Year 2008 (FY 08) we received 306 new invention disclosures, representing a continuing stream of high-quality discoveries from our talented researchers. We entered into 91 agreements with our business partners, matching last year's total, despite the challenging business climate. Our business formation activities resulted in 13 new start-up companies, matching the record set in 2004, and bringing our five-year total to 49, the majority of which are located within Michigan. We also achieved record tech transfer revenues of $25 million in FY 08, allowing us to reinvest in further research, education and economic development initiatives for the future.

We've embarked on several bold initiatives to enhance our capabilities and to expand our engagement with entrepreneurial and industry partners. These include:

+ A move to campus to better serve our faculty and business clients, co-locating with the University's new Business Engagement Center

+ Expanding the Catalyst Resource Network, supplying talent and funding to enhance entrepreneurial endeavors

+ The creation of new ways to market our opportunities, including online technology descriptions and a series of podcasts.

We're proud of our part in leveraging the technology, talent and resources of this great University to benefit the people in our community, our state and beyond.

KEN NISBET
Executive Director, U-M Tech Transfer

U-M Tech Transfer executive team from left: Rick Brandon, Doug Hockstad, Ken Nisbet, Robin Rasor, Andrew McColm.

THE MISSION of U-M Tech Transfer is to effectively transfer University technologies to the market so as to generate benefits for the University, the community and the general public.

U-M Tech Transfer

ABOUT

Technology transfer is the process by which research discoveries and inventions are transformed into valuable products and services that benefit society. This process is often long and complex, requiring creativity, skill and persistence.

U-M Tech Transfer is comprised of specialists in technology licensing, business formation, and intellectual property law—all of whom are focused on providing professional, responsive services to U-M faculty and scientists. We work with inventors in every phase of technology transfer, from initial consultations and technology assessments to marketing, licensing and start-up formation. We also aggressively cultivate a network of business partners to assist us in commercializing technology, building businesses and supplying capital and other resources.

We view ourselves as "Innovation Facilitators" who encourage creativity, supply and link resources, and guide discoveries to a successful market deployment. As such, we take pride in supporting the University's mission.

WHY DO TECH TRANSFER?

+ To increase the likelihood that new discoveries will provide tangible benefits to the general public.
+ To help create a venue that attracts, develops, and retains the very best students, faculty and researchers.
+ To improve the flow of research dollars and resources to the academic community.
+ To enrich the educational experience through student internship programs and other hands-on learning activities.
+ To leverage business partnerships to stimulate regional and national economic development.
+ To enhance the reputation and stature of the University.

COMPONENTS OF THE TECH TRANSFER PROCESS

RESEARCH
▾
PRE-DISCLOSURE
▾
INVENTION DISCLOSURE
▾
ASSESSMENT
▾
PROTECTION
▾
MARKETING TO FIND OR FORM A LICENSEE
▾
LICENSE TO EXISTING BUSINESS
{ OR }
ASSIST FORMATION OF A START-UP BUSINESS
▾
LICENSING
▾
COMMERCIALIZATION
▾
REVENUE
▾
REINVEST IN RESEARCH + EDUCATION

2008 Fiscal Year

RESULTS Tangible measures of success in technology transfer include invention disclosures, license agreements, new business start-ups and revenues. But intangible measures of achievement are equally important. For example, the quantity and quality of our engagements—with researchers, students and business and entrepreneurial partners—and the impact on the public of our transferred technologies are important indicators of success. The following pages of metrics and stories illustrate these successes.

2008 INVENTION DISCLOSURES

MEDICAL

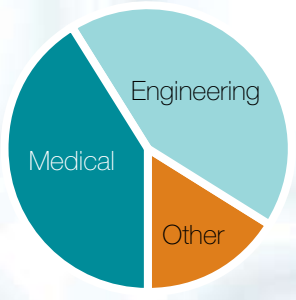
Anesthesiology	4
Biological Chemistry	3
Cancer Center	1
Cell Developmental Biology	7
Computational Med & Biology	1
Dermatology	1
Human Genetics	3
Internal Medicine	43
Med School Administration	1
Molecular Physiology	5
Neurology	2
Obstetrics & Gynecology	1
Office of Ed Resources	2
Ophthalmology	4
Otolaryngology	2
Pathology	12
Michigan Center for Translational Pathology	5
Pediatrics and Comm Diseases	2
Pharmacology	2
Physical Medicine & Rehab	1
Psychiatry	6
Psychiatry-Molecular & Behavioral Neuroscience Institute	2
Radiation Oncology	4
Radiology	2
Surgery	6
Urology Surgery	4
Total	**126**

ENGINEERING

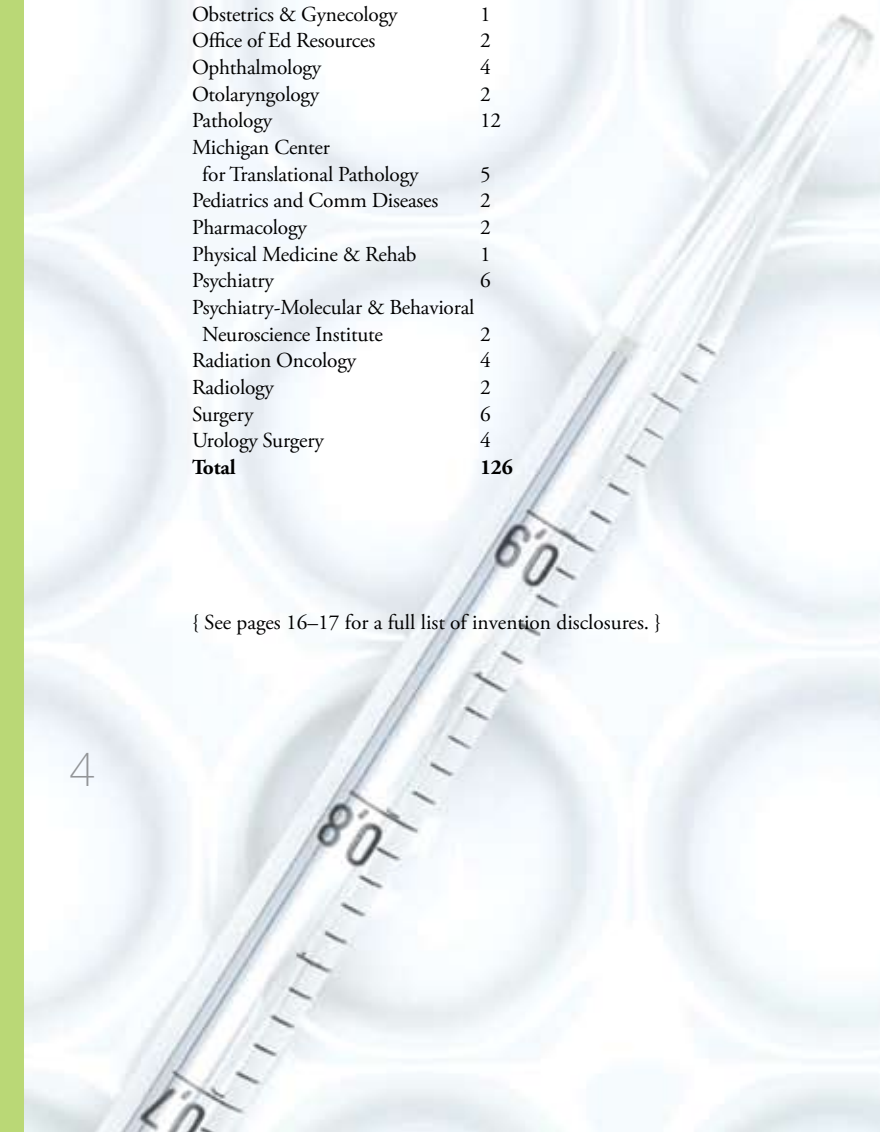
Aerospace Engineering	3
Atmosphere Oceanic Space Sci	3
Biomedical Engineering	11
Chemical Engineering	11
Civil and Environmental Eng	3
Electrical Eng & Computer Sci	61
Mechanical Engineering	22
Materials Science & Engineering	15
Naval Architecture & Marine Eng	1
Nuclear Eng & Radiological Sci	1
Total	**131**

OTHER

Art	1
Biostatistics	1
Business Information Systems	1
Business School	1
College of Literature, Science, & the Arts	12
Dentistry	8
Education	1
Epidemiology	1
Information Technology & Computer Science	1
Institute for Research on Women & Gender	2
Life Sciences Institute	4
Pharmacology	1
Pharmacy	5
School of Information	1
UM-Dearborn	1
UMH Information Technology	2
UMH Orthotics & Prosthetics Center	1
UMH Social Work	1
UMH Surgery	2
UMH Trauma Burn Center	1
Other	1
Total	**49**

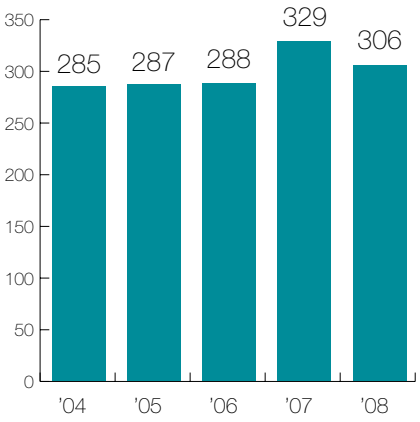


{ See pages 16–17 for a full list of invention disclosures. }

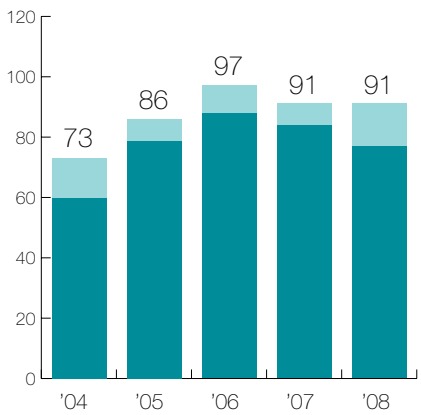


Tech Transfer | Year in Review

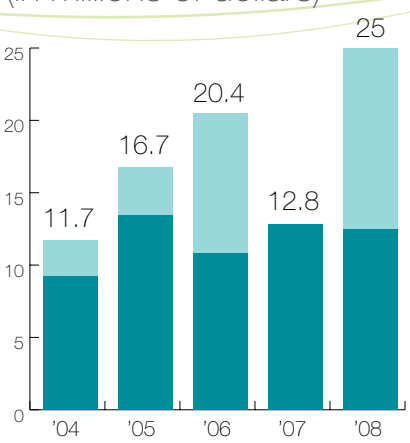
INVENTION DISCLOSURES



LICENSE AGREEMENTS



LICENSE REVENUE (in millions of dollars)



Note: admin. portion of revenues are reinvested to enhance tech transfer and industry engagement activities

2008 START-UP CLASS

Nephrion
Treatment for end-stage renal disease

InflaRx
mAB therapeutics against sepsis

OtoMedicine
Drugs and therapies for prevention of hearing loss

Tissue Regeneration Systems
System and materials to create living joint and other bone replacements

Buck 80
Sports training systems based on 3-axis motion capture

Sakti3
Drive-train batteries for next generation transportation

Omni Sciences
Applications of lasers for semiconductor process control, combustion monitoring, chemical sensing, tissue ablation, and infrared counter measures

Incytu
Cell-based therapies for diabetic ulcers

Polaris
Cannulated scalpels for use in bone fracture repair

ePack
Collection of technologies related to advanced wafer scale packaging of MEMS devices

Armune Biosciences
Cancer diagnostics utilizing microarray autoantibody signatures

Lycera
Treatments for autoimmune diseases

Arbor Photonics
Compact, high power fiber lasers for industrial and life science applications

FY 2007
START-UPS
FlexSys
ImBio
Incept BioSystems
SandBox Tech
Avicenna
Locomatix
Biodiscovery

FY 2006
START-UPS
CastAnalysis
Cyclos Semiconductor
NanoMag
Pipex
SensiGen
Compendia Biosciences
Cielo MedSolutions
Zattoo
MedSpoke

FY 2005
START-UPS
Accuri Cytometers
Invia
McCreadie Group
Xoran Technologies
Mayaterials
nPoint
PreSense Technologies

FY 2004
START-UPS
Cellectar
GMP Immunotherapy
OncoImmune
Ascenta Therapeutics
Neural Intervention Technologies
Mobius
Avidimer Therapeutics
Dentigenix
Southern Industries
MC3 Biomaterials
NeuroNexus Technologies
Opteos
Ablation Frontiers

PETER MA + WILLIAM GIANNOBILE

Regenerative Medicine

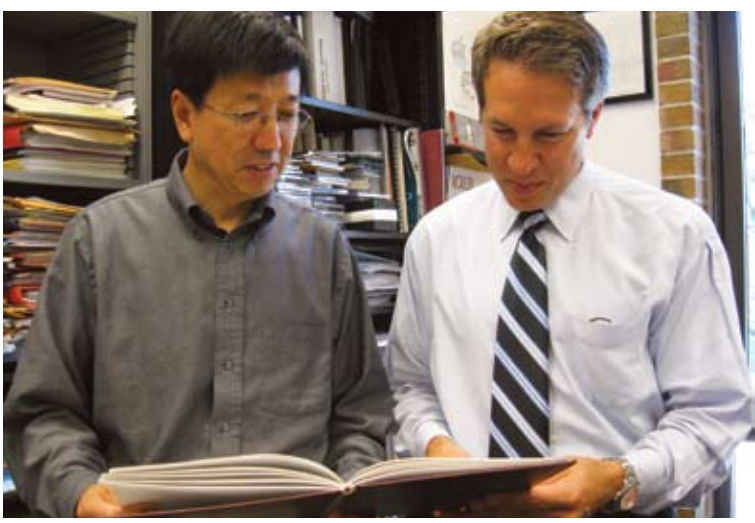
Peter Ma describes his research partnership with William Giannobile as a case of "antibody finds antigen." Certainly, the two scientists have much in common. Both came to the University of Michigan approximately ten years ago. Both hold joint appointments in dentistry and biomedical engineering. And both are interested in developing technologies for wound repair.

When the two teamed up several years ago, Ma was looking for someone with medical expertise who could help identify new applications for his three-dimensional tissue repair scaffolds. Giannobile was searching out better methods of delivering a growth factor he had developed for the treatment of periodontal disease, which affects as many as 20–40 million Americans annually.

"The FDA had approved our platelet-derived growth factor," Giannobile explains. "But the delivery system was just a ceramic matrix with growth factor attached—essentially a dose-dumping system. New tissue growth depends on providing the body with a continuous supply of bioactive molecules that stimulate blood vessel growth. What we needed was a controllable drug delivery system."

And that's exactly what he and Peter Ma have devised. Their new approach starts with a custom-designed, three-dimensional tissue scaffold made from biodegradable nanoscale fibers. By attaching nanospheres containing growth factor proteins directly to the nanofibers on the scaffold, it becomes possible to deliver the proteins continuously over any pre-determined time frame. As Ma points out, "Two days, two weeks, two months… The scaffolding can be programmed to release growth-promoting nanospheres for a very precise period of time."

U-M Tech Transfer, working with Ma and Giannobile, has optioned the technology for the delivery of platelet-derived growth factor to BioMimetic Therapeutics, Inc. The company is currently exploring both hard and soft tissue applications. In the meantime, the two U-M researchers are testing their technology in large animal models and, soon, in human clinical trials.



By combining a three-dimensional, biodegradable scaffolding with a nanoscale system for releasing continuous doses of growth factor over precise periods of time, U-M faculty scientists Peter Ma and William Giannobile have created what may well be the first controllable drug delivery system for tissue repair. "Michigan's strength across disciplines—specifically, its top-rated programs in dentistry, engineering and medicine—offers tremendous advantages for bioengineers," Giannobile says.

These adaptive wind turbine blades are lightweight, monolithic structures. Sensor-driven trailing edge flaps enable the blades to flex in response to prevailing wind conditions. By reducing structural loads and fatigue levels by as much as 80 percent, the morphing blade (being tested under the center fuselage at left) dramatically increases the potential for capturing energy.

FLEXSYS + SRIDHAR KOTA

Flex-Wing Technology for Improved Efficiency

A dozen years ago, U-M Professor of Engineering Sridhar Kota—a specialist in mechanical systems design—set himself a new challenge: developing mathematical formulas that could enable a given structure to morph into another shape. "Taking my inspiration from birds and other natural phenomena," he says, "I wondered if there might be a way to create bio-inspired structures, one-piece designs capable of flexing continuously and precisely into optimum aerodynamic shapes."

Kota's approach to compliant systems design represented a radical departure from traditional engineering strategies that relied on elaborate joints, actuators and other rigid and complex devices. By the mid-1990s, with funding from the Department of Defense, Kota and his research team were exploring applications of bio-inspired design methods and had devised a mission-adaptive compliant wing (MACW) proven to reduce aircraft fuel consumption by 3 percent—a figure that could translate into more than $2 billion in annual savings for the U.S. aviation market alone.

In 2001, with more product concepts in the pipeline, Kota launched FlexSys Inc., an Ann Arbor-based company dedicated to developing compliant structures. Among the firm's latest achievements is an adaptive wind turbine blade. In detailed analysis and simulations conducted by Sandia National Labs, the FlexSys blades reduced structural loads and fatigue levels by 80 percent and increased energy capture rates by 20 percent. As Kota explains, "If we can lower production costs by just 20 percent industry-wide, we can make wind energy comparable in price to fossil fuel."

ALLEN SAMUELS

Improved Hygiene Systems

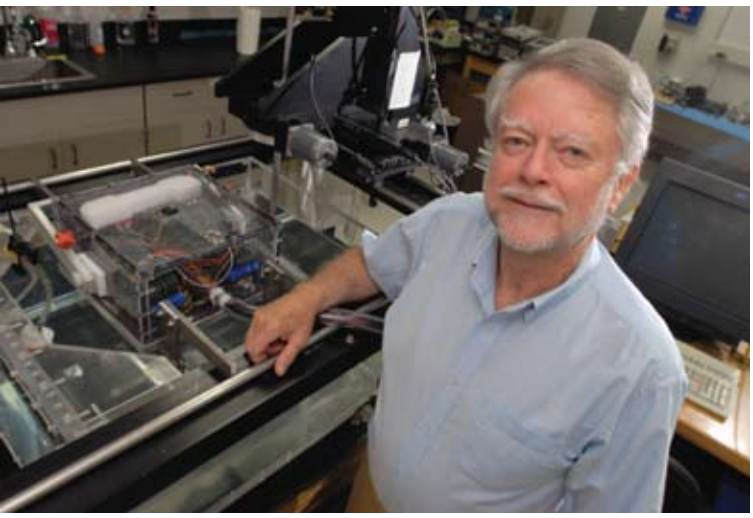
When his father was diagnosed with dementia in 2004, award-winning industrial designer and Professor of Art and Design Allen Samuels began what he calls "a year of learning." As the disease progressed and the settings changed—from home to hospital to assisted living and, finally, to hospice—Samuels remained at his father's side, providing care and support. As he recalls, "My mother and I worked hard to help my father maintain some measure of dignity. The first instance when I couldn't get him to the bathroom in time was a moment of desperation and despair for both of us."

But it was also a moment of inspiration, when Samuels decided to put his design skills to work developing adult hygiene products that were sanitary and easy to use while preserving the dignity and independence of patients with physical and cognitive disabilities. A year later, Tech Transfer and Samuels applied for patents on two products: an integrated bedpan system and a "mobile bathroom" that combines a sink, clothes hamper, storage compartment, and toilet in one portable, lightweight unit. In 2005, the Mobile Bathroom design won a prestigious International Red Dot Award.

It was at a monthly forum hosted by Ann Arbor SPARK that Samuels met entrepreneur and engineer Bob McCurrach. The two joined forces, and recently received a $65,000 gap funding grant, which will allow for prototype development and testing. This past summer, they refined their marketing strategy with the help of the Office of Technology Transfer's TechStart student interns. Field testing of the group's improved bedpan system is expected to begin within a matter of months.

As Samuels points out, "Aging brings with it many physical problems. But it also offers exciting opportunities for reconsidering the physical world. In many ways, it's an open invitation for designers and engineers."

Designed to increase the dignity and comfort of patients while preventing the spread of infection and lessening the work of caregivers, the Mobile Bathroom designed by U-M Professor of Art and Design Allen Samuels combines a sink, clothes hamper, storage compartment, and toilet in one freestanding unit. Equipped with air vents and lights, the commode can also be programmed to give pre-recorded instructions in a familiar voice to aid cognitively impaired patients.



Histotripsy uses high-intensity focused ultrasound, in controlled pulses, to break down the cellular structure of soft tissue. In addition to treating prostate cancer and benign prostatic hyperplasia, the non-invasive therapy could be used for applications that include deep vein thrombosis, liver metastasis, kidney stones and body shaping. In addition, a grant from the Heartwell Foundation is funding research into histotripsy as a possible treatment for Hypoplastic Left Heart Syndrome, which claims the lives of approximately 3,000 newborns each year.

CHARLES CAIN

A New Perspective on High-Intensity Ultrasound

In 1996, with support from the Whitaker Foundation, Professor of Biomedical Engineering Charles Cain attained his longtime administrative goal of seeing the Biomedical Engineering Program, which he chaired, become a full-fledged department within the U-M's College of Engineering. With that milestone behind him, he was ready to concentrate once again on his research.

For more than 20 years, that research had focused on therapeutic high-intensity ultrasound, primarily thermal applications in which ultrasound is used to heat and destroy diseased tissue. But one of the insoluble problems of thermal ultrasound is the lack of imaging feedback showing the physician the extent of the surgical lesion produced. Cavitation, the production of tiny energetic bubbles in the tissue, was an alternative approach taken by Professor Cain's group.

"The conventional wisdom was that cavitation should be avoided," Cain says. "But no one could tell me why. So I decided to study it as a possible mechanism for non-invasive surgery."

As Cain and his research team discovered, cavitation therapy—also known as histotripsy—proved to be ideal in many ways. Cain explains: "The process creates an ultrasonically visible bubble cloud at the point of focus so that, unlike radiation and most other non-invasive therapies, it's easy to see precisely where tissue is breaking. Using controlled pulses, practitioners can observe the tissue breaking down until, finally, no recognizable cellular structure remains." The end result is liquefied tissue, which can either be aspirated or quickly reabsorbed by the body.

In collaboration with Dr. Will Roberts of the U-M Department of Urology, Cain obtained funding from the Coulter Foundation to develop histotripsy as a treatment for prostate cancer and benign prostatic hyperplasia (BPH). With support from an excellent team of basic science researchers (Drs. Zhen Xu, Tim Hall and Brian Fowlkes), help from Tech Transfer and other University resources, and long-term funding from the National Institutes of Health, a new start-up company, Histosonics, is being formed to bring these exciting innovations to the market.

JEROME LYNCH

Wireless Sensor Networks for Early Damage Detection

In the late 1990s, U-M Assistant Professor of Civil and Environmental Engineering Jerome Lynch began to explore a relatively new research domain known as smart structures. As he explains, "This particular field employs sensors, actuation, structures and intelligence. In civil engineering, the major focus is on developing new devices for structural health monitoring."

These days, Lynch is using smart structure technology to advance the capabilities of wind turbines. "It's generally the blades that fail, often catastrophically," he says. "When that occurs, it destabilizes the entire wind energy plant and damages other mechanisms." The key to preventing these disruptions is early detection.

In collaboration with U-M Associate Professor of Aerospace Engineering Carlos Cesnik, Lynch has developed wireless micro-sensors designed to collect acceleration and vibration data from wind turbines. Embedded computational devices enable the sensors to "interrogate" the data with monitoring algorithms, de-clutter the data stream, and convey only the most useful information to engineers and technicians.

In February of 2008, with funding from the National Science Foundation and U-M's Office of the Vice President for Research, the two scientists assessed the reliability of their sensors at a major wind energy collection site in Germany. Direct monitoring of structural stresses began the following September. Discussions currently underway with the National Renewable Energy Lab could lead to further testing and wider applications of the technology.

Lynch's earlier research into smart structures, done in cooperation with Chemical Engineering professor Nicholas Kotov, led to the development of a nano-engineered "sensing skin" that, in addition to being well-suited for inclusion in the wind turbine blade assembly or coated on the blade surface, can be applied to ships, bridges and aircraft. When subjected to electrical stimulation, this appliqué-like technology produces two-dimensional maps of the structure that make it possible to identify areas of corrosion and, theoretically, to prevent catastrophic mechanical failures.

Wireless sensor networks developed by U-M faculty members Jerome Lynch and Carlos Cesnik are being used to monitor structural stress on wind turbines in Germany—a country that meets seven percent of its annual energy needs through wind power. As Lynch points out, "Rather than inundate users with raw data that is essentially useless, we leveraged the potential of the technology. Data interrogation is done within the sensors, assuring that the final data stream will contain only useful engineering information."

Since developing the American Customer Satisfaction Index (ACSI) in 1994, Professor Claes Fornell has launched three related companies, all of them based in Ann Arbor. A fourth enterprise is expected to begin operation in early 2009. "The University is a tremendous asset," he notes. "It provides an impressive level of support for moving research into commercial venues, where the potential exists for much greater economic value."

CLAES FORNELL

National Quality Research Center

In the early 1990s, Professor Claes Fornell set out to correct what he perceived to be a serious omission among American economic indicators. As he explains, "Consumer spending and customer satisfaction are the driving force behind economic growth. And yet there had never been a measure of what economists call consumer utility for the economy."

As director of the National Quality Research Center (NQRC) at the University of Michigan's Stephen M. Ross School of Business, Fornell developed the American Customer Satisfaction Index (ACSI). Several years earlier, he had designed a similar measurement tool known as the Swedish Customer Satisfaction Barometer.

Within a short time, ACSI was being used to gauge customer satisfaction with the goods and services of 200 companies as well as a multitude of government agencies. Gradually, Fornell and his associates discovered that, in addition to providing a reliable picture of macroeconomic growth, the index was highly accurate in predicting both the economic health of individual businesses and the value of their stock. "We discovered, not surprisingly, that firms with strong customer relationships do much better with their investors," says Fornell.

That discovery led to a series of new business launches, beginning in 1995 with CFI Group, a firm that uses the ACSI methodology to help organizations improve performance and increase shareholder value. In 2001, Fornell teamed up with Compuware Corporation to create Foresee Results, a rapidly growing company focused on gauging customer satisfaction with corporate web sites.

Although they maintain offices worldwide, these enterprises are headquartered in Ann Arbor and have a local payroll of approximately 200. Fornell expects to add as many as 250 employees over the next 5 years. "There are many obvious advantages to being located here," he says, "among them a strong research university and an outstanding labor pool."

Update

TRS: TISSUE REGENERATION SYSTEMS

U-M start-up TRS recently attracted $2 million in Series A financing from Venture Investors. The company, after having successfully recruited its first employees to Ann Arbor, has opened an office and development facility, where work has already begun on its first prototype products.

MOBIUS MICROSYSTEMS

Mobius Microsystems introduced its CMOS harmonic oscillator (CHO) technology at the Global Press Electronics Summit in San Francisco in April, 2008. Mobius' products are based on the most accurate solid-state oscillator technology ever developed and derived from U-M research. The California-based company recently built a new engineering facility in Ann Arbor, which was completed in June of 2008. The new facility in Ann Arbor employs 10 integrated circuit design engineers, all with advanced degrees in electrical engineering. Mobius is seeking to grow that office to up to 20 staff members in the next 2 years.

ACCORD BIOMATERIALS

U-M start-up MC3 recently spun out Accord Biomaterials to commercialize its catalytic nitric oxide coating technology for implantable medical devices. The company, headquartered in Ann Arbor, has just successfully closed a $1 million Series A funding round. Key chronic in-vivo studies are commencing this fall, and the company will be securing Series B financing in 2009 to launch its first vascular access device.

INCEPT BIOSYSTEMS

U-M in vitro fertilization (IVF) start-up Incept, after having successfully tested its PinFlo cell culture system with frozen donated human embryos, has begun work on second generation devices. The company has also raised $6.7 million in Series A funding and has established a scientific advisory board with IVF industry leaders.

MEDHUB

MedHub, a software firm providing web-enabled residency management solutions, has, in the few years since launching from the University of Michigan, grown to support not only the U-M hospital system, but also Stanford University, the Cleveland Clinic, and several others. As a result, the MedHub system is now used by over 25,000 users daily, and has completed over 1,000,000 evaluations since its initial rollout. The release of the company's Version 6.0 is expected in the fall of 2008, and will incorporate features such as electronic resident portfolios.

NANOBIO

NanoBio Corporation, a privately held biopharmaceutical company developing products for the prevention and treatment of infectious diseases, was founded in 2000 as a spin-out from the Center for Biologic Nanotechnology at the U-M. NanoBio's lead product candidates, treatments for herpes labialis (cold sores) and onychomycosis (nail fungus), have demonstrated remarkable clinical efficacy and safety in large Phase II studies. Other products in development target treatments for genital herpes, cystic fibrosis and nasal vaccines for hepatitis B, RSV and seasonal

and pandemic influenza. To date, over $70 million has been invested in the company's NanoStat™ technology platform. NanoBio currently has 22 employees at its headquarters and laboratory facilities located in Ann Arbor.

ARBOR NETWORKS

Headquartered in Lexington, MA, and with more than 300 employees worldwide, Arbor Networks employs more than 75 software engineers, software architects and network engineers in Ann Arbor to develop state-of-the-art solutions for global network providers to secure and control their networks. These solutions, originally based on research from U-M, are now deployed at more than 70 percent of the world's leading internet services providers. Arbor Network's technologies provide its customers with unrivaled insight into their networks, helping them respond to security threats and enabling them to profitably grow their networks.

FORESEE RESULTS

ForeSee Results uses the methodology of the University of Michigan's American Customer Satisfaction Index (ACSI) to help hundreds of major international companies and federal government agencies measure and manage online customer satisfaction. Founded in 2001, ForeSee Results has more than doubled in size in the last 18 months and obtained $15 million in new venture capital investment in 2007, which has allowed substantial new investment in product functionality, technology and delivery. In 2008, ForeSee Results was one of several companies awarded a tax credit in 2008 by the Michigan Economic Development Council with plans to add 275 jobs over the next six years. ForeSee Results has collected over 28 million completed customer satisfaction surveys and has more than 550 active measures with companies like Adobe, Ask.com, Capital One, CBS News, Kellogg's and Sears.

CIELO MEDSOLUTIONS

Healthcare software start-up Cielo Med Solutions has been steadily growing since its launch from the University of Michigan. The company, headquartered in Ann Arbor, now has 10 employees, and is processing over 300,000 patient encounters annually for a variety of providers. Having raised $1.2 million in capital and received an STTR grant from the National Cancer Institute in collaboration with U-M Department of Family Medicine, Cielo is presently expanding its sales reach nationally and extending the functionality of its product line to address additional medical specialties and new functionality supporting ambulatory care quality.

COMPENDIA BIOSCIENCES

U-M's genomic data analysis start-up Compendia Biosciences now counts 13 of the top 20 Biopharma cancer companies, including GlaxoSmithKline and Genentech, as its customers. The company, headquartered in Ann Arbor, currently employs 20 people and is preparing to release the fourth version of its flagship product, Oncomine™.

SAKTI3

Sakti3 is based on technology developed in the laboratory of Arthur F. Thurnau Professor, and director of the Energy Systems Engineering Program, Ann Marie Sastry. The Ann Arbor-based company aims to manufacture novel, high-power batteries for the electric vehicle market. The company received Series A financing from Khosla Ventures, a preeminent Silicon Valley cleantech fund led by Vinod Khosla, founder of Sun Microsystems.

U-M TECH TRANSFER NATIONAL ADVISORY BOARD

Engaging Advisory Talent

Since its inception in 2002, the U-M Tech Transfer National Advisory Board (NAB) has played a key role in guiding our strategies and operations. Comprised of representatives from industry, the venture capital and entrepreneurial communities, government and other university tech transfer offices, the NAB provides experience, expertise and diversity for a valued outside perspective. The formation of Ann Arbor SPARK, our regional economic development agency, and several initiatives to enhance other resources, were the direct result of recent Board activity.

Members of the National Advisory Board include:

Thomas Bumol
Vice President, Eli Lilly San Diego, CA

Marshall Cohen
DOLCE Technologies Princeton, NJ

John Denniston
Partner, Kleiner Perkins Caufield & Byers Menlo Park, CA

Richard Douglas
Senior Vice President of Corporate Development, Genzyme Corporation Cambridge, MA

Michael Finney
CEO and President, Ann Arbor SPARK Ann Arbor, MI

Larry Freed
CEO and President, ForeSee Results Ann Arbor, MI

Farnam Jahanian
Chair, Computer Science and Engineering, University of Michigan Ann Arbor, MI

Thomas Kinnear
Executive Director, U-M Zell Lurie Institute for Entrepreneurial Studies Ann Arbor, MI

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Carl Stjernfeldt
Castile Ventures Waltham, MA

Jack Turner
Associate Director, MIT, Technology Licensing Office Cambridge, MA

Tom Washing
Founding Partner, Sequel Venture Partners Boulder, CO

Jeff Williams
President and CEO, HandyLab, Inc. Ann Arbor, MI

"The University of Michigan Tech Transfer program is among the very best in the nation. It's an honor to serve with such a distinguished National Advisory Board and contribute to enhancing the entrepreneurial capabilities of the University community."

TOM WASHING
Partner, Sequel Venture Partners
Boulder, CO

Tech Transfer Programs + Activities

TECHSTART Our TechStart intern program engages graduate students from across the University to assist in the commercialization of U-M technology. Students learn the role of the entrepreneur firsthand, participating in the demanding process of converting promising technologies into commercially attractive opportunities. The result is a superb educational experience, valuable assistance for our tech transfer projects, and introductions to people and resources that can translate into local employment opportunities for our graduating students.

TECHCAST Designed to alert our business and venture partners of current opportunities, TECHcast is a series of podcast stories focused on our researchers and technologies. This new tool allows for a more thorough examination of tech transfer opportunities by providing in-depth audio profiles of inventions and discoveries, the ongoing work of researchers, and potential market opportunities (see www.techtransfer.umich.edu).

COMMUNITY ENGAGEMENT U-M Tech Transfer staff are actively engaged—often in leadership roles—in community, state and national organizations. These involvements generate valuable resources and connections that directly benefit our work. Equally as important, community engagement allows us, as U-M representatives, to contribute to economic vitality and quality-of-life initiatives that support the core missions of the University.

Tech Transfer staff: (front) Diane Brown, Sally Ingalls, Andrew McColm, Carmen Atkins, Debbie Watkins, Rakhi Juneja, Rick Brandon; (middle) Linda Hamlin, Lisa Johnson, Nadine Wong, Robin Rasor, Ken Nisbet, Jim Deane, Mark Maynard; (back) Wayne Harvey, Mike Hallman, Elizabeth Devlin, Doug Hockstad, Matt Bell, David Ritchie, Wesley Huffstutter, Greg Choiniere, Patrick Thornton, Bryce Pilz; (not pictured): Dennis Linder

Fiscal Year 2008 Invention Disclosures

AEROSPACE ENGINEERING

- Synthesis of Long Single Wall Carbon Nanotubes by Magnetically Enhanced Arc Discharge
- Shape Memory Alloy Actuator with Linear Response
- Digital Adaptive Control Algorithm Based on a Retrospective Correction Feedback Filter

ANATOMY

- Painting Skeletal Muscles in Plastinated Human Anatomical Specimens
- Methods for Painting Neurovascular Pathways of Plastinated Human Anatomical Specimens

ANESTHESIOLOGY

- Esophageal Thermal Marker
- Dual Drug Delivery Device
- Target Acquisition Verification Using Standard Stimulator
- Pressure Sensing Middle Tail Light

ART AND DESIGN

- Mosquito Killing Device for In Water and On Land
- Atmospheric, Oceanic, and Space Science
- Method for Enhancing the Sweep Speed of a Spectrum Analyzer for Radio Frequency Emitter
- Quadrature Modulation for Electric-Field Mills
- GMI Modeling Software

BIOLOGIC & MATERIALS SCIENCE

- Porous and Nano-Fibrous Gelatin and Composite Materials
- Compositions and Methods to Treat Pox Virus Infections
- Hydrophilic-Hydrophilic Block/Graft Copolymers and Nano/Micro Particles Containing Such Copolymers
- Method of Examining Precision Fit of Physical Objects

BIOLOGICAL CHEMISTRY

- Methods for Expression and Purification of Recombinant Protocatechuate 3,4-dioxygenase
- Method for In Situ Biogenesis and Delivery of Hydrogen Sulfide
- Small Molecule Inhibitors of Furin

BIOMEDICAL ENGINEERING

- Spatio-Temporally Controlled Reagent Delivery: Gene Expression and Gene Silencing in Mammalian Cells
- Device for Studying the Effects of Radial Stretch on Cultured Cells
- Dual Functioning Peptides that Control Cell-Substrate Interactions

Effect of Pumpless Arteriovenous Extracorporeal Membrane Oxygenation of Fetal Circulation

- Engineering Microscale Prostate Cancers In Vitro from Prostate Cancer Stem Cells
- Neural Probes for Concurrent Electrical and Chemical Sensing in the Brain
- Neural Polymer Probe Insertion Assist Backbone
- Open-Channel Passive Drug-Delivery Neural Probe
- Transcutaneous, Optical Detection of Blood-Glucose Level for Diabetics
- Multiple Transducer Interactions for Aberration Corrections and for Other Enhancements for Therapeutic and Diagnostic Procedures
- Method and Instrumentation for the Optical Detection of Disease in Pancreatic Tissue

BUSINESS

- Dataset Versioning for Business Value Doubly-Randomized Perturbation of Multiply Imputed Data
- Job Crafting Exercise

CELL AND DEVELOPMENTAL BIOLOGY

- Bacterial Expression Vectors for the Small Heat Shock Proteins HSP20, HSP22, HSPB2 and evHSP
- Vil-cre Transgenic Mice
- Anti-Heat Shock Protein 27 Hybridoma
- 12.4 Kb Mouse Villin Promoter
- Generation of an Anti-ß Galactosidase Antibody
- Polyclonal Rabbit Anti-TR4 Orphan Nuclear Receptor Antibody
- Polyclonal Rabbit Anti-TR2 Orphan Nuclear Receptor Antibody

CHEMICAL ENGINEERING

- In-Vitro Analog of Human Bone Marrow from 3D Scaffolds with Inverted Colloidal Crystal Topology
- Biphasic Biodegradable Microparticles with Controlled Shapes
- Sorbents for Natural Gas Desulfurization
- Ultrastrong and Stiff Layered Polymer Nanocomposites and Hierarchical Laminate Materials Thereof
- Treatment to Enhance Fuel Cell Performance
- Resonance Triggered Acoustic Pump/Pressure Regulator
- Intelligent Wearable Electronic Textiles with Carbon Nanotubes
- Conductive Fabric and Garments for Interacting with Touch Screen Displays
- Terephthalic Acid Synthesis
- Process to Remove Carbon from the Surface of a Reforming Catalyst
- Highly Selective Catalysts for Epoxidation of Ethylene to Form Ethylene Oxide

CHEMISTRY

- Synthesis of Dibora-polyacenes and Their Derivatives
- Novel Compounds for the Treatment of Psoriasis and Related Disorders
- Methods for Creating Nitric Oxide Generating Surfaces
- Chemoselective Probes for Proteomic Analysis of Protein Thiol Modifications in Living Cells
- Microporous Coordination Polymer Adsorbents for Gas Separations
- System and Method for the Detection of Biological Agent and Growth Monitoring
- Method for Assessing Bone Quality
- New Chemistry Approaches for the Development of Nitrite Sensors
- Targeted CT Contrast Agents for In-vivo Cancer Imaging

CIVIL & ENVIRONMENTAL ENGINEERING

- Wireless Sensor Prototype for Sensing, Actuation and Distributed Computing
- Distributed Software Architecture for In-Network Data Processing by Dense Wireless Sensor Networks
- Impact Resistant Strain Hardening Brittle Matrix Composite for Protective Structures

COMPUTATIONAL MEDICINE AND BIOLOGY

- Search Algorithm and Interface for Rapidly Diagnosing Causes Based on Symptoms

DERMATOLOGY

- Mathematical Modeling of Collagenase-1 Induction

EDUCATION

- Project Based Inquiry Science (PBIS) Middle School Curriculum

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

- A Network Service for Collecting, Storing and Accessing File Usage Information
- Automating Post-Silicon Debugging and Repair
- New Encoding Methods for On-Chip Data Communication Using Pulse Width Modulation
- Low Profile Miniaturized Planar Antenna with Omnidirectional Vertically Polarized Radiation
- Controlled Growth of Larger Heterojunction Interface Area for Organic Solar Cells
- High-Efficiency White Organic Light Emitting Devices Utilizing Excitons Generated in Multiply Regions
- Increasing OLED Lifetime
- Increasing OLED Lifetime Through Recombination Zone Extension
- Method and Apparatus for Clustering and Visualization of Multicolor Flow Cytometry Data
- A Behavioral Detection System for Mobile Handsets
- Method of Classifying the Program Behavior for Behavioral Detection of Malicious Programs on Mobile Handsets
- Method of Modeling the Program Behavior for Behavioral Detection of Malicious Programs on Mobile Handsets
- High-Force Liquid-Gap Electrostatic Hydraulic Micro Actuators
- Methods for Inductive Supply Noise Suppression
- Supercontinuum Laser for Surface Roughness Metrology
- Telecom Tunable Lasers for Micron Level Metrology
- Terahertz Waveguide Emitter
- Multi-Component Organic Solar Cells and Photodetectors with Broad Spectrum Response
- Controllable OVJP Deposition System
- A Method for Compact Multilevel Electrical Integration of Microsystems
- Analyzing and Transforming a Computer Program for Executing on Asymmetric Multiprocessing Systems
- Histotripsy for Thrombolysis
- Infrared Detection in Organic Thin Films
- Design and Process for Creating Photodetector Arrays with Integrated Backplanes
- Proactive Transaction Scheduling for Contention Management
- Reconfigurable Energy Efficient Near Threshold Cache Architecture
- Remote Control System for Insect Flight
- Lossy Compression of Bilevel Images Based on Markov Random Fields
- Exploiting Abundant Don't-Cares in Logic Synthesis
- Fast Algorithm for Optimal Control Parallel Excitation RF Pulse Design in MRI
- An Approximate Sub-Graph Matching Method
- Protecting Bus-Based Hardware IP by Secret Sharing
- Ending Piracy of Integrated Circuits
- Spectral-Spatial Pulse Design for Signal Recovery in T2*-Weighted Functional MRI
- Simultaneous Heerojunction Organic Solar Cells with Broad Spectral Sensitivity
- Photosensitive Optoelectronic Devices
- Hybrid Optimization for X-ray Iterative Reconstruction
- Motion Artifact Reduction in Iterative Reconstruction for X-ray Imaging
- Photovoltaic Solar Cells with Near-Infrared Responsivity
- Use of Organic Semiconductor Carbon Nanotube Materials in Photovoltaic and Photoelectric Devices
- Predicting Stock Returns and Fund Performance Through Network Analysis
- Sherpa: Fast and Successful Routing in Arduous Terrain
- Method for Fast Incremental Evaluation of a Fixed Percentile Delay of a Circuit
- Logic Non-Volatile Memory with MIM Capacitor and Stacking
- Embedding Periodic Low-Index Material in the Top-Emitting Organic Light Emitting Devices to Enhance the Light Outcoupling
- A Spin on Curable SiO Containing Polymer Based Resist for Micro and Nanoimprinting Lithography
- Improved Optical Out-Coupling Efficiency of Organic Light Emitting Devices
- Power Scalable Visible Supercontinuum Generation
- All-Optical Scanning Confocal Ultrasound Imaging and System Implementation
- Stress-Enhanced Standard Cells for CMOS Devices
- Pico-Power Reference Voltage Generator
- System and Method for Detecting Mobile Malware Variants
- Wireless Magnetoclastic Monitoring of Intraluminal Prostheses
- Bridge DC-DC Converters
- Fast, Automatic Detection Redirection Botnets
- Patterning of Layers on Flat and Hemispherical Substrates by Stamped Metal Resist
- Hybrid Optimization for X-ray and CT Iterative Reconstruction
- Vacuum and Hermetic Packaging Using Low-Temperature Bonding
- Electromagnetic 3D Time-Domain Super-Resolution Method for Medical Imaging
- Inverted Organic Photovoltaics
- Polymer Wrapped Carbon Nanotube Infrared Photodetectors and Photovoltaics
- Razor Application Specific Compound Functional Units

EPIDEMIOLOGY

- Plasmid System for Production of Recombinant Rift Valley Fever Viruses

HUMAN GENETICS

- Treatment of Neurological Diseases
- Tail-Cuff Animal Identification System
- Q54 Mouse Model of Epilepsy Caused by Dominant Mutation of Sodium Channel Scn2a

INFORMATION

- Collaborative Patent Clustering

INTERNAL MEDICINE

- Noncontact Infrared Fiberoptic Device for Prevention of Esophageal Thermal Injury during Radiofrequency Catheter Ablation
- Targeted Delivery of Imaging Agents/Drugs to Cancer Cells Using Fibroblast Growth Factor as Targeting Agent
- Living Well with Fibromyalgia
- Development and Evaluation of Orally-Bioavailable, Nano-Therapeutic Systems for Treatment of Liver Cancer
- Methods and Compositions for Treating Biofilms
- Monoclonal Antibody to Lysosomal Phospholipase A2
- Enhanced Anti-Tumor Activity of a Cell-Based Vaccine
- Private-Doc Blood Glucose Monitoring
- Regulation of Macrophage Trafficking in the Ischemic Brain
- Sheathed Endoscopy Forceps for Sterile Sampling of Epithelial Microbiota
- Dendrimer-Entrapped Gold Nanoparticles for Focused Retinoblastoma Laser Treatment

- Device to Deploy Diagnostic or Therapeutic Agent with or without Biopsy
- Mechanical Conflict System (MCS)
- Genotyping for Variant Predicts for Bone Loss
- Peptide Targeted Nano Polymer Cancer Therapeutic
- Real-Time, Multi-Channel, Multi-Site Analysis of Cardiac Electrograms in the Time and Frequency Domains
- Small Molecule Inhibitors of RhoC GTPase
- GI Septapeptides
- Methods and Compositions for Treatment of NASH or NAFLD
- Inhibitors as Anti Angiogenics in Cancer
- Multi-Functional Delivery Platforms Produced Via Combinatorial Synthesis
- Software Program to Display Affymetrix 6.0 SNP Array Data
- Rat Glepp 1 Monoclonal Antibody (IB4)
- Transgenic Rat Podocyte Depletion Model
- Cancer Vaccine
- Intramural WiFi Localization for In-Building Navigation and Wayfinding Using 802.x Wireless
- Mechanisms of Leptin Signaling
- Smac Mimetics
- Therapeutic Strategy for Calcific Stenosis
- Methods and Compositions for the Diagnosis and Treatment of Lupus
- Diagnostic Applications for a Morphogen in Pre-Cancer and Cancer
- Nanoemulsions as Adjuvants
- Conditional Disruption of the ZNF148 (aka ZBP-89) Locus in Mice
- Multivalent Nanoemulsion as a Vaccine
- Breast Cancer Cell Lines Contain Functional Cancer Stem Cells
- Endoscopic Device for Biliary Tract Tissue Sampling for the Characterization of Biliary/Pancreatic Structures
- Potent and Selective D3 Ligands
- Purinergic Receptor Modulation of Inflammation
- A Novel Immunostimulatory Ligand
- Biomarkers for (-)-Gossypol
- ITC and Zeta Potential Measurements of Nanoemulsions
- BRM Expression Assays and Related Diagnostics
- Monitoring CTC Cells in Women with EP Positive Metastatic Breast Cancer

LIFE SCIENCES INSTITUTE

- Treatment of Obesity, Insulin Resistance, Diabetes and Related Disorders
- Solid Phase Synthesis of Cryptophycins
- Compositions and Methods for Preventing Mammalian Hair Graying
- Engineering Self-Sufficient Biosynthetic Cytochrome P450s

MATERIALS SCIENCE AND ENGINEERING

- A Unique Dispersion Method for Particles in Nanocomposites
- Photopolymerizable Thermally Reversible Gel Materials
- Printable Silicon from Polysilane Polymers
- Large Area Maskless Photopolymerization
- Organic Phosphorescence Emitter
- Dipolar Nanoparticles for Photovoltaic Energy Conversion
- Fully Dense Ultrafine Ceramic Composite Materials
- Phosphorescent or Luminescent Plastic Bottles for Overnight Use
- Bio-Artificial Neuro Muscular Interface Device
- Roll-Bending and Reverse Roll-Bending Method and Apparatus for Material Strengthening
- Volumetrically Scaled Lighting Elements Based on Emissive Fibers
- Parylene Deposition Nozzle
- Thiol-Modified EDOT for Covalent Electrode Coating
- LAMP
- An Enhanced Fiber-Based Photovoltaic Device with a Semi-Transparent Core
- Active Materials Actuator with Reset Capability
- Fiber-Based Thermoelectric Devices
- Piezoelectric MEMS Microphone
- 3D Cohesive Zone Model for Nonlinear Fracture Analysis
- Minimally Invasive Surgical Tool with Enhanced Dexterity
- Heuristic Reduction of Gyro Drift in Vehicle or Person Tracking Applications
- Smart Latch for Energy Applications
- Shape Memory Alloy Design Tool
- Assistive Device for Tremor Reduction
- Tactile Reflexive Actuated Mechanisms
- A Portable Micro Electro Mechanical Systems Biochip for HIV/AIDS Monitoring
- Hybrid Nanostructure Arrays
- Smart Flue
- Piezoelectric MEMS Microphone
- Conformable Surgical Tool for Surface Machining Bones and Joints
- Methods for Controlling Tool Temperature and Diffusive Flank Wear
- ChemReader: Machine Vision-Based Automatic Annotation of Chemical Databases
- Inline Cylinder Bore Measurement Technique
- Polish Detection on Shaft Surface
- Small Bore Porosity Inspection System
- Electric Field Assisted Pulsed Laser Deposition Process for Enhancement of the Collection Rate
- Method and Apparatus for Practicing Falls

MEDICAL SOFTWARE

- Food Allergy Risk Communication and Decision Support System (FARiCo)
- Reaching Economic Alternatives that Contribute to Health (REACH)
- Infusion Patient Arrival and Tracking System

MOLECULAR AND CELLULAR DEVELOPMENTAL BIOLOGY

- Method to Select for Enhanced Protein Stability and Expression

MOLECULAR PHYSIOLOGY

- Induction Chamber Anesthetic Expeller
- Methods and Compositions Relating to Skeletal Muscle Injury/Damage and Poloxamer-Based Skeletal Muscle Repair
- Extending Culture Life and Viability of Cultured Adult Mouse Cardiac Myocytes
- Double Oxygen Sensing System for Searching and Testing Chemical Compounds
- Methods and Compositions for Stabilizing HIF 1 alpha

NAVAL ARCHITECTURE MARINE ENGINEERING

- Appendages for Enhancement of Vortex Induced Forces and Motion for Hydrokinetic Energy Conversion

NEUROLOGY

- Hybrid Multichannel Printed Circuit Board Microdrive
- Cardiopulmonary Resuscitation Response Time Program

NUCLEAR ENGINEERING & RADIOLOGICAL SCIENCES

- Real Time Gamma-Ray Compton Imaging Using the Simple Back-Projection Algorithm

OBSTETRICS & GYNECOLOGY

- Microfluidics for In Vitro Maturation of Oocytes

OPHTHALMOLOGY

- Diagnostic for Age Related Macular Degeneration
- Applications of Ocular Flavoprotein Fluorescence
- Cone Arrestin 3 Antibody
- A Metabolism-Based Anti-Inflammatory

ORTHOTICS & PROSTHETICS

- AFO Scanning Cage

OTOLARYNGOLOGY

- Silicon Electrode Array Insertion System for Chronic Deep Brain Recording and Stimulation
- Slotted System for Insertion of Chronic Multichannel Silicon-Electrodes and Their Ribbon-Cables into Deep Brain Recording and Stimulation Locations

PATHOLOGY

- Tissue Biomarker of Prostate Cancer
- Therapeutics for Acute and Chronic Inflammatory Diseases
- Gene Fusion in Prostate Cancer Progression
- Methods of Creating Homogeneous Immunoassays
- Proinflammatory Pathway
- Compositions and Methods for Attenuation of Fibrosis
- Dual Blockade of Leukocyte Receptors for the Treatment of Systemic Inflammation, Sepsis, Septic Shock, and Multi-Organ Failure
- Blockade of C5a Receptor, C5L2, for the Treatment of Systemic Inflammation, Sepsis, Septic Shock and Multi-Organ
- Downstream Target of EZH2
- Method for Sample-Based Data Aquisition in Mass Spectroscopy
- Laboratory Specimen Drop Box
- PTIP Polyclonal Antibody
- Pax2 Monoclonal Antibody
- The Use of Two Botanicals with Complementary Activities for Improvement of Skin Structure and Function and to Improve Healing of Damaged/Atrophic Skin
- Potential Therapeutic for Attenuation of Fibrosis
- Molecular Cross-Talk between AR- and ERG-Mediated Signaling Pathways
- Transgenic Mouse Model for Prostate Specific Expression of EZH2

PEDIATRICS & COMMUNICABLE DISEASES

- Muscle Patching "Band-Aid"
- Biomarker and Therapeutic for Death Secondary to Septic Shock

PERIODONTICS AND ORAL MEDICINE

- LMP-1 Therapy to Promote Tissue Repair Around Teeth and Dental Implants
- Biomarker Predictors of Oral Inflammation
- Responsive Angiogenic Implanted Network Droplet Assay
- Diagnostics and Therapeutic Targets for Identifying and Treating Periodontal Diseases

PHARMACOLOGY

- A Transgenic Mouse Model of Cardiac Hypertrophy and Cardiac Failure
- Long-Acting Bacterial Cocaine Esterase

PHARMACY

- Novel Inhibition of HIV Protease
- Natural Products Genomic Translation and Mining Process
- Crystal Structure of the N-Terminal Region of Replicative Helicase DnaB from Mycobacterium Tuberculosis
- Inhibitors of the Beta-Catenin/TCF Complex
- Pept1/Pept2 Double Knockout Mice
- Prodrugs of Neuraminidase Inhibitors

PHYSICAL MEDICINE & REHABILITATION

- Temporary Emergency Department Splint System

PHYSICS

- Ultrasound-Based Robotic
- A Perfusion Phantom for Medical Imaging

PSYCHIATRY

- Effects of FGF Modulators
- SNPs Associated with Bipolar Disorder
- Methods for Treating Anxiety
- Systems and Methods for Structured Visual Data Mining
- Identification of Disease-Relevant Genetic Networks
- Genes and Their Interactions Related to Schizophrenia Diagnosis and Treatment
- Genes and Their Interactions Related to Bipolar Disorder Diagnosis and Treatment
- Computational Method to Identify Disease-Relevant Genetic Networks

RADIATION ONCOLOGY

- Screen for Modulators of N-Linked Glycosylation
- Methods and Compositions of Modulating ATDC or its Family and the Use Thereof
- Methods and Compositions of Modulating Tumor Initiating Cells and the Use Thereof
- Methods and Compositions for the Enhancement of Wound Healing

RADIOLOGY

- Method of Display and Quantification of Hemodynamic Characteristics in Image Data Sets
- Paddles for Breast Imaging and Breast Medical Procedures

SOCIAL WORK

- Palliative Care Metrics and Billing Database

SOFTWARE

- Simple Net Install
- M-Dash Software

SURGERY

- C-Met, a Marker and Therapeutic Target of Pancreatic Cancer Stem Cells
- Patient Information Device
- Biomarkers in Benign Urologic Diseases
- Rebalance Regulatory and Effector T Cells with B7 Blockade in Cancer Immunotherapy
- Health Related QOL Measure
- Suction Tube Controller
- Methods and Compositions for Treatment of Inflammatory Bowel Disease
- Antagonists Which Lack Absorption into the Systemic Circulation
- Instrumented Implant Device for Correcting Short Bowel Syndrome
- Compositions and Methods of Therapy Against Prostate Cancer Bone Metastases
- Overexpression of T Cells as a Therapeutic Strategy for Cancer and Autoimmune Diseases
- Methods for Promoting Cardiac Hypertrophy and Fibrosis

Industry Research Engagement

Each year, research conducted at the University of Michigan exerts a profound impact on our understanding of the world and on our ability to improve human life.

In FY 08, research expenditures at the University reached record levels—a total of $860 million in funding from the federal government, the state of Michigan, private foundations, and industry partners. During that same period, industry-funded research reached an all-time high of $43 million, the result of engagements with 278 companies.

"The U-M Business Engagement Center provides a central point of contact to connect industry with the rich set of resources within the University." DARYL WEINERT | Executive Director, BEC

NEW U-M BUSINESS ENGAGEMENT CENTER LAUNCHED!

To accelerate and enhance interactions with industry, the University has established the Business Engagement Center (BEC). In essence, the BEC serves as a "front door" for the business community, an entryway to the U-M's vast facilities, resources and expertise. The Center works closely with all schools and colleges to assure a welcoming, "user-friendly" path for prospective industry partners.

These engagements typically include:

+ Partnering with University faculty on research programs.
+ Contracting with University units to develop and deliver customized training programs for professional-level employees.
+ Recruiting students seeking internships or embarking on full-time careers.
+ Licensing U-M technology that directly enhances economic vitality and quality of life throughout the region.

BEC Staff: (front) Nick Glauch, Susan Shields; (middle) Umesh Patel, Stella Wixom, Elizabeth Devlin; (back) Nick Miller, Deb Mondro, Daryl Weinert

(Next page) DRDA Staff: Julie Feldkamp, Sharyn Sivyer, Genevieve Espinosa, Gayle Jackson, Kathleen Koorhan, Kathryn DeWitt, Therese Maxwell, Thomas Zdeba, Elaine Brock, Marvin Parnes, David Plawchan, Jeffrey Longe, Anthony Nielsen, Krista Campeau, Amanda Coulter

University of Michigan businessengagement CENTER

RESEARCH DEVELOPMENT & ADMINISTRATION

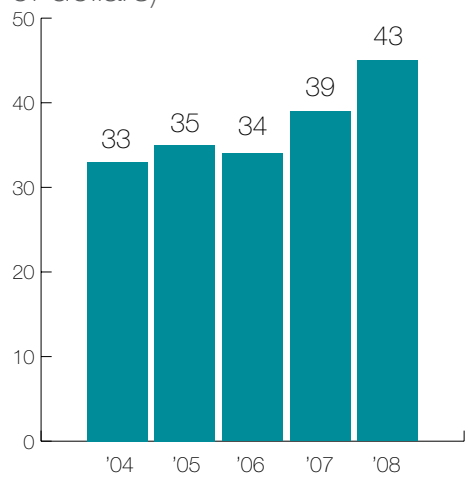
Industry research programs are coordinated by the Division of Research Development and Administration (DRDA). This specialized unit provides comprehensive proposal development and award services, including contract negotiation, to ensure smooth, productive engagements with all University sponsors.

"DRDA strives to navigate the complex requirements inherent in federal research, and to provide great customer service to our industry partners."

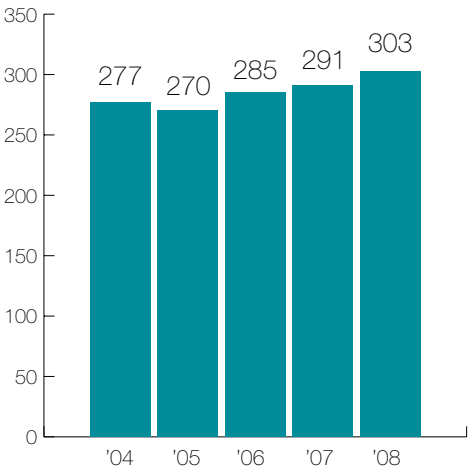
MARVIN PARNES | Executive Director, DRDA, and Associate VP for Research

Industry Research | Year In Review

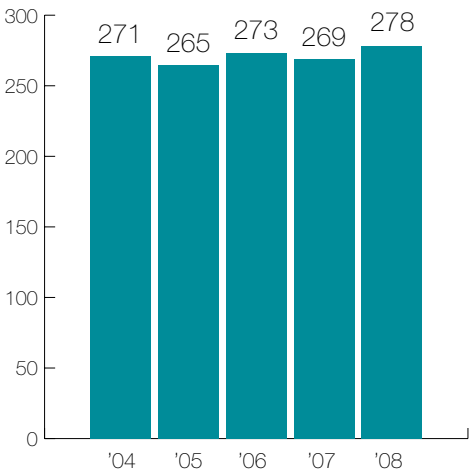
INDUSTRY RESEARCH (expenditures in millions of dollars)



FACULTY ENGAGED IN INDUSTRY-FUNDED RESEARCH



INDUSTRIAL SPONSORS



2008 TOP INDUSTRY FUNDERS (measured by research expenditures)

General Motors Corporation
Pfizer, Inc.
Ford Motor Company
Dow Chemical Company
Ascenta Therapeutics
Sanofi Pasteur
General Electric Company
ARM Ltd.
Merck and Company, Inc.
Novartis

DIANN BREI + GENERAL MOTORS

On the Road to Smarter, Safer Vehicles

In 2002, when General Motors decided to expand its work in smart materials and structures and focus on the design of devices with integrated smart material actuation, the company didn't have far to look for solutions. Necessary resources were as close as the Smart Materials and Structures (SMS) Design Lab headed by U-M Associate Professor of Mechanical Engineering Diann Brei.

As Brei notes, the concept of SMS began in the 1980s, when the U.S. Air Force was searching for lightweight, compact, adaptable structures. Smart materials and structures are those that integrate and leverage the power of phenomena such as smart materials, mechanical systems and electronics.

The research partnership between the SMS Design Lab and General Motors was so successful that in May of 2006 GM launched the U-M/GM Collaborative Research Laboratory (CRL) for the purpose of developing new, market-ready technologies based on smart materials and structures.

"In this laboratory, we're definitely pushing the state of the art," says Brei, who co-directs the CRL along with Nancy Johnson, GM R&D's group manager of Smart Materials and Structures. "This is leapfrog technology. We're trying to do things that have never been attempted before in order to open the door to new devices and new industries."

In one recent CRL project, Brei and U-M colleague Assistant Research Scientist Jonathan Luntz developed an ultrafast, resettable hood lifter. As Brei explains, "One of the approaches being explored within GM and the automotive industry to mitigate the consequences of pedestrian impact is to increase the space between hood and components to provide more ride down." With feasibility demonstrated in the laboratory for the smart material enabled approach developed in the CRL, the intent is to take this device to suppliers for further development.

The ultrafast, resettable hood lifter developed by a team of GM and U-M researchers is a part of GM's ongoing pedestrian protection initiative. Activated by pedestrian contact with a vehicle bumper, the smart structure deploys within milliseconds—raising the hood and thereby creating a greater distance for pedestrian deceleration between hood and underlying engine components.

Biostatistician and statistical geneticist Mike Boehnke develops statistical methods for analyzing genetic risk factors in disease. As Boehnke notes, "Our goal is to make discoveries that result in new and effective drugs, create avenues for customized therapy and help scientists and physicians better predict who is most likely to develop a given disease."

MIKE BOEHNKE + GLAXOSMITHKLINE

Uncovering the Genetic Basis of Disease

"Thanks to the Human Genome Project and other recent initiatives, the field of genetic research is in a particularly exciting place right now," says Biostatistics professor Mike Boehnke. He's in a position to know. In addition to directing the U-M Center for Statistical Genetics and Genome Science Training Program, Boehnke is principal investigator for two major studies in predictive genetics. He is currently lead investigator in a study of bipolar disorder being conducted in collaboration with researchers from GlaxoSmithKline, a world leader in pharmaceutical research and commercialization.

One research project with the U-M's Molecular and Behavioral Neuroscience Institute (MBNI) aims to determine which portions of the genetic code are, at least in part, responsible for bipolar disorder. Currently, the U-M team is collaborating with scientists from GlaxoSmithKline, who have been pursuing parallel research. After completing their separate statistical analyses, the two teams agreed to combine data and publish their findings jointly.

"At this preliminary stage, I can say that we have the possibility for a couple of genetic loci that may predispose individuals to bipolar disorder," Boehnke says. "I'm hopeful that, ultimately, our findings will lead to a better understanding of the biology of the disease and permit more effective targeting of drug therapies."

Boehnke is no stranger to collaborative efforts. He is also part of a large study involving colleagues such as Francis Collins, former U-M research scientist and director of the National Human Genome Research Institute, and researchers in Finland, the National Institutes of Health, and the University of Southern California to study the genetic risk factors for type 2 diabetes. "We chose this particular disease because it was so understudied," Boehnke explains. In collaboration with two other research groups, the Finland–United States Investigation of NIDDM Genetics (FUSION) study has thus far identified ten genetic variants associated with type 2 diabetes.

ADAM MATZGER

New Nanostructures to Benefit the Environment

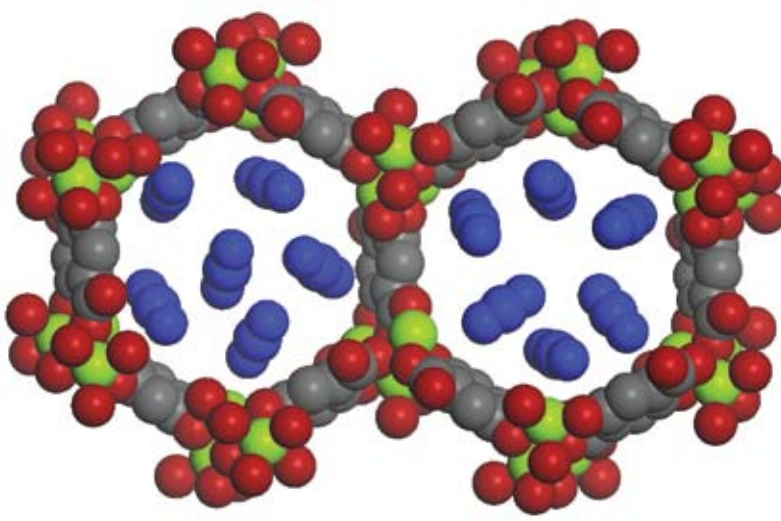
As Associate Professor of Chemistry Adam Matzger points out, the field of solid state chemistry is filled with fascinating challenges and conundrums. There's crystal polymorphism, for instance, the potential for molecules in solution state to crystallize into unpredictable and largely uncontrollable forms. But these days, perhaps no challenge is more compelling—at least for Matzger and his research team—than how to create molecular structures with more surface area, and therefore more storage capacity, than any other known materials.

Matzger's pursuit of high-surface nanostructures began in earnest four years ago when the Department of Energy (DoE) issued its Freedom Car Initiative and, along with it, 2010 performance targets for on-board automobile hydrogen storage systems. "Hydrogen storage is a longstanding problem because it requires extremely high pressures in its gaseous state and extremely low temperatures as a liquid," Matzger says.

Following two years of research, Matzger and U-M colleagues Antek Wong-Foy and Omar Yaghi published a groundbreaking paper identifying the ideal chemical properties for hydrogen storage materials. As a next step, working in conjunction with General Motors, Matzger and his team used new synthetic strategies to develop high-surface-area microporous coordination polymers (MCPs).

"Initial testing has demonstrated the ability of our materials to meet and exceed DoE standards for hydrogen storage materials," Matzger says. "The next task is for GM production engineers to develop a system to accommodate our technology."

In addition to its work in hydrogen storage, the Matzger team is developing highly efficient nanostructure sorbents designed to capture and store carbon dioxide emissions from coal-powered manufacturing plants. Once the gas has been collected, it can be injected into the earth to facilitate oil and methane mining operations.



Pictured here is Mg/DOBDC, a microporous coordination polymer (MCP) designed to capture and store carbon dioxide emissions from the flue gas of coal-fired power plants. Created by a U-M research team in collaboration with Universal Oil Products, this nanostructure has the highest surface area—and potentially the largest CO_2 storage capacity—of any magnesium-based MCP yet developed. In addition, the polymer uses significantly less energy than current technology.

"This seed money offers a wonderful opportunity for faculty to conduct innovative research directed towards technology development. By providing a transition to other, long-term funding sources for research, it's especially beneficial for young faculty." —David Sherman | Director, Center for Chemical Genomics

LIFE SCIENCES INSTITUTE + THERMO FISHER SCIENTIFIC

Innovative Tools for Speeding the Process of Drug Discovery

In their efforts to understand the workings of diseases and develop treatments for them, scientists are looking for high-throughput screening and assay miniaturization tools—the kind of technologies that will enable them to analyze molecules accurately, quickly and efficiently.

In 2005, the Biosciences business of Fisher Scientific International, Inc. (now part of Thermo Fisher Scientific) launched a five-year collaboration with the University of Michigan's newly created Center for Chemical Genomics (CCG) located within the Life Sciences Institute. Their mutual goal: develop technologies to improve the speed and effectiveness of disease research and drug discovery.

Under the terms of the partnership, Thermo Fisher is providing seed money for select pilot projects at the U-M and has the opportunity to license new technologies resulting from that research. Each project includes a faculty investigator and a Thermo Fisher Scientific life science research counterpart to facilitate commercialization opportunities.

To date, a total of 13 pilot projects have been funded, many of them focused on the development of biosensors and microarrays for high-throughput screening applications. David H. Sherman, a professor of medicinal chemistry and director of the CCG, notes that the partnership has fostered collaborations not only between Thermo Fisher Scientific and CCG but with numerous other U-M units as well, including the Medical Center, the College of Engineering, and the Department of Chemistry within the College of Literature, Science, and the Arts.

During its five-year research collaboration with the U-M's Center for Chemical Genomics, Thermo Fisher Scientific is targeting the development of new procedures for protein testing, innovative ways of using RNA-interference products, broader applications of high-content screening, and other advancements. "It is part of our responsibility as the world leader in serving science to support this leading research institution," says Ian Jardine, vice president of global research and development for Thermo Fisher Scientific.

COHERIX

Instant Innovation

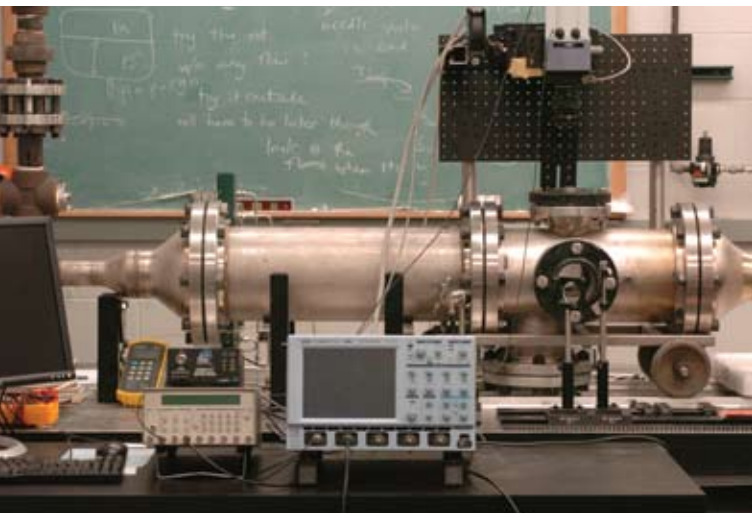
Faculty and researchers at the University of Michigan have long engaged with businesses to provide solutions to real industry needs. These individual consulting engagements also benefit the University by providing "real world" perspectives to our research and teachings, and by providing connections to industry for our students. In order to expand these productive engagements, a new program, "Instant Innovation," was recently launched by the College of Engineering in collaboration with U-M's Business Engagement Center.

The brainchild of Professor of Engineering Sridhar Kota, Instant Innovation harnesses the expertise of multiple faculty to accelerate the growth of local high-tech companies by addressing current technical and business issues and brainstorming about new opportunities. Partnering with local entrepreneur Dwight Carlson, the Instant Innovation program was piloted in FY 08 with Carlson's company, Coherix. Coherix is a global leader in three-dimensional inspection systems for semiconductors and automotive powertrains.

During a day-long session, faculty from multiple disciplines met with Coherix executives to discuss five key challenges related to product capabilities, performance and cost. The faculty consultants then submitted research proposals for all five topics. Two of those proposals were subsequently funded by Coherix.

"This experience exceeded our highest expectations," says Carlson. "I only wish we could have funded all five proposals. Instant Innovation offers a tremendous vehicle for the entrepreneurial community to effectively link up with the University."

At the age of 24, Dwight Carlson founded Xycom with Fred Trudo and developed the first minicomputer-based vehicle emissions test system. In early 1973, Carlson's team created the microcomputer technology now used in self-service gas pumps worldwide. In 1981, he founded Perceptron to introduce laser-based metrology to automotive manufacturing. His current endeavor, Coherix, uses digital holograms to improve performance and reduce costs in the automotive and semiconductor industries.



GEAE is leveraging the expertise of four research teams from the U-M College of Engineering. Principal investigators include professors James Driscoll (combustion technology); Jun Ni (advanced manufacturing); Tresa Pollock (materials science); and Matthew Castanier (computation and design tools). Pictured here is a Twin Anular Premix Swirler (TAPS), part of the new, low-polluting GENX jet aircraft engine being developed by GEAE.

COLLEGE OF ENGINEERING + GENERAL ELECTRIC

Improving the Performance of Jet Engines

When the engineers of General Electric Aircraft Engines (GEAE) set out to develop a next-generation jet engine for the Boeing 787 Dreamliner, they faced a bevy of tough design challenges. One of the toughest involved meeting strict FAA limits on nitric oxide emissions—a primary component of smog and a major factor in ozone depletion.

Fortunately, the company's University Strategic Alliance (USA) Program gave them access to the expertise of leading research scientists such as James Driscoll, a specialist in combustion technology and U-M's associate chair of aerospace engineering. The Alliance represents a long-term partnership between GEAE and eight major research universities in the U.S. and abroad.

Beginning in 2005, Driscoll and a team of student assistants have been using high-pressure combustion chambers and advanced lasers to help GEAE determine exactly how and why their new high-performance engine is able to yield lower pollution levels. By placing components in a high-pressure combustion chamber and using laser flow vision diagnostics, it becomes possible to literally "see" the mechanisms responsible for combustion and pollution control—and locate opportunities for design improvements.

"In essence, we're supporting their engineering efforts," Driscoll says. "The new engine has demonstrated its ability to improve fuel economy by at least 10 percent and reduce nitric oxide emissions by as much as 30 percent. We've given GEAE engineers something they didn't have: a way to visualize where combustion is taking place, examine how nitric oxide pollutants are formed, create computer models, and identify the causal factors in lower pollution levels." He notes that this research is also making it possible to enhance overall engine performance.

In all, GEAE is sponsoring four research projects within the College of Engineering focused on boosting performance, improving tolerances and reducing production costs. Funding for the five-year partnership is expected to total $5 million, making U-M the leading university within the USA Program.

Engaged in Economic Development

BUSINESS ATTRACTION

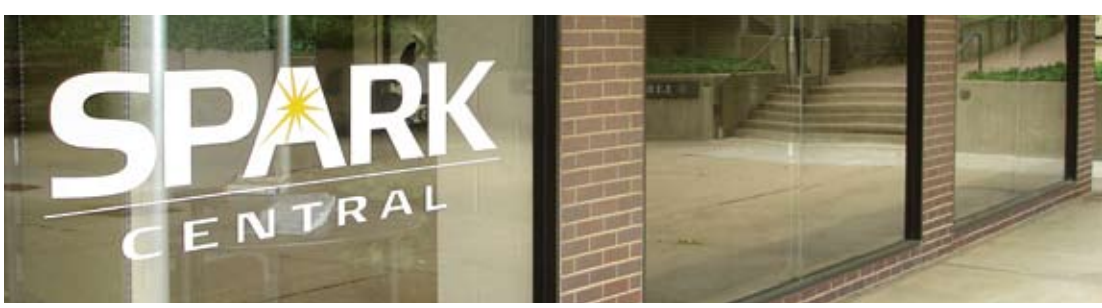
The University has played a vital role in attracting new businesses to our region. Recently, the Spanish aerospace company, Aernnova, opened its North American engineering operations in greater Ann Arbor due largely to the high quality of U-M Engineering graduates. This recruitment effort was facilitated by the College of Engineering Corporate and Government Relations unit partnering with Ann Arbor SPARK. The creation of the new Business Engagement Center, working with other school and college units, will expand efforts to assist in recruiting additional businesses to the region.

NEW BUSINESS START-UPS

U-M Tech Transfer has an integrated "business formation" function to assist the creation of new business start-ups based on U-M technology. A small team of business formation experts works with inventors and other Tech Transfer licensing, marketing and legal professionals to produce high-quality start-up projects capable of attracting experienced management, venture funding and outside commercialization partners. With 49 new start-ups created in the last 5 years, and several significant follow-on funding successes, our approach to "seeding" new businesses for the region has proven to be a resounding success.

ANN ARBOR SPARK

The University plays an active and productive role with Ann Arbor SPARK to promote economic growth for our region. Members of the University community serve on boards and committees to grow, retain and attract businesses. The University has assisted SPARK in specific projects, such as a wet lab facility, opportunities for the former Pfizer research campus, new funding opportunities and important policy and strategic initiatives.



IRLEE

The Institute for Research on Labor, Employment and the Economy (IRLEE) provides local, state and regional economic forecasting services for business, government and academic constituencies. Engaging student resources, IRLEE assesses the impact of economic restructuring and provides hands-on assistance to distressed Michigan businesses and communities. These efforts enhance the retention and revitalization of existing businesses undergoing economic transition.

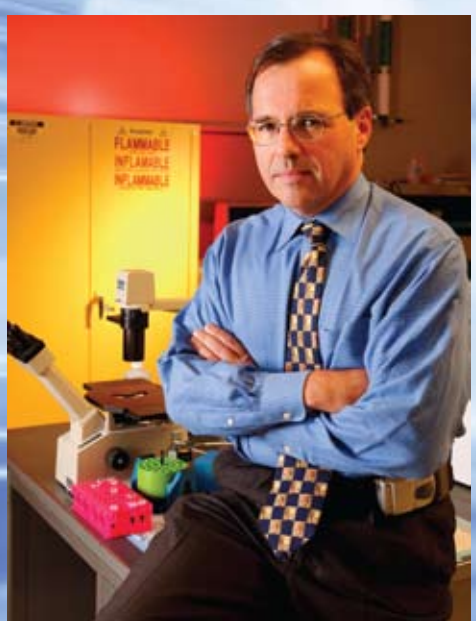
MIIE + MUCI

The Michigan Initiative for Innovation and Entrepreneurship (MIIE) is a consortium of all 15 Michigan public universities collaborating to enhance statewide economic competitiveness and stimulate growth. A pilot grant of $2 million was awarded by the C.S. Mott Foundation to fund proposals for investments in technology, gap projects, initiatives to encourage engagement with entrepreneurial and industry partners and entrepreneurial educational activities. MIIE initiatives were modeled after the highly successful Michigan Universities Commercialization Initiative (MUCI) that used funding from the state's 21st Century Jobs Fund to match gap funding projects from Michigan's research universities. These projects accelerated and enhanced dozens of tech transfer opportunities over the last several years.

Promoting a Culture of Innovation and Engagement

UNIVERSITY RESEARCH CORRIDOR

The University Research Corridor (URC) is an alliance of Michigan's three largest research universities (Wayne State University, Michigan State University and the University of Michigan) to leverage their research and intellectual capital to create a vibrant Michigan economy. With other academic partners, the URC promotes research collaboration and initiatives to promote technology transfer, talent development and business creation and attraction.



INNOVATOR OF THE YEAR

In FY 08 the University of Michigan awarded its Distinguished Innovator Award to Dr. James R. Baker, professor of Medicine, professor of Biomedical Engineering, and director of the Center for Biologic Nanotechnology. This award recognizes exemplary transformational innovation and fostering of entrepreneurial activities. Dr. Baker is a founder of two U-M startups—NanoBio, developing a variety of nanoemulsion therapies, and Avidimer Therapeutics, developing pharmaceuticals from nano-scale dendrimer bio-structures.

TECHKNOW FORUM

TechKnow Forum, a collaboration with several state and regional government, industry and academic partners, provides insights into technology, market trends and entrepreneurial opportunities within a dynamic, entertaining production. TechKnow 2007 focused on Alternative Auto Fuels and included expert panelists from U-M, Ford, GM, Toyota, NextEnergy, the Center for Automotive Research, and the Automotive X Prize.

NEW ON-CAMPUS LOCATION

In FY 08 U-M Tech Transfer moved to an on-campus location, co-locating with the new Business Engagement Center. This location on central campus enhances our ability to engage with faculty, students and business partners. The co-location of our two units provides "one-stop shopping" for industry and entrepreneurial engagements. Over 300 researchers, entrepreneurs, business and community leaders attended our Open House in May 2008, shown above.

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