



2007

annual report

on technology transfer, industry research,
and economic development

U N I V E R S I T Y O F M I C H I G A N

leading innovation.
fueling economic development.
improving our quality of life.



YEAR ENDING JUNE 30, 2007

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the engaged university

MESSAGE FROM THE VICE PRESIDENT FOR RESEARCH

In these challenging times, the University of Michigan is engaged as never before in making a positive impact on our state and our region. We have been hard at work over the past year, fostering new industry research collaborations, transferring our research discoveries to the market, creating new business start-ups, and contributing to the state's economic vitality.

This year, we have expanded our traditional U-M Tech Transfer Annual Report to highlight the University's many successful partnerships with industry. Through its engagements with industry and the entrepreneurial community, the University of Michigan is playing a vital role in fostering innovation and improving our quality of life. It is my hope that this Annual Report communicates the depth of our resources and the breadth of our accomplishments and commitment.

I invite you to discover the vast potential that resides within the University of Michigan—and to partner with us in transforming that potential into viable products, services, and enterprises that benefit our state and our nation.

STEPHEN R. FORREST
VICE PRESIDENT FOR RESEARCH
UNIVERSITY OF MICHIGAN



"The University of Michigan is a vital bridge to the future for our state. Our impact must be broad, because the future of American competitiveness depends vitally on transforming the Midwest. That means being a university that helps shape a strong Michigan economy, provides the best health care possible to citizens, offers exceptional regional campuses, and works with the K-12 system to increase the number of college-educated citizens—students who will be tomorrow's decision-makers." —MARY SUE COLEMAN, President, University of Michigan



“Given our unique set of resources, we have a responsibility to transform ideas into reality. Our ability to move knowledge from the laboratory bench to the marketplace must become a major focus of this University in the next decade.”

STEPHEN R. FORREST
Vice President for Research

investing in innovation

Vision | The University of Michigan is committed to playing a leadership role in transforming our regional and national economies by engaging our industry and entrepreneurial partners and deploying the potential of our ideas, people, and resources.

Investing in Industry Research | Collaborating with industry enhances our ability to meet our missions of education, research, and service while stimulating a culture of innovation and entrepreneurship. We are investing our time, talent, and resources to encourage industry engagements among our faculty and students.

Investing in People | Over the next five years, U-M will invest \$30 million to fund 100 additional tenure-track faculty positions, with the goal of expanding interdisciplinary research and increasing faculty links with undergraduates. Priority will be given to faculty positions that support our major initiatives such as energy, the life sciences, and environmental sustainability.

Investing in Tech Transfer and Engagement | We are reinvesting most of our tech transfer financial returns in order to ensure that these contributions will be sustained and enhanced. These reinvestments create additional resources for technology licensing, business formation, and industry engagement.

creating a culture of innovation & engagement

Distinguished Innovator Award | In FY '07 the University of Michigan unveiled the Distinguished Innovator

Award to recognize exemplary transformational innovation, movement of an innovation to market readiness, or innovative means of transferring technology and knowledge. Professor Mohammed Islam, a faculty member in the Department of Electrical Engineering and Computer Science, became the first recipient of this award. Professor Islam's research areas include mid-infrared lasers, and his achievements include numerous technology inventions, start-up companies, and establishing entrepreneurship courses within the College of Engineering.

Celebrate Invention | On October 3, 2007, over 350

University of Michigan inventors, entrepreneurs, and university and community leaders attended the 7th annual Celebrate Invention reception. This annual event is designed to honor the achievements of over 650 U-M inventors who either disclosed a new innovation, had a patent granted, or saw one of their technologies licensed to industry in FY '07. Highlighting that fiscal year 2007 produced 329 new technology disclosures, the highest yearly total to date, the theme of the program was "329 ways to make life better!" Participants networked with new and old friends and visited eight "Innovation" kiosks that highlighted inventions of U-M inventors.

Business Engagement Center | Finding access to

University resources can be baffling to business and community partners. To address this obstacle, we are establishing a Business Engagement Center to provide a "front door" to the University of Michigan. This will allow us to better connect U-M people and resources with the needs of our industry and entrepreneurial partners. Sharing a new central campus location with U-M Tech

Transfer, the Business Engagement Center will provide connections, collaboration opportunities, and communications on current activities. Daryl Weinert, senior director of Corporate and Government Relations for the College of Engineering is the interim executive director of the Business Engagement Center.



Top: 2007 Distinguished Innovator Award recipient Mohammed Islam; bottom: 2007 Celebrate Invention event

Daryl Weinert, interim executive director of the Business Engagement Center.





U-M Tech Transfer executive team from left: Doug Hockstad, Robin Rasor, Dan Broderick, Ken Nisbet, Rick Brandon

technology transfer engagement

OUR YEAR | We are pleased to report another successful year of transferring our research discoveries to commercial partners for the benefit of the general public.

In Fiscal Year 2007 (FY '07), we recorded 329 new invention disclosures, 14 percent more than the previous year, demonstrating a record pace of engagement by our inventors, students, and staff. During that same time period, we entered into 91 agreements with our business partners, reflecting not only technology deployed to the market but also a continuing expansion of business relationships to foster innovation and economic development. Our business formation expertise and partnerships created 7 new business start-ups, continuing our success in job and company creation. With 45 new start-ups over the last five years, most of which have taken root here in Michigan, the University is planting the seeds for economic opportunity and diversification. Although financial returns from these activities are not a primary objective, revenues from successful partnerships allow us to reinvest in further research, education, and industry engagements, thereby expanding our potential contributions in the years ahead.

Our work benefits a wide array of stakeholders. U-M Tech Transfer provides services and connections for U-M researchers to guide their inventions to market. Our activities and resources provide hands-on learning and employment opportunities for research assistants and students. And our technology services and partnership initiatives help enhance the competitiveness of our industries, create jobs and new businesses to stimulate economic development, and improve the quality of life in our communities.

KENNETH J. NISBET
EXECUTIVE DIRECTOR
U-M TECH TRANSFER

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.

components of the tech transfer process

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

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.

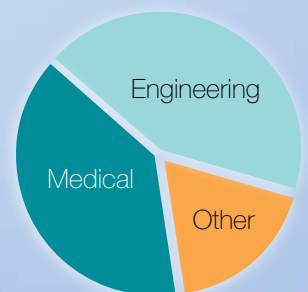
2007 fiscal year

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 some of our successes.

2007 INVENTION DISCLOSURES

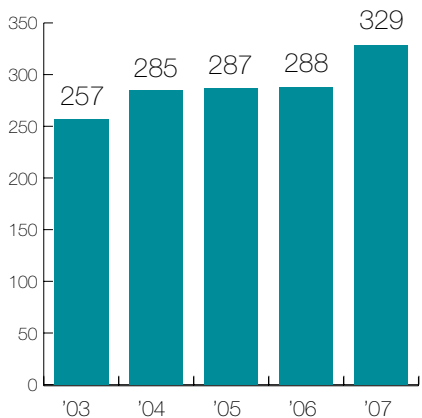
| Medical | | Engineering | | Other | |
|--|------------|---|------------|--|-----------|
| Anesthesiology | 1 | Aerospace Engineering | 2 | Architecture | 2 |
| Bioinformatics | 1 | Atmosphere Oceanic Space Sci | 3 | Business Administration | 4 |
| Biological Chemistry | 4 | Biomedical Engineering | 16 | College of Literature, Science, & the Arts | 24 |
| Cell Developmental Biology | 2 | Center for Ergonomics | 1 | Counseling Services | 1 |
| Dermatology | 1 | Chemical Engineering | 15 | Digital Media Commons | 1 |
| Emergency Medicine | 1 | Civil & Environ Eng | 3 | UM-Dearborn | 6 |
| Human Genetics | 7 | Electrical Engineering & Computer Science | 65 | Dentistry | 7 |
| Internal Medicine | 39 | Macromolecular Science Eng | 2 | Kinesiology | 2 |
| Michigan Nanotech Institute | 1 | Mechanical Engineering | 22 | Life Sciences Institute | 4 |
| Microbiology & Immunology | 1 | Materials Sci Eng | 9 | Nursing | 1 |
| Molecular Physiology | 1 | Naval Architecture Marine Eng | 2 | Office of the VP for Research | 1 |
| Neurology | 3 | Space Physics Research Lab | 1 | Pharmacy | 3 |
| Obstetrics & Gynecology | 2 | Total | 141 | Public Health | 2 |
| Ophthalmology | 8 | | | School of Information | 1 |
| Pathology | 15 | | | UMH Medical Equipment | 1 |
| Pediatrics & Comm Diseases | 1 | | | UMH Orthotics & Prosthetics Ctr | 1 |
| Pharmacology | 6 | | | UMH Surgery | 2 |
| Physical Medicine & Rehab | 1 | | | University Transportation Research Institute | 1 |
| Psychiatry | 2 | | | Total | 64 |
| Psychiatry—Molecular & Behavioral Neuroscience Institute | 5 | | | | |
| Radiology | 5 | | | | |
| Radiation Oncology | 5 | | | | |
| Surgery | 12 | | | | |
| Total | 124 | | | | |

{ See pages 18–19 for a full list of invention disclosures. }

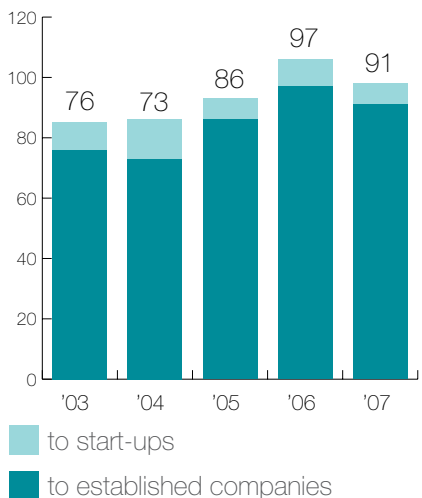


tech transfer | year in review

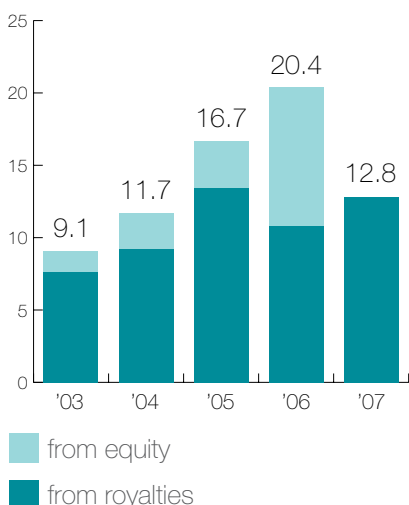
INVENTION DISCLOSURES



LICENSE AGREEMENTS



LICENSE REVENUE (in millions of dollars)



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

FY 2003 START-UPS

GMP Cancer Diagnostics
 ProView
 Atheron
 Alerion Biomed
 Advangen
 Soar Technology
 Polytorx
 MedHub
 Etubics

FY 2004 START-UPS

Collectar
 GMP Immunotherapy
 Oncolmmune
 Ascenta
 Neural Intervention
 Technologies
 Mobius
 Avidimer Therapeutics
 Dentigenix
 Southern Industries
 MC3 Biomaterials
 NeuroNexus
 Technologies
 Opteos
 Ablation Frontiers

FY 2005 START-UPS

Accuri Cytometers
 Invia
 McCreadie Group
 Xoran Technologies
 Mayaterials
 nPoint
 PreSense Technologies

FY 2006 START-UPS

CastAnalysis
 Cyclos Semiconductor
 NanoMag
 Pipex
 SensiGen
 Compendia
 Biosciences
 Cielo MedSolutions
 Zattoo
 MedSpoke

THE START-UP CLASS OF 2007

Flexsys
 MEMS technology for creating morphing wing surfaces

ImBio
 Software for medical imaging

Incept BioSystems
 Microfluidic devices for premium cell management

SandBox Tech
 Highly mobile mechanical robots

Avicenna
 Reporting software system for electrophysiology analysis

Locomatix
 Software for managing extremely large databases of geospatial information

Biodiscovery
 Custom DNA and peptide arrays synthesized on open surfaces





According to CEO Shawn Marcell, two SensiGen products are currently undergoing laboratory evaluations prior to FDA clinical trials. The AttoSense HPV Test for early detection of cervical cancer should reduce false negative results and prevent as many as 2,000 avoidable deaths annually due to cervical cancer. With the AttoSense Kidney Test, it will become possible for the first time to accurately diagnose early-stage kidney disease and monitor subsequent treatment.

ENGAGED IN IMPROVING DIAGNOSTICS FOR MAJOR DISEASES

SensiGen | Early, accurate diagnosis is the key to treating many serious diseases—and to preventing avoidable deaths. For instance, each year cervical cancer claims the lives of as many as 4,000 women. Tragically, almost half of those deaths could be avoided if more accurate diagnostics were available. Likewise, 90 million Americans are at risk from chronic kidney disease (CKD), yet current diagnostics can detect CKD only in its latter stages.

In the near future, physicians will have access to a new and vastly improved set of diagnostic tools. Beginning as early as 2008, biotech start-up SensiGen expects to begin marketing its ultrasensitive, gene-based molecular diagnostic products for early detection of chronic kidney disease and human papillomavirus (HPV), the chief cause of cervical cancer. Other products in the SensiGen pipeline include high-sensitivity diagnostic assays for lupus, inflammatory bowel disease, and various forms of cancer.

The technology had its origins in the laboratory of Dr. David Kurnit, professor of pediatrics and communicable diseases at the U-M Medical School. Kurnit's goal was to create a method for detecting and measuring nucleic acids and DNA fragments at unprecedented levels of sensitivity—which he achieved by combining mass spectrometry with PCR, a method capable of exponentially amplifying a single copy of DNA.

The U-M has played a key role in bringing this technology to market. In 2003, Kurnit submitted his first invention disclosures to U-M Tech Transfer, which initiated planning for a new business start-up. Three years later, he and his wife, Kristine, launched SensiGen with \$2.7 million in seed money from the Michigan Economic Development Corporation. The company is currently headquartered in former Pfizer lab space leased from Ann Arbor SPARK. As SensiGen President and CEO Shawn Marcell (pictured above) observes, “The University of Michigan has been, by far, the most straightforward, most efficient, and most professional academic organization I’ve ever worked with. We make a great team.”

As Ann Marie Sastry points out, the success of plug-in electric vehicles will require reconsideration of cleaner grid sources, “and a new breed of technologists who can provide engineering analysis in a way that directly informs policy.” With the goal of training these new engineers, Sastry launched, as its first director, the nation’s first graduate degree program in Energy Systems Engineering (ESE) in the fall of 2007.



ENGAGED IN HYBRID VEHICLE DEVELOPMENT

Ann Marie Sastry
Professor of Mechanical, Biomedical, and Materials Science
Engineering | Director, Energy Systems Engineering Program

“They’re the source of a third of carbon emissions,” says Ann Marie Sastry, “and getting carbon emissions under control means we have to think about how to get cars powered by cleaner fuel sources.” Science has established the reality of the unintended consequences of IC engine-powered mobility. And though reduction of carbon will require dual consideration of auto and grid power, the technology sea change will begin with electrified drive trains.

Sastry, and others, feel that the needle has moved far enough on battery technologies for these drive trains to soon become reality. For the past 12 years, her U-M lab has worked on several key electrochemistries, models, and designs. Her group was the first to develop high-throughput, 3D finite element simulation software to evaluate the performance of various materials in high-power electrodes. She and her colleagues also devised an algorithm for optimizing power systems. Other research projects involve micro-scale batteries, grid batteries, and automotive batteries, sponsored by the Department of Energy, the U.S. Army and Air Force, the National Science Foundation, and the Ford Motor Company.

“[E]nergy storage devices...are the proving grounds for disruptive automotive technologies.

Thus far, the lab has developed several methods of designing and creating new batteries, and patents have been filed on several of their designs. “U-M Tech Transfer was enormously helpful in navigating that process,” Sastry says. “We’re now evaluating business models that allow us to get the technologies into devices more quickly.”

The stakes could not be higher. “From an energy standpoint, it makes sense to use electrified drive trains, and it will happen,” Sastry predicts. “Until then, we’ll continue to make and enhance batteries for portable electronics, improve small-scale power supplies for wireless devices, and make progress on the energy storage devices that are the proving grounds for disruptive automotive technologies.”



As director of the Health Management Research Center, Dee W. Edington is focused on preventing low-risk individuals from slipping into high-risk categories. As he explains, "Low-risk people make up about 60 percent of almost every employee population. Helping them maintain their healthy status needs to be a high priority component of every worksite health care program investment since, in every analysis, individuals who are at low-risk status for...risk factors or behaviors are less costly than those who are at high-risk status."

ENGAGED IN REVAMPING THE HEALTH CARE PARADIGM

Dee W. Edington, Professor of Kinesiology, Research Scientist,
Department of Health Behavior and Health Education

For more than 30 years, Dee Edington has been driven by one passionate goal: the transformation of America's health care paradigm. "For too long, this country's health care model has been focused on disease rather than on health," he insists. "Today, America ranks in the mid-30s worldwide in life expectancy but first in health care costs." The solution? "Redefine health as vitality and energy, rather than as the mere absence of disease. Devise new and better wellness interventions. Above all, get companies interested in paying for wellness in addition to sickness."

In the late 1970s, Edington was instrumental in founding the U-M Health Management Research Center. At about the same time, he and several colleagues began developing a comprehensive, computer-based Health Risk Appraisal (HRA) that, today, comprises the largest set of comparable lifestyle-related health status data in the world. The HRA, which includes assessments and other tools for promoting health awareness in individuals, has been licensed most recently to CIGNA, a major health services company.

Early on, Edington's team of researchers decided to focus exclusively on the work site. As he explains, "Because companies generate most of the dollars in this country, we began dealing almost exclusively with business organizations, and we changed our message from health as an individual good to health as an economic indicator and a corporate value."

"For too long, this country's health care model has been focused on disease rather than on health."

These days, in addition to writing a book on how Americans perceive health, Edington makes as many as 75 presentations a year to business organizations. "My hope," he says, "is to change the conversation around health and contribute to the growing acceptance of wellness as a serious organizational, governmental, and economic strategy."

"Through our new relationship, we have an exciting opportunity to positively impact the health and well-being of individuals, further control costs and improve productivity for employers and plan sponsors, and contribute to the industry's understanding about the most effective ways to engage consumers in managing their health."

—CIGNA HealthCare president David Cordani

ENGAGED IN

CREATING A SAFE, SUSTAINABLE INFRASTRUCTURE

Victor Li, E. Benjamin Wylie Collegiate Chair,
Professor of Civil and Environmental Engineering,
Professor of Materials Science and Engineering

Imagine concrete so light it can float on water, so deformable that it behaves like steel when overloaded, and so durable that it promises huge reductions in maintenance, replacement costs, and resources. Thanks to Professor Victor Li and his research assistants, this amazing material is currently being tested on U.S. highways and is being used in construction projects abroad.

“Imagine concrete
so light it can float on
water, so deformable
that it behaves like steel
when overloaded....”

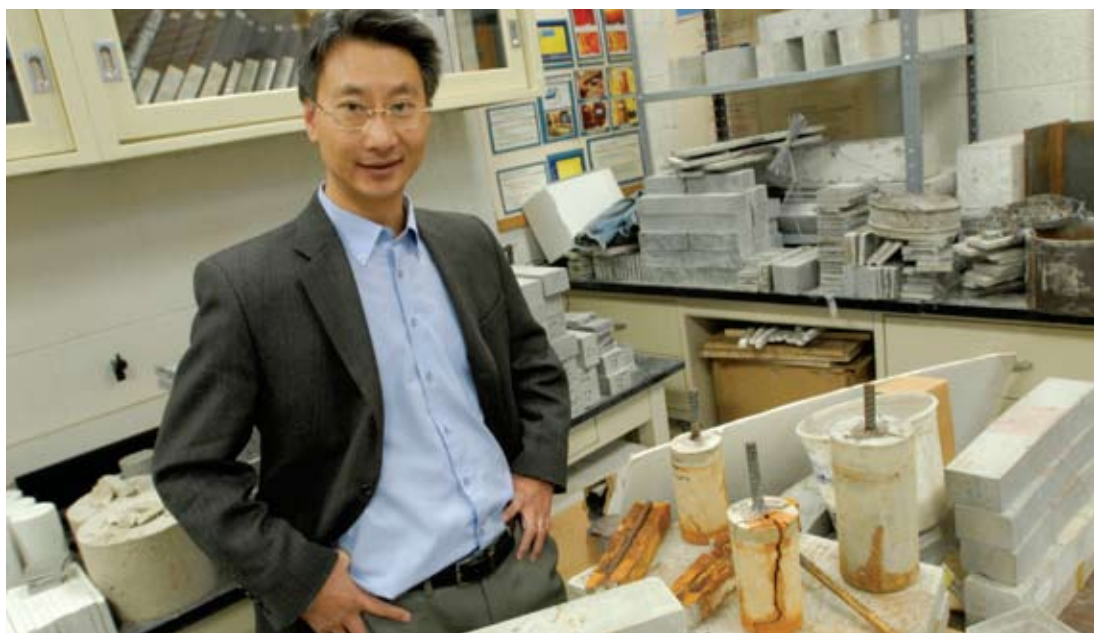
Li didn't set out to engineer ductile concrete. As a doctoral student at Brown University, he focused on earthquake prediction. It was while teaching at MIT that he became interested in earthquake-resistant concrete. Thus began a ten-year research odyssey that ended at the University of Michigan with the development of Engineered Cementitious Composites or ECC.

Field-testing began in 2002, when the Michigan Department of Transportation used ECC for a patch repair on a bridge in Ann Arbor. Results were so impressive that, in 2005, a deteriorating expansion joint on a bridge in Ypsilanti, Michigan, was replaced with ECC, as a first step toward a completely quiet, jointless bridge in the future. In Japan, the Kajima Corporation is using the material in major construction projects.

Li and his team have adopted a two-track approach to future ECC material development, creating a standard version as well as custom-engineered specialty materials. Recently, this “designability” inspired Metamorphics Global, Inc., to enter into a licensing agreement with the University. The New York-based start-up will use the ductile qualities of ECC to enhance the appeal of its digitally colored concrete building products.

In the meantime, Li's work continues on various fronts, including plans for using ECC in various U-M parking structures, a multidisciplinary National Science Foundation-funded project to reduce the carbon footprint of concrete structures, and a possible new self-repairing version of ECC.

In laboratory and field-testing, ECC has been proven to be 500 times more resistant to cracking and 40 percent lighter in weight than regular concrete. Despite its remarkable properties, the composite is made from common ingredients such as cement, water, sand, fly ash, and fibers. What makes it superior to standard concrete—or other fiber-reinforced composite—is the fact that every particle of every ingredient is engineered to precise dimensions, proportions, and functionality. The result is a product that looks and feels like normal concrete, but responds more like steel, deforming rather than fracturing under heavy loads.





"Information systems have the potential to provide enhanced health care and control costs.

The University of Michigan provides both talent to develop these innovations based on real-world needs and a comprehensive health care setting for first-customer implementation."
—Jim Adox, Venture Investors



ENGAGED IN DEVELOPING MEDICAL SOFTWARE TECHNOLOGIES

Avicenna Medical Systems, Cielo MedSolutions, Compendia Bioscience, Invia Medical Imaging Solutions, MedHub

Necessity, it's been said, is the mother of invention. And nowhere is that more evident than at the University of Michigan where, every year, new treatments and technologies are developed as a way of solving internal, highly specialized challenges. Often, those technologies take the form of custom software applications, many of which are medical technologies with applications in the wider world. These past few years have been especially productive, as a record number of medical software innovations made their way into commercial markets—via license agreements—to start-up companies and existing businesses.

+ Drs. James Corbett and Edward Ficaro launched INVIA Medical Imaging Solutions in 2005 as a platform for developing, marketing, and supporting their nuclear cardiology imaging software, which provides clinical information on coronary blood flow and cardiac function for improving the clinical management of patients with heart disease. The software, initially licensed directly to end-users from U-M Tech Transfer, gained such popularity that it became evident that more focused and dedicated support was needed, thus leading to the formation of INVIA. In 2007, the company entered into licensing agreements with Siemens, GE, Philips, Fuji, Agfa, and various medical specialty firms.

+ Another software application, OncoPrint, was also initially marketed and licensed directly from the University of Michigan to end-users. Compendia Bioscience was formed in an effort to better support users and provide focused development plans. In October, Compendia Bioscience, rolled out a new premium edition of its OncoPrint software. Based on database sorting technology developed by U-M Professor of Pathology and Urology Arul Chinnaiyan, graduate student Dan Rhodes, and a team of fellow researchers, OncoPrint integrates and unifies vast amounts of oncology data, enabling scientists to quickly locate cancer targets and key biomarkers. An academic version of the software is available free of charge.



+ When U-M's Electrophysiology unit began experiencing costly slowdowns in accounting and billing, a team headed by Dr. Frank Pelosi developed software to reduce waste, streamline overhead, and speed payment of invoices. Avicenna Medical Systems was launched in FY 2007 to market the original software along with a suite of related products for monitoring and managing drug treatments.

+ In 2002, Associate Professor of Surgery Paul Gauger collaborated with local entrepreneur Peter Orr to develop a web-based system designed to address the increasing regulatory burdens placed upon large teaching hospitals. The system manages rotation and call schedules, affiliated institutional billing, and Medicare reimbursement and critical documentation requirements associated with all aspects of physician training. Launched in 2003, MedHub is in daily use by thousands of users at the U-M, Rush University Medical Center, Stanford University, Cleveland Clinic, and other large peer teaching institutions across North America.

+ In early 2004, researchers at the U-M began studying the use of software in family medicine practices and how it could be employed to facilitate patient care by monitoring treatment, collecting and organizing clinical data, and generating reports for health plans and physician incentive programs. The software being evaluated had been developed by U-M doctors Donald Nease, Michael Klinkman, and Lee Green and the results looked promising. In 2005, U-M Technology Transfer TechStart intern Linda Sanchez led a team of graduate students assigned to evaluate market opportunities for the software, then known as ClinfoTracker™. Today, Cielo MedSolutions, the company formed to help bring the technology to market, is selling Cielo Clinic™ software. A commercial-grade clinical quality management system is based on ClinfoTracker™, a software suite currently being used to help ensure quality of care for more than 150,000 patient encounters each year.





ENGAGED IN NEW DRUG DISCOVERIES

Dr. James Shayman
Professor of Pharmacology and Internal Medicine,
Associate Vice President for Research–Health Sciences

In 1988, James Shayman, a nephrologist trained in lipid biochemistry and cell biology, boarded a shuttle bus on his way to a cancer research conference. Sitting next to him on the bus was Norm Radin, a U-M neurochemist who had recently developed a lead compound for blocking glycolipid synthesis and, potentially, treating a group of rare, often deadly genetic diseases. That chance encounter led to a productive research collaboration and a promising new drug—now undergoing clinical trials—for victims of Gaucher Disease.

“It took only a few minutes for us to discover our shared interest in lysosomal storage disorders,” Shayman recalls. “Lysosomes,” he goes on to explain, “are organelles within a cell involved in the breakdown of lipids, proteins, and sugars. With Gaucher Disease, an enzyme deficiency leads to a buildup of fat in major organs, resulting in debility and, in the case of children, death. Currently, the approved treatment is an intravenous enzyme replacement at an annual cost of approximately \$250,000 per patient. In all, there are seven related diseases affecting approximately 30,000 Americans.”

By 1998, Shayman’s lab had developed a family of inhibitors that were both effective and selective in blocking lysosomal lipids involved in Gaucher Disease and Fabry Disease. Within two years, and with the help of U-M Tech Transfer, the compounds had been licensed to Genzyme Corporation. Phase I trials indicated that, unlike competing compounds, Genzyme’s clinical candidate Genz-112638 demonstrated no significant toxicity. Phase II trials, now underway for Gaucher Disease, are fully enrolled and highly promising.

“There’s reason to believe this new compound, which is administered orally and costs significantly less than infusion therapy, could become the primary treatment for Type I Gaucher Disease,” Shayman says. “There are also indications that the compound could meet the needs of patients with other forms of lysosomal storage diseases, including Fabry Disease, and perhaps even more common disorders such as diabetes.”

“The University of Michigan’s track record in drug development for orphan diseases is excellent,” says James Shayman, U-M’s Associate Vice President for Research–Health Sciences. “In the case of Genz-112638, the compound was invented here, proof of concept was developed here and, if the drug is successful, it will significantly improve quality of life for thousands of Gaucher patients. It will also have the social benefit of saving hundreds of thousands of dollars in annual health care costs. Furthermore, its possible application to diabetes and other widespread diseases demonstrates the importance of research into rare diseases.”

“There’s reason to believe this new compound, which is administered orally and costs significantly less than infusion therapy, could become the primary treatment for Type I Gaucher Disease.”

ENGAGED IN ALTERNATIVE ENERGY RESEARCH

Levi T. Thompson

Richard E. Balzhiser Collegiate Professor of Chemical Engineering,
Professor of Mechanical Engineering,
Director, Hydrogen Energy Technology Laboratory

Many engineers, economists, alternative energy proponents, and scientists—Levi Thompson among them—consider hydrogen to be the ultimate fuel: plentiful, safe, and non-polluting. “And whether that fuel is sourced from water, methanol, diesel, or something else, catalysts are extremely important in the conversion process,” he says. “Catalysts accelerate reactions and are critical to the formation of most products we use today.” Which is why, for more than a decade, Thompson has focused intently on the development of novel and better-performing catalytic materials.

Currently, Thompson’s laboratory is at work on catalytic technologies for hydrogen production. These include water-gas-shift and methanol-reforming catalysts to convert hydrocarbons into hydrogen for use in chemicals production, petroleum refining, and fuel cells. Thompson’s lab is also developing electrocatalysts and nanofabrication methods for fuel cell fabrication as well as high-activity catalysts for low-cost fuel processors that could one day power laptops, cell phones, and PDAs, as well as clean-running vehicles.

But these days, Thompson is doing more than researching and developing catalysts. In his new role as director of the U-M’s Hydrogen Energy Technology Laboratory, he’s functioning as a catalyst himself.

The facility is located on the third floor of the Michigan Memorial Phoenix Energy Institute on North Campus. As Thompson notes, “This new laboratory is intended to facilitate multidisciplinary research and help researchers move more quickly from concept to material or device. They’ll have access to advanced equipment as well as technical expertise and administrative support. The facility will also bring engineers and scientists together for research talks, forums, and other events. The idea is to encourage as many strategies and approaches as possible in the development of hydrogen-based technologies.”

Levi Thompson, one of 12 recipients of the Michiganian of the Year Award for his research, entrepreneurship, and the recruiting and mentoring of minority students, has recently launched Inmatech. This new start-up will commercialize catalytic materials and processes discovered and developed in his U-M laboratories.





“Being on the National Advisory Board has allowed us to contribute to vital Tech Transfer initiatives and feel connected to the greater University community.”

JOHN DENNISTON, Partner
Kleiner, Perkins, Caufield & Byers



productive engagement, strategic expertise

U-M T E C H T R A N S F E R NATIONAL ADVISORY BOARD

Comprised of representatives from industry, the venture and entrepreneurial communities, government, and other university tech transfer offices, our National Advisory Board provides advice and guidance on Tech Transfer programs, activities, and services. To date, the Board has tackled numerous projects: benchmarking best practices in technology transfer; enhancing technology marketing, establishing a mentoring program, and finding solutions to the shortage of early-stage funding. It was the Board’s work that led to the formation of Ann Arbor SPARK, our regional economic development partner, and it is the Board’s efforts that have enhanced our strategic operations and provided a model of productive engagement with business and industry.

Members of the National Advisory Board include:

Thomas Bumol
*Vice President, Eli Lilly
San Diego, CA*

Thomas Porter
*Trillium Ventures
Ann Arbor, MI*

Marshall Cohen
*Entrepreneur
Princeton, NJ*

Rick Snyder
*Chief Executive Officer,
Ardesta
Ann Arbor, MI*

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

Michael Staebler
*Partner,
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tech transfer programs and 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.

CATALYST RESOURCE NETWORK | Talent is frequently the key missing ingredient in entrepreneurial opportunities. To address this need, U-M Tech Transfer—acting on the advice of its National Advisory Board—created a talent attraction and engagement process. *Catalyst* is a database of individuals qualified to assist with tech transfer and other engagements. Currently, *Catalyst* includes the names of hundreds of individuals, heavily leveraging our valuable U-M alumni network, and has produced outstanding talent connections to accelerate and enhance our projects and businesses.

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 row) Debbie Watkins, Sally Ingalls, Carmen Atkins, Nadine Wong, Rakhi Juneja, Andrew McColm;
(middle row) Matt Bell, Elizabeth Wagner, Robin Rasor, Ken Nisbet, Tina Bissell, Lisa Johnson, Mark Maynard, Rick Brandon; (back row) Dennis Linder, Mike Hallman, Doug Hockstad, Wesley Huffstutter, Bryce Pilz, Greg Choiniere, Wayne Harvey, Dan Broderick; (not pictured) David Ritchie, Jim Deane, Teri Grieb, Linda Hamlin



fiscal year 2007 invention disclosures

AEROSPACE ENGINEERING

- A Process for Representing an Adhesively Bonded Joint with a Single Finite Element
- Hydrogen Extraction from Methane Using a High-Density Radio-Frequency Plasma Source

ANESTHESIOLOGY

- Intensive Care Unit Manager

ARCHITECTURE

- Bio-Composite Facade System
- Syntax 2D

ATMOSPHERIC, OCEANIC, AND SPACE SCIENCE

- A Miniature Sensor for Electric Field Measurements in Dusty Environments
- Web-Based Interactive Classroom System
- WHISPER: Wireless Hydrology Instrument for Snow Pack Environment Reporting

BIOINFORMATICS

- A Novel Approach for Development of Live Anthrax Vaccines

BIOLOGICAL CHEMISTRY

- A Continuous Fluorescent Assay for Histone Demethylases
- Methods and Compositions for Treatment of Diabetic Nephropathy
- Methods of Treating Epilepsy
- Protein Target and Structure for Development of Antimicrobials

BIOMEDICAL ENGINEERING

- Small Molecules That Inhibit AB Ion Channel Activity
- New Ultra-Sensitive Sensors for Chemically and Biochemically Active Reagents Using Ion Channel-Forming Peptides
- Screening for Molecules That Inhibit the Ion Channel Formation of Amyloid β Peptides
- Methods and Compositions for Cartilage Repair
- Local Pulsewave Velocity Measurement Using a Linear Array
- Thermal Strain Imaging with a Linear Array
- Easy Cell Load Computer Programmed Chemotaxis Chip
- Channels with Semi-Porous Membranes
- Braille Microfluidics FACS
- Interchangeable Microfluidic Control and Applications of Ionic Liquid as Hydraulic Fluid
- Reconfigurable Elastic Nanofluidic Systems
- Non-Invasive Ultrasound Elasticity Imaging on Engineered Tissue and Biomaterial Scaffold
- Conducting Phase-Sensitive Acoustoelectric Hydrophone
- Photoacoustic Indicators
- PolyGlycerol 1,12 Dodecanoate: A New Polymer for Tissue Engineering Applications



- Cavitation Ultrasound: A Potential Minimally Invasive Therapeutic Method

BIOPHYSICS RESEARCH DIVISION

- Disulfide by Design

BUSINESS SCHOOL

- ACSI Methodology Report
- ACSI Quarterly Reports

- Portfolio Factors and Portfolio Alphas in Financial Analysis
- The American Customer Satisfaction at Ten Years—A Summary of Findings

CELL DEVELOPMENTAL BIOLOGY

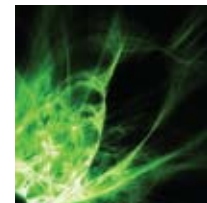
- Method of Delivering DNA to the Developing Embryo
- Stimulation of Erythropoiesis

CENTER FOR ERGONOMICS

- Human Motion Simulation Framework Reference Implementation Software

CHEMICAL ENGINEERING

- A Dynamic Bayesian Environment for Learning and Predicting Trends in Biomedical Data



- An Automated Method for Building Molecular Pathways Using Incremental Bayesian Learning
- Catalysts for the Electrochemical Hydrogenation of Vegetable Oils
- Catalysts for NO x Selective Catalytic Reduction with Reformate
- CVD Coating with Reactive Composition Gradients
- Conductive Coatings Made by Layer-by-Layer Assembly
- Device for Programmable Synthesis of Microparticles with Configurable Anisotropy
- Dewetting Method of Layer-by-Layer Assembly
- Fabrication of Carbon Nanotube Materials for Implantable Devices
- Feed Manipulation Strategies in the Fischer-Tropsch Process
- Inkjet Printing of Materials for Use in Fuel Cells
- Nanoimprinted Electrodes for Microfuel Cell Applications
- Nested Landing Pad System for Synthetic Biology
- Multi-Phase Capsules
- Venturi Microregulator

CHEMISTRY

- Adsorbents for Organosulfur Compound Removal from Fluids
- Analyte Sensor Devices and Holders, Methods, and Systems Utilizing the Same
- Compositions and Methods Relating to Novel Compounds and Targets Thereof
- Detection of Explosive Devices
- Devices and Methods for Predicting Thrombotic Risk of Patients
- Methods of Accurately Assaying 1,4 and 1,5 Substituted Benzodiazepines and Formulations Thereof
- Nanoparticle-Enabled Brain Tumor Surgery and Therapy
- Novel Inhibitors of the FoF $_1$ -ATPase
- Novel Inhibitors of Mitochondrial Enzymes
- Novel Soluble 1,4 Benzodiazepine
- Novel Strategies, Linkers, and Coordination Polymers for High-Performance Sorbents
- Plasmon Particles in Detection and Dynamics

- Porous Coordination Copolymers and Methods for Their Production
- Preparation of Functionalized Zeolitic Imidazolate Frameworks
- Synthesis of 1,4 Benzodiazepines

CIVIL & ENVIRONMENTAL ENGINEERING

- Portable Submersible Miniature Particle Velocimetry Device
- Electrical Impedance Tomography of Nanoengineered Thin Films
- Self-Healing Engineered Cementitious Composites

COUNSELING SERVICES

- Counseling Center Assessment of Psychological Symptoms

DEARBORN COLLEGE OF ARTS, SCIENCES & LETTERS—SOCIAL SCIENCE

- The Modern Middle East: A Sourcebook for History

DENTISTRY

- BMP Releasing Porous Materials for Tissue Repair and Regeneration
- Coordinator—Clinical Trial Management Systems
- Immobilizing Particles onto Complex Surfaces
- Multi-Analyte Detection of Biomarkers Predictive for Periodontal and Peri-Implant Disease Activity
- PDGF Releasing Matrices for Angiogenesis and Tissue Regeneration
- Pulsatile Release Devices
- RANKL Inhibition to Treat Periodontal Disease

DERMATOLOGY

- Mouse Model for Testing Skin Anti-Aging Therapies and Studying of Pathophysiology of Skin Aging/Photoaging

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

- Accurate Correction of Measurement Errors
- A Class of Low-Voltage PDMS Gold Wet Actuators for Use in High-Density Microfluidics
- A Method for Low-Temperature Deposition of Metals in OVPD of Organic Electronic Devices



- A Method for Low-Temperature Deposition of Metals in OVPD of PV Cells
- An Enhanced Carrier Frequency Offset/Doppler Shift Estimator for Wireless Access in Vehicular Environments Systems
- A Network Service for the Detection, Analysis, and Quarantine of Malicious Files
- A New Duplexer Design
- An Efficient and Accurate Method for Evaluating Time Series Similarity
- An Ultra-Low Power Timer for Sensor Monitoring Systems
- Application of Nanoparticle Heaters to Cryopreservation of Living Cells
- A Reflective Modulator for Fiber-to-the-Home
- Automatic Error Diagnosis and Correction for RTL Designs
- Bit Index-Based Single Error Correction Scheme

- Brick and Mortar Silicon Manufacturing
- Clock Distribution Network Architecture for Resonant Clocked Systems
- Criteria for the Design of High-Efficiency Organic Photovoltaic Cells

- Critical Path Monitoring Circuit
- Commercially Viable Structure for Chemi-Resistive Nanofilm Detectors
- Compact Low-Profile Assembly of Silicon Neural Probes into 3D Arrays
- Current-Mirror Type Fixed Pixel Electrode Circuit for AMOLED with Non-Linear Current-Stealing Function
- Design of High-Efficiency Quantum Dot Solar Cells
- Diagnostic Text Search Engine
- Electrical Power Generation Using Evaporation or Transpiration
- Enhanced External Quantum Efficiency in Organic Solar Cells
- Enhancement of III-Nitride Light Emitter Efficiency
- Fast Time-Domain Cable Circuit Simulator for Electromagnetic Compatibility and Interference Analysis
- Field-Repairable Control Logic
- Frequency Scanning Radar
- Generic Environment-Resistant Package for MEMS
- High-Mobility Crystalline Layers for Solar Cells
- Improved OLED Light Outcoupling
- IR Sensitive Solar Cells
- Lightweight User Authentication via Occasional Random Challenges in Secure Mobile Transactions
- Locality-Based Block Selection
- Low-Dark Current Photodetectors
- Low-Leakage Memory Circuit
- Memory Block Grouping for Hard- and Soft-Error Tolerance
- Modified LRU Block Replacement for Fault-Tolerant Caches
- Monitoring Crystalline Quality in OVPD
- Multi-Level Flash Memory Block Grouping for Hard Fault and Wear-out Tolerance
- Multiple TFT Structures for Large-Current or High-Current Density
- Nanoscale Amorphous-Silicon-Based Ultra-High Density Resistance Switching Memory and Logic Devices
- Novel Chip-Scale Semiconductor All-Optical Buffer Using Phase Change Memory Technique
- Novel Estimation Strategy for a Series of Machining Cycles
- Optical Microresonator Sensors Using Capillary Microtubes
- Organic Thin Film Templating for OLEDs
- Organic Deposition of Large-Area Thin Films
- Organic Vapor Jet Deposition Using Nozzle Arrays
- Passive Wireless Readout Mechanisms for Nanocomposite Thin Film Sensors
- Patterning Thin Metal Layers on Spherical Substrates by Stamping
- Piezoelectrically Actuated Ceramic-Si-Glass Microvalve
- Plug Valve in Vapor Deposition System
- Prism: Lightweight File System Virtualization via Selective Cloning
- Slotline TTD Phase Shifter and Applications

- Subphthalocyanine-Based Devices for High-Open-Circuit Voltage Organic Photovoltaic Cells
- Systems and Methods for Regulation of Engine Variables



- Type II Quantum Dot Solar Cells
- Quality Factor Boosting via Mechanically Coupled Arraying
- Reconfigurable Frequency Selective Surface with Miniaturized Elements
- Roll-to-Roll Fabrication of Microlesons Arrays
- Scalable Trajectory Indexing
- TD-IE Software
- TD-SPICE Software
- Top Anode AMOLED Pixel Structure with Annular TFT
- Transparent SIMD Using Lightweight Dynamic Mapping
- True Random Number Generator
- Ultra Low-Cost Defect Protection for Microprocessor Pipelines
- Very Low-Dark Current Organic Photodiode
- Voltage Program Type Pixel Electrode Circuit for AMOLED with Threshold Voltage Compensation
- Wearout Detection Unit for Early Detection of Semiconductor Defect

EMERGENCY MEDICINE

- Diagnostic for Spider Venom

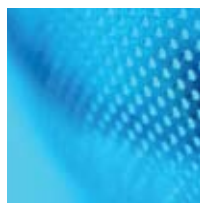
HUMAN GENETICS

- Compositions for Protecting against Doxorubicin Cardiac Damage
- Compositions for the Treatment of Arthritis
- Compositions for the Treatment of Lupus
- Compositions for the Treatment of Multiple Sclerosis
- Genetic Variants and Neurological Disease
- Mutation in Epilepsy
- System for Graphical Summarization and Retrieval of Information from Large Document Corpora

INTERNAL MEDICINE

- Algorithms to Predict Clinical Adherence, Response, and Shunting with Thiopurines
- A Marker of Normal and Cancer Human Breast Stem Cells
- Anemia Tracker
- Animal Cage Top Design
- An Ostial Stenting System
- A Novel Method for Recombinant Human Interferon-Gamma Purification
- A Target for Resistance to Diet-Induced Obesity and for Improved Insulin Sensitivity
- Biomarkers for Prostate Cancer
- Cell Surface Marker and Therapeutic Target for Angiogenic-Dependent Diseases
- CRP Transgenic Rabbits for Drug Screening
- Dendrimer Drug Delivery
- Dendrimeric Nanodevice as Targeted Anticancer Therapy
- Dendrimeric Prodrugs as a Controlled Release Formulation in Pain Management

- Dendrimeric Prodrugs as Effective Anticancer Therapy
- Diagnostic Markers for Lupus and Acute Coronary Syndromes
- Diazo Bicyclic SMAC Mimetics and the Uses Thereof
- Endoscopic Suturing Device
- Implantable Immune Modulatory Devices
- Isolation and Therapeutic Utility of Lung-Resident Mesenchymal Stem Cells
- Leptin Receptor Antibodies and Associated Reagents
- Markers of Colon Cancer Susceptibility
- Methods and Compositions for Preventing Fibrosis
- Methods and Compositions to Treat Infection in Cystic Fibrosis Patients
- Methods for the Evaluation and Treatment of Pre-Hypertensive and Hypertensive Subjects with or without Insulin Resistance
- Methods for Tracking Leukocyte Interactions and Target Treatment
- Methods for Treating Hypertension for Hypertensive Patients
- Methods of Determining Flow in a Conduit
- New In-Vitro Method for Detecting Salt Sensitivity



- New Method to Preserve Red Blood Cell Function during Prolonged Storage and to Increase Their Survival after Transfusion
- New Small Molecule Inhibitors of MDM2
- Novel Brain Tumor Marker
- Predictors of All-Cause Mortality, Cardiac Mortality, and Myocardial Infarction
- Prostate Cancer Susceptibility Gene
- Selective Cytopheretic Inhibitory Device
- Silicon Ultrafiltration Membrane
- Synthesis of Dendrimer-Based BH3 Conjugate That Induce Apoptosis in Cancer Cells
- Targets of Anti-Angiogenic Therapy and in Diagnosis of Cancer
- Tissue Specific Factor V Transgenic Mice
- Treatment of Liver Injury

KINESIOLOGY

- Upper Limb Training and Assessment Board
- A Method of Reducing Hyperreflexia and Improving Movement in Spastic Patients

LIFE SCIENCES INSTITUTE

- A Baculovirus System for Use in Heterologous Protein Production in *Drosophila*
- Methods and Compositions to Upregulate Translation and Enhance Heterologous Expression in *E. coli*
- Protein Solubilizing Fusion Partners
- Synthetic Lac Promoters with Finely Modulated Induction Response

MACROMOLECULAR SCIENCE ENGINEERING

- Microfluidic Devices Made of Cyclo Olefin Copolymer and Poly (Dimethylsiloxane)

- Rapid Prototyping of Rounded Rough Channels

MECHANICAL ENGINEERING

- Adaptation of Shape-Changing Materials to Dynamic Accommodation of Prosthetic Socket Application
- Air Mattress Control System for Rotation and Proning of Hospital Patients
- A System and Method for the In-Vitro, Guided, Self-Organization of Myotendinous Junctions
- A System and Method for the In-Vitro, Self-Organization of Bone, Ligament, and Bone-Ligament Engineered Constructs
- Autonomous Internal Combustion Engines
- Bio-Hybrid Direct Current Power Supply
- Compact Orthostatic Heart Rate Monitor to Detect Dehydration
- Computed Tomography Orientation Detection System
- Fabrication of Rewritable Nanostructures on Material Surface
- Hybrid Battery Supply for EV, HEV, or PHEV
- Inflatable Bumper and the Design Software
- Method for Mid-Load Operation of Auto-Ignition Combustion
- Method to Obtain Process Stability in Gas-Metal-Arc Welding of Aluminum
- Micromachined Deposited Battery
- Microtubule-Based Separation and Concentration of Biomolecule Analytes
- Nanostructure Evolution Simulation Software
- Optical Sensor for In-Process Quality Monitoring of Welds Made on Zinc-Coated Steel
- Smart Materials-Based Active Seals
- Strain Energy Impact Test System for Characterizing High-Strain-Rate Material Response
- Use of Power Electronics for Boosting of Current, and Provision of Adequate Acceleration, in Hybrid, Electric, and Plug-in Hybrid or Electric Vehicles
- Vehicle Solar Concentrator
- Vibration Isolation Coupler

MICHIGAN NANOTECH INSTITUTE

- One-Step Formation and Functionalization of Dendrimer-Stabilized Gold Nanoparticles for Targeted Cancer Therapy

MICROBIOLOGY & IMMUNOLOGY

- Vaccine for Urinary Tract Infections

MOLECULAR AND CELLULAR DEVELOPMENTAL BIOLOGY

- Method for Optimizing the Folding of Proteins and Peptides

MOLECULAR PHYSIOLOGY

- Methods and Compositions for Producing Serotonin

MATERIALS SCIENCE ENGINEERING

- Apparatus and Method of Producing a Fine Grain Metal Sheet for Forming Net Shape Components
- Carboxylic Acid-Modified EDOT for Bioconjugation
- Direct Production of High-Strength, Formed Part Shapes from Low-Cost Granular Stock
- Fluorescent Organic Molecules
- Novel In-Vitro Tissue Culture System for Interfacing Biological Tissues to Implanted Devices
- Optical Field-Enhancing External Coating for Organic Photovoltaic Devices

- Protocol for Covalent Grafting and Polymerization of Monolayers of Polymers in Animal Tissues
- Self-Signal Amplifying DNA Microarrays
- Transcutaneous Biomedical Device with a Regenerative Materials Interface

MUSIC

- Educational DVD—What's Cookin' in the Kitchen—A Planetary Portrait

NAVAL ARCHITECTURE MARINE ENGINEERING

- Enhancement of Vortex Induced Forces and Motion
- Reduction of Vortex Induced Forces and Motion

NEUROLOGY

- Pediatric Sleep Questionnaire
- Sleep-Related Breathing Disorder Scale
- EMG Whiz Software

NURSING

- Adolescent Preventative Services Questionnaire

OBSTETRICS & GYNECOLOGY

- A Medical Approach for the Prevention and Treatment of Human Uterine Leiomyomas
- Microfluidics Device for Regulation and Directed Differentiation of Cells

OPHTHALMOLOGY

- Diagnostic Test for Infectious Endophthalmitis
- Identification, Enrichment, and Use of Mammalian Photoreceptor Precursors
- Methods and Compositions for Repair, Survival, and Regeneration of Photoreceptors in the Human Retina
- Novel Anti-Inflammatory Approach
- Novel Anti-Inflammatory Compound
- Novel Carbohydrate Derivative
- Potential Therapeutics for Retinal Detachment
- The Eyes Have It: An Interactive Teaching and Assessment Program on Vision Care

PATHOLOGY

- Amplification and Over-Expression of Protein in Breast Cancer
- Antigen for Pax2 Monoclonal Antibody Generation
- Autoantibody Profiles for the Diagnosis of Lung Adenocarcinoma
- Breast Cancer Targeted Therapy
- Distinct Molecular Subtype of Tmprss2: ETS Fusion



- Metabolic Profiling of Prostate Cancer
- Molecular Markers of Prostate Cancer Progression
- Novel Gene Rearrangements in Clinical Prostate Cancer Specimens and Prostate Cancer Cell Lines
- Pathology Sample Management System
- Pathology Tissue Samples Handling Tray
- Prognostic Markers for Cancer
- Transgenic Mice with Gene Fusions

- Recurrent Rearrangements of ETV1 in Prostate Cancer Cell Lines
- Regulator of EZH2 Expression
- Small Molecule Inhibitors to the Histone Methyltransferase EZH2

PEDIATRICS & COMMUNICABLE DISEASES

- Systems, Methods, and Compositions for Detection of Human Papilloma Virus in Biological Samples

PHARMACOLOGY

- *E. coli*, Baculovirus, and Insect Proteins
- Method for Tranquilizing Heart Muscle
- M-Screen—An Integrated Web Enabled High Throughput Screening Chemoinformatics System
- Therapeutic Effects of an Anti-Oxidant Compound
- Small Molecule Inhibitors of RGS Proteins
- Targets for Antidepressant Medication

PHARMACY

- Cryptophycin Biosynthetic Cluster DNA and Cryptophycin Epoxidase
- Imaging Probes for Studying Nuclear Structure and Function
- Polymorphism and Metabolic Syndrome Risk with Antipsychotics

PHYSICAL MEDICINE & REHABILITATION

- Language Independent Functional Evaluation Software (LIFE)

PHYSICS

- High-Efficiency Solar Cells
- Introductory Physics Instructional and Demonstration Equipment
- Plates for Sub-Wavelength Near-Field Focusing of Electromagnetic Waves
- Ultrafast Optical Magnetometer

PSYCHIATRY

- Methods of Treating Bipolar Affective Disorder
- Computational MicroRNA Filtering for Microarray Data Analysis

PSYCHIATRY—MOLECULAR AND BEHAVIORAL NEUROSCIENCE INSTITUTE

- FGF System Splice Variants and Behavioral Effects of Injection of FGF Related Drugs
- Genes, SNPs, Splice Variants, and Pathways Associated with Bipolar Disorder, Major Depressive Disorder, Schizophrenia, or Anxiety
- Methods and Compositions for Diagnosing Suicidal Tendencies
- Stimulator of Synaptic Vesicular Uptake of Serotonin
- Transgenic Mouse Model for Stress and Anxiety Disorders

PUBLIC HEALTH

- Microscale Integrated Sampler-Injector
- Center for Health Communications Research Tailoring System

RADIATION ONCOLOGY

- Application Specific Integrated Circuit
- Injection Device for Prostate Seed Implants
- Multi-Biopsy Needle for Prostate Cancer
- RNA Microarray Technique
- Ultra-Fast Algorithms for Liver Perfusion Quantification from Dynamic Contrast Enhanced Imaging

RADIOLOGY

- An Imaging Biomarker for Treatment Assessment in Focal and Multi-Focal Metastatic Bone Cancer and Multi-Focal Tumors of the Soft Tissues
- Bioactive Agent for Photoacoustic Technology
- Method and Apparatus for Measuring Volumetric Flow
- Photoacoustic Guided Diffuse Optical Imaging
- Technique for Guidance and Monitoring of Photodynamic Therapy with Photoacoustic Technology

STATISTICS

- Method and Apparatus for Estimating Dominance Norms of a Plurality of Signals

SCHOOL OF INFORMATION

- Shape Factory Collaboration Experiment
- Space Physics Research Lab: 1
- High-Resolution Time Measurement in a FPGA

SURGERY

- A Novel Tissue Engineering Scaffold and Surgical Sealant
- Aptamers to Target Cancer Metastasis
- Biomedical Research and Surgical Navigation Utilizing Internal Global Positioning System
- Bladder Cancer Cell Lines
- Identification of Human Pancreatic Cancer Stem Cells
- Methods and Compositions for Fabrication of Heart Muscle
- Methods for Preventing Induced Cardiac Dysfunction
- Percutaneous Wireless Batteryless Intracranial Pressure Monitoring System
- Prostate Cancer Target
- Resorbable Wound Closure Fasteners and Device for Wound Approximation and Fastener Application



- Therapy and Diagnosis of Cancer and Autoimmune Diseases
- Using Small Molecules to Retard/Regenerate Degenerating Intervertebral Discs

UMH MED EQUIPMENT

- Pediatric Ventilator Mobility System

UMH ORTHOTICS AND PROSTHETICS CENTER

- Flexion/Extension Assist Joint

UMH SURGERY

- Breast Biopsy Device
- Remote Controlled Cordless LED Headlamp with Cordless Charger

U-M TRANSPORTATION RESEARCH INSTITUTE

- Six Sigma Black Belt Lecture Notes



Division of research
Development and
Administration executive
team; Marvin G. Parnes
and Elaine L. Brock

industry research engagement

OUR YEAR | At the heart of research is the quest for understanding — whether of the basic facts of nature or of how to make something more effective, energy efficient, or environmentally sustainable. In FY '07, the University of Michigan spent more than \$2 million a day, every day, on research. Industry supplied more than \$38 million of those funds.

Industry–university collaborations leverage and enhance the respective strengths of both partners. Faculty contribute their knowledge and skill, supported by specialized research facilities and equipment. Industry partners contribute business expertise and successful experience in bringing products to market. This two-way exchange is mutually beneficial. Researchers receive grants to explore challenging questions, assured that their efforts will one day be applied. Industry collaborators gain the knowledge they need to develop and improve products and manufacturing processes, as well as access to state-of-the-art facilities and highly trained students.

Industry partners have a variety of options for working with the University. In addition to contracts for individual projects, there are multi-year alliances, with projects determined jointly by faculty and industry sponsors on a yearly basis. Industrial affiliate programs offer a competitive edge by providing immediate access to technology, students, and faculty consultants. In addition, U-M researchers are available to conduct clinical trials for the testing of new drugs and medical devices. Industry partners may also pay to use specialized U-M facilities, or hire faculty as consultants.

U-M has consistently ranked in the top tier of American universities in total amount of research funding from industry. However, given the University's stellar performance in obtaining federal funds, there is an opportunity to do even more. As we continue to reduce barriers and increase institutional supports for working with industry, we anticipate that our faculty will achieve the same national preeminence in industry engagement that they have attained in overall research activity.

MARVIN G. PARNES

ASSOCIATE VICE PRESIDENT FOR RESEARCH AND
EXECUTIVE DIRECTOR OF RESEARCH ADMINISTRATION

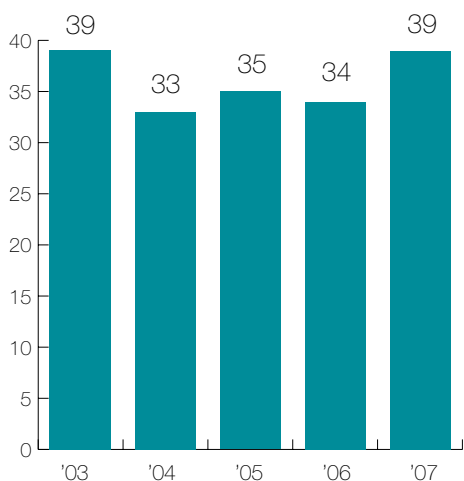
ELAINE L. BROCK

SENIOR ASSOCIATE DIRECTOR

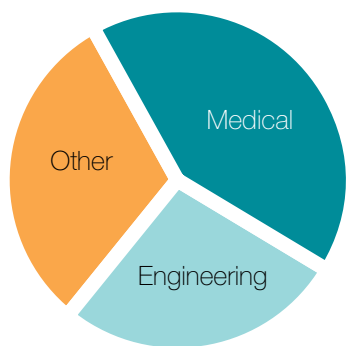
sponsored research | year in review

ABOUT | Industrial sponsors of University research include domestic and foreign auto manufacturers, major pharmaceutical companies, and a host of smaller organizations. Some are located in Ann Arbor, while others are headquartered across the globe. As the administrative liaison for U-M industry sponsors, the Division of Research Development and Administration (DRDA) provides proposal development and contract negotiation services for faculty members who wish to work with business and industry.

INDUSTRY RESEARCH
(expenditures in millions of dollars)



INDUSTRY FUNDING
(research expenditures, '07)



2007 TOP INDUSTRY FUNDERS
(measured by research expenditures)

- General Motors Corporation
- Pfizer, Inc.
- Dow Chemical Company
- Ford Motor Company
- Ascenta Therapeutics
- ARM Ltd.
- General Electric Company
- Novartis
- Genentech, Inc.
- Novartis Institutes for BioMedical Research, Inc.
- Amgen, Inc.
- Wyeth Pharmaceuticals, Inc.

80 different companies funded at least \$100,000 in expenditures.

Division of Research Development and Administration Staff: (first row) Kathryn DeWitt, Dennis Cebulski, Jeffrey Longe, Dave Plawchan, Marifelice Roulo, Marvin Parnes, Elaine Brock, Laura Cifor, Tom Zdeba, Julie Feldkamp; (middle row) Krista Campeau, Terri Maxwell, Susan Falcone, Amanda Coulter, Susan Silence, Denise Williams, Sharyn Siwyer, Jo Anne Painter, Sue Murphy, Bob Beattie, Suzanne Tainter, Anthony Nielsen, Jolette Munoz, Jocelyn Jacobs, Maryellen Kouba; (back row) Kate Strzempke, Karen Sampson, Gayle Jackson, Dan Stanish, Julie Liberty, Jim Randolph, Pat Roe, Marie Turner, Patricia Quigley, Anna Myerscough. Not pictured: Genna Espinosa, Kate Koorhan, Cheyne Kornacki, Mike Randolph, Jill Reed, Dawn Selvius.





The University of Michigan's Transportation Research Institute conducts interdisciplinary research aimed at increasing driving safety and advancing knowledge of transportation systems. With funds from federal and state agencies, motor vehicle manufacturers and suppliers, and other industries and organizations, the Institute has conducted nearly 1,000 studies relating to accident data collection and traffic safety analysis, bioengineering, human factors, mechanical engineering, psychology, economics, and public policy.

ENGAGED IN BETTER DRIVING EXPERIENCES

Parking—the bane of many a driver—could become a snap for owners of the 2008 Infiniti EX35, who will have the Around View Monitor to aid them. The system was developed by

Nissan Motor Company, Ltd., with help from researchers at the University of Michigan's Transportation Research Institute (UMTRI). Wide-angle cameras mounted on all four sides of the vehicle display video on the navigation system screen. This synthesized “bird’s-eye view” shows the car in relation to curbs, other cars, and other objects.

“Nissan came to us with a product idea that they had developed in Japan,” says Paul Green, an UMTRI research professor. “We helped them shape that idea into a form for drivers in the U.S. market.”

Green leads a research team that focuses on understanding driver capabilities and limitations in order to design appropriate controls, displays, and information systems for vehicles. Driver distraction is a major focus of his current research, which makes extensive use of instrumented cars and UMTRI's driving simulator.

For the Around View Monitor research (pictured above), the UMTRI team assembled data on parking crashes and went out on the streets to see how well drivers parked normally. They conducted experiments in which U.S. drivers parked using Nissan prototypes to determine how comfortable drivers were when using the system, how well they avoided bumping into other vehicles, and how long it took them to park. Nissan then did further development to create the system now used in its cars.

“This project exemplifies the sort of industry working relationship that is a benefit to everybody.”

“This project exemplifies the sort of industry working relationship that is a benefit to everybody,” says Green. “It’s a relationship built on good faith and has continued over more than a decade.”

One reason it works so well is because Nissan has a “window person,” the Japanese term for a corporate liaison. Importantly, says Green, “that person is aware of Michigan’s strengths and capabilities. The company’s goal is to make the relationship a strategic partnership with ongoing interaction, not a single project that begins and ends the relationship.”

ENGAGED IN SUSTAINABLE DESIGN

Considering the total environmental impact of a product throughout its life span—from the initial choice of materials to design, production, transport, and final disposal or re-use—is the goal of life cycle assessment (LCA). Steelcase, the Michigan-based manufacturer of office equipment, is recognized as an industry leader in applying life cycle assessment in the development, manufacturing, and marketing of its products. Now the company is looking to integrate LCA elements into the earliest stages of product development.

“An interactive computer program—known as a ‘wizard’—will help estimate impacts, make tradeoffs, and provide reports on environmental performance.”

Since 2003, Steelcase has partnered with the University of Michigan’s Center for Sustainable Systems (CSS) to develop life cycle analyses of products and incorporate them into the furniture development process. Located at the School of Natural Resources and Environment, CSS is an interdisciplinary research and education center that develops life cycle-based models for improving systems to meet societal needs in a more sustainable manner.

According to U-M’s Greg Keoleian, CSS has conducted life cycle assessments of six Steelcase products and is now developing a life cycle-based software tool to support their sustainable product development process. Keoleian is associate professor of sustainable systems at the School of Natural Resources and Environment, CSS co-director, and principal investigator on this project.

The ultimate research goal is an interactive tool to help designers and engineers address environmental impacts from the very beginning of a product’s life. The tool needs to be flexible enough for use with a wide range of Steelcase office furniture product lines and compatible with domestic and international divisions. An interactive computer program—known as a “wizard”—will help estimate impacts, make tradeoffs, and generate reports on environmental performance.

Renewable energy, hydrogen infrastructure, transportation, green buildings, consumer products, and packaging are among the topics of more than 50 research projects completed by the Center for Sustainable Systems over the last decade. Greg Keoleian standing with students Blake Marshall, Mike Lepech, and Caroline Conway.





Energy efficiency is driving the need to create advanced superalloys for jet engines and power generation.

ENGAGED IN PRODUCING SUPERIOR SUPERALLOYS

Inside a jet engine, the turbine blades must retain strength at temperatures of 2000° F or more for hours at a time. Given those rigorous performance parameters, nickel-based superalloys are the materials of choice for these blades.

As Tresa M. Pollock, the L.H. and F.E. Van Vlack Professor of Materials Science and Engineering at the University of Michigan explains, “Some of the most interesting challenges in the area of structural materials lie in the development of materials capable of operating at high fractions of their melting point. Energy efficiency mandates increasingly higher temperatures for these materials in both jet engines and in power plants for electricity generation.”

“The turbine blades inside a jet engine must retain their strength at temperatures of 2000° F.”

With funding from General Electric, Pollock is working to identify new directions for alloy design in aircraft engines. Pollock’s research focuses on the chemical “recipes” for alloys, methods for creating the alloys such as casting and solidification processing, and on understanding the microstructure and the mechanical properties of the materials. The facilities used by her research team for making single crystals of these materials are unique to U-M.

With GE funding, Pollock and her students have demonstrated a new single-crystal growth technique for these advanced superalloys. The technique involves withdrawal of an investment mold from a 2800 °F furnace into a 500 °F bath of liquid tin. This technique improves the properties of the materials while permitting the design and use of new alloys.

Pollock and her team are also studying the mechanical properties and failure modes of new alloys in order to build better physics-based property models. These models could be used to predict the final properties or the lifetime of engine parts. In 2005, the College of Engineering joined General Electric Aviation’s University Strategic Alliance (USA) Program.

This five-year agreement provides nearly \$5 million in research support to engineering faculty to address topics of mutual interest.

ENGAGED IN

BUILDING NEW MODELS FOR INDUSTRY-UNIVERSITY RESEARCH

More powerful, durable batteries for hybrid and plug-in vehicles, and new collision-avoidance technologies, are among the innovative automotive technologies being developed by U-M scientists as part of the year-old Ford-University Innovation Alliance. The Alliance teams faculty members with more than 30 Ford Motor Company scientists and engineers to work on some 20 projects.

“...the Dearborn-based automaker already has delivered more than \$4 million to the fledgling Ford-University Alliance...”

Traditionally, most relationships between industry and the University have involved a single U-M researcher working to solve a narrowly focused problem. The Ford Alliance exemplifies a more broad-based approach, bringing together groups of scientists and engineers from industry and the University.

When Ford formed the partnership with U-M last year, the company agreed to provide \$2 million by February of 2008. But the Dearborn-based automaker already has allocated more than \$4 million to the fledgling Ford-U-M Innovation Alliance. According to Edward Krause, external alliances manager at Ford, that’s largely because the arrangement is working even better than expected. “Things are going so well at Michigan that we’re actually getting extra money beyond what the company originally committed to,” Krause says, “and we are going to be pushing for an expanded presence at U-M.”

Krause attributes part of the partnership’s success to a “very noticeable change in attitude” at the University in recent years. “Seven years ago, Michigan was one of the more difficult schools to deal with, even for a company as close as Ford,” he notes. “Now I would say that Michigan is actually very much among the leaders in terms of innovative ways of working with industry.”

The University has formed similar partnerships with General Electric, General Motors, and ARM Limited.



Computer science and engineering professors Brian Noble (left) and Jason Flinn (center) spend one day a week working with Ford researchers T. J. Giuli and David Watson (right) on ways to bring more electronic media into cars. Building on Ford’s popular Sync voice-controlled phone and music system, the research taps Flinn’s expertise in distributed storage and Noble’s in wireless networks. The project is part of the Ford-U-M Innovation Alliance.

BRIDGING THE ELECTRONIC AND MOLECULAR WORLDS

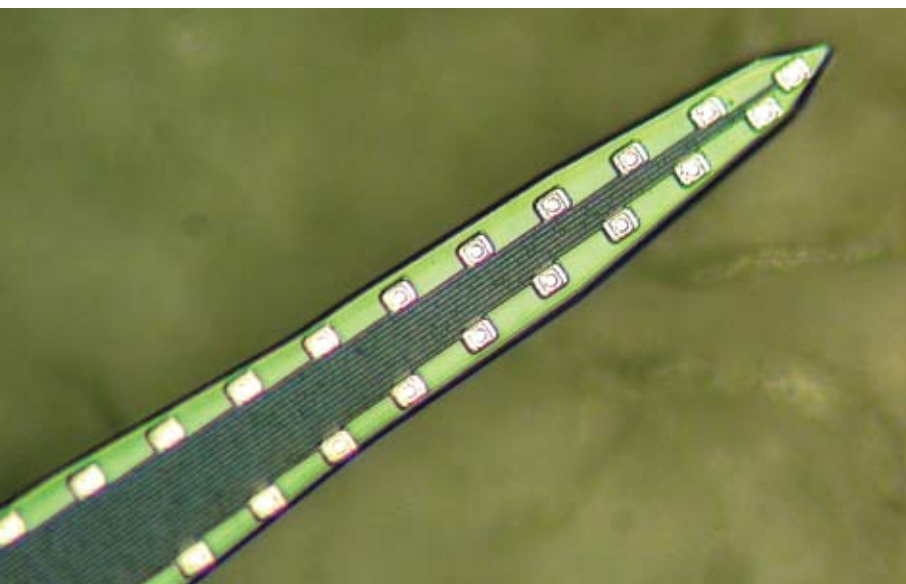
A single probe that can monitor chatter among many brain cells simultaneously could help scientists understand Alzheimer's disease. An environmental gas analyzer small enough to fit in a shirt pocket could be a boon to America's homeland security and public health efforts. These are just two examples of tiny devices under development at the Wireless Integrated MicroSystems Engineering Research Center (WIMS ERC), located at the University of Michigan.

The WIMS ERC combines U-M's programs in sensors and microsystems with Michigan State University's leadership in materials and Michigan Technological University's world-class expertise in packaging, micromilling, and hot embossing to create tiny information gathering devices that will have applications in many areas of life. The microsystems can be as large as a hand-held calculator or considerably smaller than a single grain of rice, with features smaller than a micron. By comparison, a sheet of paper is 100 microns thick.

The Center is funded by the National Science Foundation, with additional support from the State of Michigan, the three partnering core universities, other federal agencies, and a consortium of some 20 companies. These industrial partners from the automotive, chemical, medical technology, and microelectronics industries get a first look at new technology and an opportunity to connect with students trained in WIMS research.

According to John Janik, staff engineer in the Advanced Technology Department at Stryker Instruments, headquartered in Kalamazoo, "WIMS researchers provide invaluable resources and guidance. They are helping us move forward in areas we couldn't have dreamed of five years ago."

"The microsystems can be as large as a hand-held calculator or considerably smaller than a single grain of rice, with features smaller than a micron."



This neural probe has 32 recording sites along the tip, allowing the simultaneous monitoring of neural activity in small regions of brain tissue. The technology has been licensed to U-M start-up NeuroNexus. Because neural signals in diseases such as Alzheimer's are meaningful only when considered in the context of a whole population of cells, this probe will be a valuable tool in brain research.

Reducing blood pressure can lower the risk of stroke, heart failure, and other serious medical conditions, explains Ken Jamerson, M.D.



ENGAGED IN IMPROVING BLOOD PRESSURE CONTROL

Combinations of drugs in a single tablet may be what it takes to get blood pressure under control for millions of Americans, according to results from a large international study led by Ken Jamerson, M.D., a professor of cardiovascular medicine at the University of Michigan Medical School. After 18 months of treatment, more than 80 percent of U.S. participants were able to control their blood pressure, an exceptional outcome.

“These data strongly suggest that single tablets containing two drugs will control the blood pressure of the vast majority of patients who are taking medication but have not achieved ideal blood pressure.”

“These data strongly suggest that single tablets containing two drugs will control the blood pressure of the vast majority of patients who are taking medication but have not achieved ideal blood pressure,” Jamerson observes. “This may affect the blood pressure control of more than 38 million Americans.”

In May, Jamerson presented the 18-month results at the American Society of Hypertension meeting on behalf of his colleagues from Norway, Sweden, and five other American medical centers involved in the ACCOMPLISH (Avoiding Cardiovascular

Events through Combination Therapy in Patients Living with Systolic Hypertension) clinical trial. The study was begun in 2003 and is funded by Novartis.

Other studies have found that patients often have trouble taking the multiple medications they need to control blood pressure, thus leading to the development of combination pills. This study compares the impact of two different two-drug combinations. Because many studies have already shown that reducing blood pressure can lower the risk of stroke, heart failure, and other serious conditions, achieving blood pressure control in large percentages of high-risk people is an accomplishment in itself, says Jamerson.

ENGAGED IN ECONOMIC DEVELOPMENT

Mindful of our role as a public institution, the University of Michigan has renewed its commitment to economic development and the use of its knowledge, people, and resources to spur opportunity in the region and the state. Some examples of this commitment include:

New Business Start-ups | The University has invested in a dedicated team of “business formation specialists” within U-M Tech Transfer to actively assist in the development of new business start-ups formed around U-M technology. These specialists work with inventors and other Tech Transfer team members to produce high-quality business opportunities capable of attracting experienced management, venture funding, and outside commercialization partners. Our track record (45 start-ups over the last 5 years) is a testament to the value of this approach as a catalyst for innovation and economic growth within our communities.

Ann Arbor SPARK | Beyond our role in the creation of Ann Arbor SPARK—a regional economic development agency—the University has played an active and ongoing part in helping the organization to fulfill its mission. Members of the University community serve on the SPARK board and on community task forces; assist in the agency’s business accelerator process and business attraction opportunities; and contribute to events, public policy discussions, and quality-of-life initiatives.

Chamber of Commerce | The University is also actively engaged with chambers of commerce throughout the area. Representatives of the University occupy leadership roles on directors’ boards, serve on advisory and steering committees, and actively assist in key programs and initiatives that serve regional business communities.

MUCI | MUCI (Michigan Universities Commercialization Initiative) is a collaboration among Michigan research universities, led by the University of Michigan, to encourage technology commercialization. The result of a successful grant award from the state’s 21st Century Jobs Fund, MUCI provides matching funds to stretch the investments from each university in early-stage “gap funding” opportunities. These enhanced gap investments have resulted in the acceleration and quality enhancement of several dozen tech transfer projects over the last several years.

MRUN | The University was a founding member and continues to be an active supporter of MRUN (Midwest Research University Network), an alliance of business development professionals from 28 major Midwest research universities. This organization functions as a forum for the exchange of best practices, resource networking, business collaborations, and shared event and marketing initiatives.

MVCA | MVCA (Michigan Venture Capital Association), with the assistance of the University community, maintains an active program to support and foster the growth of Michigan’s venture capital community. This engagement enhances the funding resources for U-M Tech Transfer start-up opportunities. It also enlarges the talent pool and expands both funding capacity and business resources.

IRLEE | IRLEE (Institute for Research on Labor, Employment, and the Economy) provides local, state, and regional economic forecasting to business, policymaking, and academic constituencies; assesses the impacts of economic restructuring on people and communities; and provides applied management and technical assistance to companies and distressed communities undergoing economic transition in Michigan. IRLEE will also evaluate the efficacy of interventions designed to advance innovation and improve the economy.

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