

2012

Office of Technology Transfer |
I M P A C T R E P O R T



Tech Transfer Impact

2012 was another rewarding year, with a record number of new inventions, more agreements with industry than ever before, and eleven exciting start-ups. We're proud of our inventors and our Tech Transfer team, and appreciative of our many partners and supporters. The full magnitude of these contributions is best measured by looking back at where we started. In 2002, we had 237 new inventions, 61 agreements and 5 start-ups. Today, ten years later, we recorded 368 new inventions, completed 121 agreements and spun out 11 start-ups, placing us again among the top ten of all universities. Even more important, a culture of tech transfer engagement is integrated into every aspect of our university.

Part of our progress can be attributed to a special set of advisors, our U-M Tech Transfer National Advisory Board, which was created in 2002. This distinguished board consisting of leading business, venture, entrepreneurial and government leaders has generously contributed time, ideas and connections to enhance our tech transfer capabilities and our ability to contribute to our Michigan and national economies. This report is dedicated to our National Advisory Board members whose contributions have helped shape a decade of progress.



Executive Director
U-M Tech Transfer

The executive team of U-M Tech Transfer (from left):
Rick Brandon, Doug Hockstad, Ken Nisbet, Robin Rasor,
Jim O'Connell



Where It All Began Ann Arbor 2002

Today, Ann Arbor is a national hub of technology transfer, home to dynamic business and venture communities and a powerhouse research university—all fully engaged and dedicated to transforming the regional economy. Within this growing entrepreneurial ecosystem, new ideas thrive, new partnerships abound and new ventures flourish.

But it wasn't always so.

UNREALIZED POTENTIAL From the very start, Ann Arbor's business community and the university worked closely together on economic issues. As U-M President Mary Sue Coleman noted in a 2003 address: Even in the nineteenth century “the university and town had greater ambitions than just to be another public university and another college town.”

“Even so, when we benchmarked in 2002 against other universities, it was clear we needed to do more,” says Tech Transfer Executive Director Ken Nisbet. “We needed to create an entrepreneurial culture through a series of strategic investments.”

TAKING IT TO THE NEXT LEVEL The university began those investments in talent and resources, first by recruiting Robin Rasor as director of licensing to begin building a world-class licensing team in 2002. Follow-on investments in other key staff, start-up creation capabilities, project development funds and talent resources continued to strengthen our tech transfer potential.

But it was the creation of the NAB in 2002 that helped provide a strategic focus and direction for our tech transfer activities.



“Our \$1.27 billion research enterprise holds great promise for the future. But it takes technology transfer, partnerships with the private sector and a solid commitment from the university for our society to realize that promise.” **STEPHEN R. FORREST**
U-M Vice President for Research



“Innovation and entrepreneurship are vital to our impact as a great university. Providing the best academic and research opportunities, and contributing to our economy, are central to our mission as a public institution.”

MARY SUE COLEMAN
President, University of Michigan



"From the very start, those of us serving on the U-M Tech Transfer National Advisory Board decided that this was the time to be bold in our thinking, to aim high and to achieve great things. Our goal was to make Michigan a national center for innovation, business growth and opportunity."

RICK SNYDER | Chair, National Advisory Board 2002–06
Governor, State of Michigan



Accelerating Progress The National Advisory Board

In the past 10 years the University of Michigan has become a driving force in statewide economic development and a national model for university-based technology transfer programs. This remarkable growth cycle coincided with the creation of the U-M Tech Transfer National Advisory Board (NAB) in 2002.

The original members of the board were drawn from across the

United States, with backgrounds in entrepreneurship, venture capital, industry and government.

The National Advisory Board has provided the foundation for numerous initiatives that have transformed the University of Michigan and Ann Arbor since 2002, including the creation of:

- + Ann Arbor SPARK
- + The Catalyst Talent Network
- + The U-M Venture Accelerator

PAST AND CURRENT NAB MEMBERS

Thomas Bumol*
Eli Lilly
San Diego, CA

David Canter
NCRC
University of Michigan
formerly Pfizer Global R&D
Ann Arbor, MI

Jeff Carbeck*
mc10
Cambridge, MA

Marshall Cohen*
Princeton Power Systems
Princeton, NJ

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

Richard Douglas*
Entrepreneur
formerly Genzyme
Boston, MA

Michael Finney*
Michigan Economic
Development Corp.
Lansing, MI

Larry Freed*
ForeSee Results
Ann Arbor, MI

Jan Garfinkle
Arboretum Ventures
Ann Arbor, MI

Kenneth Graham*
Inverness Graham
Investments
Newton Square, PA

Farnam Jahanian*
NSF CISE Director
CSE, University of
Michigan (on leave)
Washington, DC

Sabrina Keeley
Business Leaders
of Michigan
formerly Ann Arbor
Chamber of Commerce
Ann Arbor, MI

Tom Kinnear
Zell-Lurie Institute
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Trillium Ventures
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Business Leaders
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Renaissance
Detroit, MI

Chuck Salley
NextCAT
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Rick Snyder
Governor, State of Michigan
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Licensing Office
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Mount Sinai
Tech & Bus Dev
formerly ARCH
Development Corp
Chicago, IL

Jeff Williams*
Tangent Medical
Ann Arbor, MI

*Current member

A Decade of Success

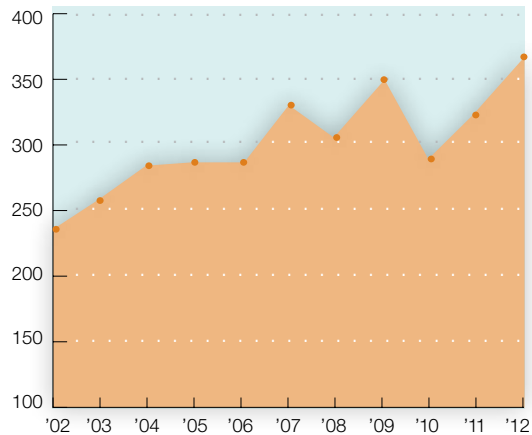
Success in tech transfer is generally measured by the number of inventions, agreements, start-ups and revenues. Other measures are equally important, such as the quantity and quality of our engagements with faculty, students, businesses and venture partners. Also important is the impact on the public of our technologies, start-ups and people. The following pages of metrics and stories illustrate our success.



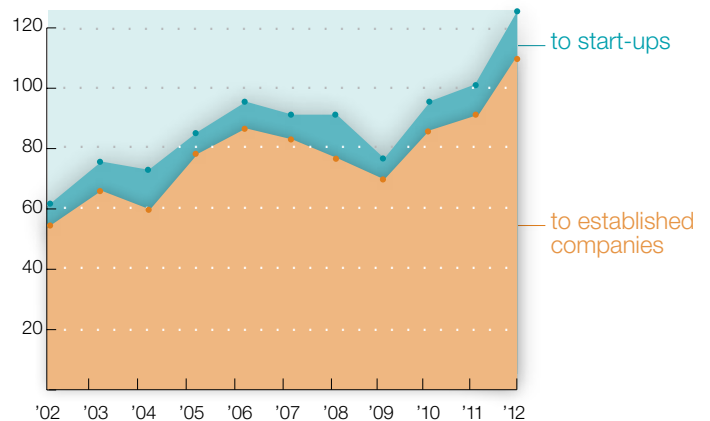
The Past 10 Years

- + more than 3,000 inventions reported
- + 98 start-ups launched
- + more than \$1 billion in private venture funding
- + more than 1,000 start-up jobs created
- + hundreds of new products and services

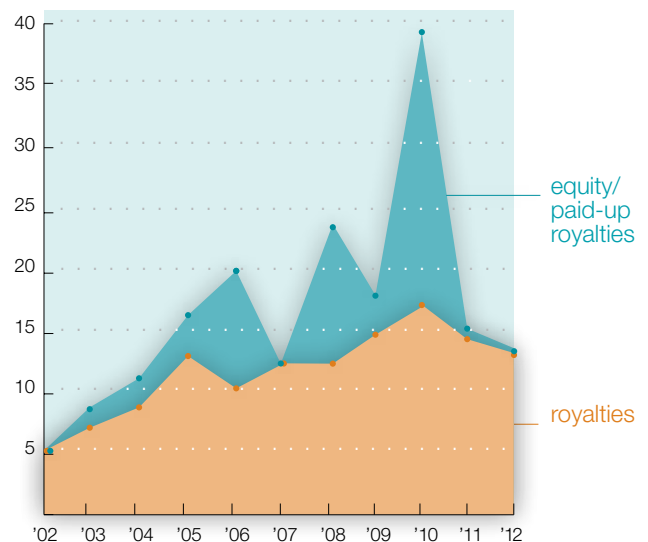
INVENTION REPORTS FY12=368



LICENSE AGREEMENTS FY12=123



LICENSE REVENUE (in millions) FY12=\$13.8M



AlertWatch

HEADS UP DISPLAY FOR ANESTHESIOLOGISTS

Professor and Chair of Anesthesiology Kevin Tremper has been creating innovative medical monitoring technologies for more than three decades. Like all of his inventions, Tremper's latest technology was developed in response to a specific set of needs. As he explains, "In operating rooms and ICUs across the country, patient monitoring systems are doing a poor job of presenting data. False positives are common, leading to alarm fatigue. Our goal was to devise an intuitive, organ-system-based monitoring display that incorporates data from multiple sources of the electronic medical record."

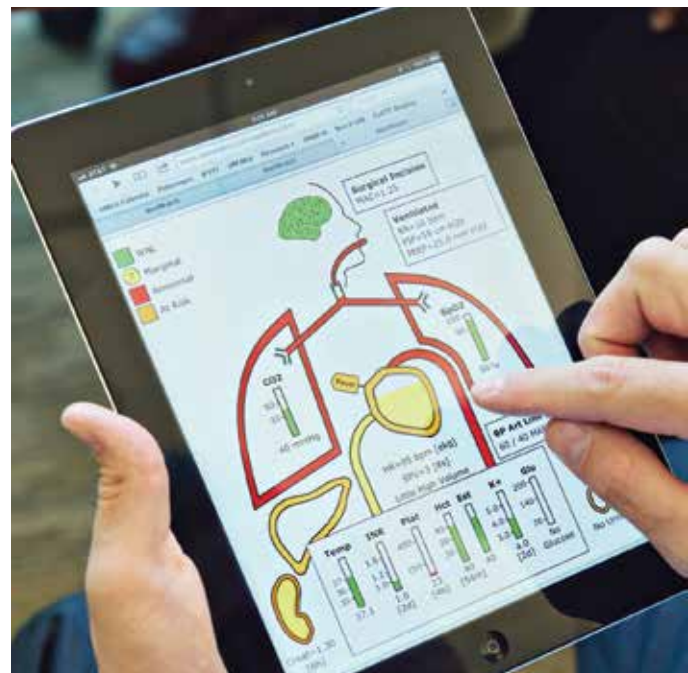
The result was AlertWatch, a single-display monitoring device that aggregates four data sets—physiological monitors, anesthesia records, lab results, and medical history—to produce a dynamic, easy-to-interpret graphic display of a patient's condition. The system simultaneously provides useful calculations describing whether each system is normal, slightly abnormal, or definitely abnormal (green, yellow, red colored icons), on a real-time basis. While the system is designed to run on standard PCs, patient data is also accessible via iPads and iPhones.

This project was initially developed in conjunction with graduate students in the Engineering School as a research project with the help of Tremper's assistant of 28 years, Jenny Mace. In 2008, a department programmer, Jan Gombert, took over the software development to the point of having a well-functioning prototype. In the spring of 2012, Tremper joined forces with Justin Adams, a CEO with a focus and passion for start-ups, to launch AlertWatch LLC. The team also includes James Bagian, MD, veteran astronaut and a faculty member in both biomedical

engineering and anesthesiology; Tyler Tremper, recent graduate of U-M computer engineering; and Mark Rathwell, recently recruited computer program developer. This year the enterprise relocated to the Tech Transfer Venture Accelerator.

The AlertWatch system is currently being piloted in 75 operating rooms throughout the U-M Health System. Early feedback is positive, and the technology is attracting a steady flow of seed funding from angel investors. CEO Justin Adams expects to be marketing the technology within a year, following FDA approval. "In the meantime, while we work on that," he said, "we've also begun adapting the OR version of AlertWatch to the ICU and Emergency Room settings."

AlertWatch is designed to provide critical care staff with a simple but powerful display for real-time patient monitoring and decision support. The system uses multiple data sets and information streams to generate audible, color-coded alerts for major organs.



Spider9

DYNAMIC ENERGY SYSTEMS

In 1936, Henry Ford built a factory on the site of a former gristmill in Northville, Michigan. During its 42 years of operation, the Ford Valve Plant manufactured millions of engine valves using the mill's original waterwheel to generate electricity. Today, this factory-turned-office building is once again pioneering the application of innovative renewable energy, only this time with technology developed at the University of Michigan and commercialized by Spider9.

Spider9 is integrating an energy storage system and rooftop solar arrays within this historic facility. These renewable technologies are linked together with a control system that is based on advanced battery research from U-M College of Engineering professor Kang G. Shin and research assistant Hahnsang Kim. With the help of U-M Tech Transfer, Spider9 co-founders Dave Park, Glynne Townsend, David Smith and Bill Beckman created Spider9's Energy Operating System (EOS). After further development, the team extended the technology's application and market focus.

Today the Spider9 OSE is capable of optimizing the performance of wind farms, solar fields, grid-scale batteries and inverters. Applications include solar arrays, wind farms, commercial buildings, power plants, utilities and military installations.

“Our technology monitors the individual component elements within a renewable energy system and then interacts directly and dynamically with the device's electrical architecture, reconfiguring it to optimize performance of the system at any given time and circumstance,” says Townsend. “The benefits of the integration include increased energy harvests, improved reliability, longer equipment life and reduced maintenance costs, lowering both the

initial investment and annual maintenance costs of integrating renewables into any energy system.”

This unique value proposition has led to customer engagements throughout the United States and the Caribbean, as well as in Greece, Dubai, India and China, with first commercial units expected later this year.



Spider9's multi-kW energy storage system demonstrates increased overall system performance including a 20 percent increase in energy output. Pictured here are Spider9 team members (left to right): Emily Potter, Glynne Townsend, David Reuter.

Support for Spider9 has come from a variety of Michigan-based sources. U-M Tech Transfer facilitated the formation of Spider9's executive team, the Michigan Economic Development Corporation supplied crucial loans and capital assistance, and Michigan and Illinois venture capital firms have provided seed and development funding.

Venture Center

CONNECTING ENTREPRENEURS AND VENTURE PARTNERS

2012 START-UP CLASS

AlertWatch

Heads-up display for anesthesiologists

Baker-Calling

MEMS microphones

EA Associates

Healthcare cost and productivity assessment services

e-Sens

Microfabricated electrochemical sensors for water quality

Diapin Therapeutics

Peptide-based therapies for diabetes

Emergent Micro Systems

Communication, education and entertainment device for underserved countries

Lecture Tools

Student engagement and assessment tools

Possibilities for Change

Teen risk behavior web-based screening tools

Pryor Medical

Lower aortic tourniquet

Reveal Design Automation

IC design verification products

Spider9

Dynamic energy systems

U-M Tech Transfer Mentors-in-Residence: (back) Norman Rapino, David Hartmann, William Brinkerhoff; (front) Brad Martin, Ken Spenser, Jack Ball

THE VENTURE CENTER, the venture creation unit within U-M Tech Transfer, acts as a one-stop “hub” for entrepreneurs and venture funding partners interested in U-M start-up opportunities. The Venture Center has a core staff of experience a venture creation specialists, a team of Mentors-in-Residence, “gap” funds to advance our projects and a host of other resources and connections.

- + **The Mentors-in-Residence (MiR)** program employs seasoned entrepreneurs “embedded” within our tech transfer team to provide opportunity assessment and venture development services. Our team of MiR specialists provides assistance with business modeling, customer needs assessment and connections to key customer prospects and venture partners.
- + **The U-M Venture Accelerator**, launched in January 2011, is presently home to 18 companies. It has filled up rapidly, providing late-stage U-M start-up companies with world-class laboratory and office space adjacent to the talent and business services of the Venture Center in our North Campus Research Complex.

The Venture Center has produced a steady-stream of high potential U-M start-up opportunities for entrepreneurs and our venture capital partners. Over the last 10 years, we have launched 98 new start-ups, one every five weeks, providing job opportunities and economic advantages for our region.

Our track record of launching successful start-ups, with a history of follow-on funding and acquisitions, led to a new U-M initiative to invest in our U-M start-ups.

In October 2011, the University announced MINTS (Michigan Invests in New Technology Start-ups) whereby the university is co-investing with qualified venture firms in promising U-M start-ups. An analysis by the U-M Investment Office of the investment returns of the start-ups launched by U-M Tech Transfer led to this initiative. The MINTS program can invest up to \$1 million alongside a lead venture capital firm in our early-stage ventures. This demonstrates the university’s support for U-M start-ups and our commitment to economic development in our region.



ONL Therapeutics

ADDRESSING RETINAL EYE DISEASE

As a clinician and an associate professor of ophthalmology in the Kellogg Eye Center, Dr. David Zacks specializes in disorders of the retina. The problem that fascinates and perplexes him most is this: Even after receiving treatment for retinal disease, patients continue to lose vision. So what are the molecular mechanisms that cause the ongoing death of photoreceptors, those cells that capture light and convert it into brain signals?

Zacks and his research team found a possible answer. “When cell death occurs, a protein known as the Fas-receptor becomes activated,” he says. “By blocking activation of Fas-receptors with a 12-amino acid peptide, we discovered that we could preserve 80 percent of the photoreceptor cells that would normally die. And while the compound doesn’t restore vision, it does stop further damage.”



To date, ONL Therapeutics has received nearly \$1 million in seed funding from private investors, Small Business Innovation Research (SBIR) grants and Ann Arbor SPARK. The ONL team is actively developing its 12-amino acid peptide for intraocular delivery with the hope of initiating clinical trials in the near future.

The idea of launching ONL Therapeutics began during early-stage conversations with Tech Transfer specialists and Mentor-in-Residence Thomas Collet. “They warned us that it would be a long, arduous road,” Zacks says. “But we view this compound as a potential platform for stopping cell death in many diseases. And we were driven forward by the prospect of helping patients.” Working closely with Collet, Zacks put together a leadership team consisting of Raili Kerppola, former vice president of drug development at Bausch and Lomb, and Dr. Jeff Jamison, an expert in drug development from Kalamazoo. “I know the odds of success are relatively low for any start-up,” Zacks readily admits. “But I believe we’ll all come out winners, regardless—as human beings and as scientists who are pursuing translational research.”

Arbor Ultrasound Technologies LLC

ULTRASOUND IMAGING SYSTEMS

During fellowship training at the University of Michigan, nephrologist and now professor of internal medicine William “Rick” Weitzel developed an abiding fascination with ultrasound, especially the emerging measurement techniques that were enabled by new signal processing methods. Soon after being recruited by U-M, he teamed up with a group of Michigan researchers focused on exploring new medical applications for ultrasound technology. Weitzel’s first independent project was the invention and design of a device capable of monitoring vascular access health in dialysis patients—a crucial procedure, since successful dialysis requires reliable access to the blood supply.

Now, in partnership with U-M electrical engineering research scientist Grant Kruger, Weitzel has taken ultrasound to the next level. “Basically, we found a way to marry low-cost, modular ultrasound data acquisition hardware with high-performance software and signal processing capabilities,” Weitzel says. “This will allow us to create a family of devices targeting a broad range of diseases and body systems that include monitoring and imaging for dialysis access and other blood vessels, as well as for heart, liver and kidney disease.”

In December 2010 the commercialization potential was great enough for Weitzel to launch a start-up, Arbor Ultrasound Technologies LLC. As the group concentrates on developing R&D devices that will allow rapid commercialization, the core technical team has grown to include electrical engineer Leo Koziol. Numerous collaborators in ultrasound and clinical medicine at U-M make the cooperative development effort possible. The R&D effort is now funded by NIH STTR (Small Business Technology Transfer Research) grants, which support the collaborative university and company research projects.



In determining which market segment to pursue in their initial product release, Rick Weitzel with U-M research scientists Grant Kruger and Leo Koziol worked with a team of TechStart consultants.

Early funding was provided by an NIH challenge grant and, later, Small Business Technology Transfer Research (STTR) grants.

“Start-ups are definitely not a Lone Ranger effort,” Weitzel notes. “At every touch point, we’ve had collaboration within the University and constructive input from Tech Transfer. They were instrumental in technical evaluation determining patent-ability phase, and identifying market needs. Tech Transfer’s Mentor-in-Residence Dave Hartmann provided very valuable perspectives. The TechStart team helped us evaluate potential markets. And Tech Transfer connected us with the U-M’s Coulter Translational Research Partnership, which resulted in translational research funding sufficient to finish a key mechanical feature of our current prototype system.”

TechStart

TECH TRANSFER STUDENT INTERNSHIPS

Every summer, U-M Tech Transfer's TechStart program employs approximately 12 graduate students from business, engineering, medicine, law and information technology. These students are then divided into small multidisciplinary teams and assigned to several different technology transfer projects.

Working closely with their faculty clients and Tech Transfer staff and mentors, the TechStart student consultants evaluate products for viability, analyze the competitive landscape, identify business models and develop market entry strategies.

Students are attracted to the program for a variety of reasons. For some, it's a firsthand introduction to the world of start-ups. For others, it's a chance to build skill sets. And for still others, it's a risk-free way of exploring a new career path.

"Through TechStart, we're able to make valuable and relevant expertise available to U-M faculty and those entrepreneurs working on U-M start-up projects free of charge," says Mark Maynard, who manages the TechStart program. "Our interns bring a remarkable array of highly focused knowledge, skills and experience to every consulting project. And they, in turn, benefit from the experience."

He adds that one of the secondary aims of the program is to keep young talent in Michigan. "Every year, several TechStart consultants choose to put down roots and launch their careers in the Ann Arbor area," he says.



Where Are They Now?

Many TechStart alumni have chosen to stay and become a part of Michigan's entrepreneurial ecosystem after graduation. They include: Vince Alessi, President of Kymeira Advanced Materials, Inc. (Ann Arbor) | Paul Keough, Senior Manager of Corporate Development, Neogen Corporation (Lansing) | Neelima Ramaraju, Director of Public Health Applications, LLamasoft (Ann Arbor) | Gus Simiao, CEO, Vortex Hydro Energy (Ann Arbor) | Praveen Suthrum, President and Co-founder, NextServices (Ann Arbor) | Bhramara Tirupati, VP of Marketing & Sales, Nutriinfo.com (Ann Arbor) | Yipei Wang, Business Development, OncoFusion (Ann Arbor)



Michigan Apps

LEADING THE WAY IN MOBILE APPLICATIONS

Want to learn about muscles, nerves, and sensory loss? Want to test your ability to determine what sounds a heart is making? Wondering how long before the next U-M bus arrives at your stop? There's an app for all those things. In fact, the iTunes Store now offers 19 University of Michigan apps, most of them free.

“When the iPhone first came out, we recognized the opportunities it offered for the entire U-M community, so we got out in front immediately,” recalls Doug Hockstad, Tech Transfer’s associate director of software and engineering licensing. “As a first step, we created the Mobile Apps Innovation Challenge—an annual competition for students and faculty.” Over the years, winning apps have included everything from gift card monitoring software to a multi-tasking music player management system.

Tech Transfer also promotes creative collaborations among faculty researchers, licensees, and computer engineering students. Those partnerships have resulted in apps such as *Sleep Champ*, a questionnaire based on the work of Professor Ronald Chervin that enables parents to do preliminary assessments of their child’s sleep behaviors. With *UMSkinCheck*, developed by

a team of physicians led by Dr. Michael Sabel, users can photograph and monitor potential problem areas on their skin. And *NerveWhiz*, an early medical education app developed by Dr. Zach London, has been downloaded more than 76,000 times by users eager to try its muscle localizer and sensory maps.

As Hockstad notes, “Faculty have been quick to see the potential of this emerging space. To date, downloads for U-M apps exceed 176,000. And the ideas keep coming. Right now, in addition to the Health System and Medical School, we have applications from LSA, the Ross School of Business, the School of Education and the U-M Library System.”

Another app, the *Michigan app*, is used by thousands in the University of Michigan community each day to collaborate on group projects, access campus news, check on bus arrival times and much more.



IMRA America, INC.

ULTRAFAST FIBER LASER TECHNOLOGY



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In 1990, AISIN SEIKI Co., Ltd. of Japan—one of the world’s largest manufacturers of automotive components—sent a team of executives to Ann Arbor. Their mission was to launch IMRA America, Inc., a research center charged with developing new technologies for the future needs of society.

As IMRA’s director of research at the time, Takashi Omitsu was particularly interested in laser technology. That interest soon led him to Gerard Mourou, head of U-M’s newly established Center of Excellence in Laser Technology—and from there to a long, productive and mutually beneficial partnership that continues to the present day.

In 1994, the U-M team patented a revolutionary laser process, which IMRA later licensed as its first technology patent from the university. Unlike conventional pulse lasers, which generate tremendous heat and literally melt any material they contact, ultrashort pulse lasers operate with minimal heat transfer, making them ideal for various medical and manufacturing applications.

By 2009, the company had obtained an exclusive license for the technology. Today, that U-M technology is an integral part of IMRA’s business, in combination with IMRA’s state-of-the-art femtosecond fiber lasers, which it markets to leading manufacturers of LEDs used in many devices such as LCDs or in general lighting. As Omitsu

explains, “By cutting without heat and without damaging the microchips, our femtosecond lasers are able to secure the highest levels of brightness and the best transmission of light. This has made them the technology of choice for high-end applications such as smartphone, tablet and TV screens.”

These days, with support from Tech Transfer, the U-M Medical School, and the Business Engagement Center, IMRA is turning its attention to nanotechnology. Its first product will be a gold-based nanoparticle with unique pharmaceutical capabilities. “As always,” says Omitsu, “we continue to work with the University of Michigan as a collaborator in moving new technologies into the market.”



Entrepreneurial Partnerships

Entrepreneurs Engage was launched in 2012 by U-M Tech Transfer and the Michigan Venture Capital Association. Using an “unConference” format, over 150 of our region’s best entrepreneurs and venture partners discussed topics selected real-time by the participants to enhance the collaboration and resources available to our entrepreneurial communities.

The **Michigan Venture Capital Association** (MVCA) and U-M Tech Transfer announced a partnering agreement to increase the interaction of MVCA venture capital firms with promising U-M start-up opportunities. This agreement includes the co-hosting of a series of entrepreneurial events and the establishment of the MVCA Collaboration Office located within the NCRC offices of U-M Tech Transfer and our Venture Center.

Thanks to the generous support from the Michigan Economic Development Corporation (MEDC), the **Tech Transfer Talent Network** was launched by U-M Tech Transfer and six other Michigan universities (Michigan State University, Wayne State University,

Michigan Tech University, Oakland University, Western Michigan University and Grand Valley State University). Using key talent initiatives pioneered at U-M Tech Transfer, the MEDC funds allow for the sharing of these talent tools and resources to enhance the tech transfer capabilities of our sister institutions.

Ann Arbor SPARK, our regional economic development organization, and U-M Tech Transfer have a strong partnership to enhance our respective entrepreneurial and venture support capabilities. Ann Arbor SPARK provides access to state-funded micro-loans, pre-seed funds and numerous workforce development, job matching services and business attraction services that contribute to the vitality of our U-M start-ups and other businesses in the region.



Contact Us!

The U-M Tech Transfer team is ready to introduce you to your next big opportunity. Contact us at 734.763.0614 or www.techtransfer.umich.edu



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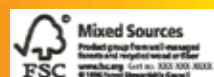
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