

URC

University Research Corridor

2007 Annual Report



Michigan State University
University of Michigan
Wayne State University

“

Aside from the auto industry, Michigan's most powerful economic institutions are its great research universities, led by U-M. Now they must be woven into the region's economy more directly and dynamically than ever before. ” (Columnist Tom Walsh, *Detroit Free Press*, 1/30/2007)

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“ Michigan’s Big Three universities, underutilized jewels, are breaking with the past and taking an aggressive role in leading change. Their presidents are active in business recruitment and leadership; they’re more prominent in revitalizing corners of Detroit; they’re working with state development types.” (Daniel Howes, *The Detroit News*, 12/4/2006)

LETTER FROM THE PRESIDENTS

Welcome to the inaugural annual report issued from the University Research Corridor, a new alliance of the University of Michigan, Michigan State University, and Wayne State University. We created the alliance to promote and leverage our collective assets and to encourage collaboration among our universities and the state.

Our goal: Accelerate statewide economic development.

We believe strongly that robust investment in all 15 of Michigan's public universities is key to the state's future economic stability. The state's universities and community colleges are the critical path to an educated, skilled, and flexible workforce, one prepared to respond to the economic challenges ahead. Specifically, our research-intensive universities have a unique and important role in fostering the innovation that will fuel new industries.

The University Research Corridor describes the significant concentration of university-based research and development within a geographic area, much like North Carolina's Research Triangle. In fact, the URC generated more external research dollars last year than the universities that make up North Carolina's successful alliance.

Through the URC, we can:

- Promote the state's R&D assets to businesses and investors
- Encourage greater collaboration among and beyond our campuses so the state realizes even more impact from its research universities
- Provide services to the state to support new business recruitment and development

The URC offers powerful collective assets. Our institutions conduct the vast majority of university-based research in the state. Together we account for 94 percent of the federal and other research dollars brought to Michigan by public universities—over \$800 million. That R&D translates into a large and growing base of university-based tech transfer and new business development. In the past five years, the URC received 632 patents and accounted for 79 start-up companies—effectively creating at least one new business every month.

Recently, the Anderson Economic Group (AEG) of East Lansing completed a comprehensive economic impact study of the URC. We commissioned the study to benchmark our performance and productivity over time. We hope to provide a "report card" by which the state can evaluate the return on its investment and establish measures of accountability, as well as increase the visibility of our collective assets as we work to attract new business to the state of Michigan. Both Wayne State and Michigan State have worked with the Anderson Economic Group in the past, and we are confident that the firm's methodology is rigorous, conservative, and accurate. We wanted to make sure that the data we present now and measure over time is rock solid, so it captures a reliable picture of economic activity and impact.

The results are startling in scope: The URC is responsible for bringing \$12.8 billion of new revenue into the state each year, earnings that would not exist in our state if not for these three highly productive teaching and research universities.



Our combined assets form a significant component of the state's economic engine. Our operational expenditures exceed \$6 billion in activity, including more than 68,000 jobs. Add to that the nearly 600,000 graduates who live and work in this state. In fact, AEG calculated that 6.9 percent of all wage and salary income in the state of Michigan is directly attributable to the URC.

And of course, the URC universities are key drivers for some of Michigan's largest business sectors including agriculture and medicine.

But as you will see in this annual report, perhaps the most powerful measure of our statewide economic impact is our nationally competitive research strength. The AEG study looked at several areas of the country with research universities in close proximity, including North Carolina, Massachusetts, Pennsylvania, and California. The state's university-based research assets are comparable to and highly competitive with many of these regions known for building knowledge economies.

But it will take significant collaboration and additional investment to make the most of our assets, and to galvanize economic transformation here in Michigan. Competition from other states and other countries is fierce. California's history of business development and investment has produced an impressive track record, and illustrates the power of partnerships in the business, university, and state arenas.

The URC is still a fledgling effort, but we believe that by working together along with other leaders in higher education, business, and government, we will:

- Increase awareness of our collective assets
- Attract and retain talent
- Increase tech transfer activities
- Mount collaborative research projects
- Encourage new business development throughout Michigan

This inaugural annual report demonstrates that robust university-based research translates into new technologies, increased business opportunities, and substantial economic impact for our state. But there is another important message illustrated in the pages of this publication: enormous potential for the state's future economy.

Sincerely,

Lou Anna K. Simon
Michigan State University

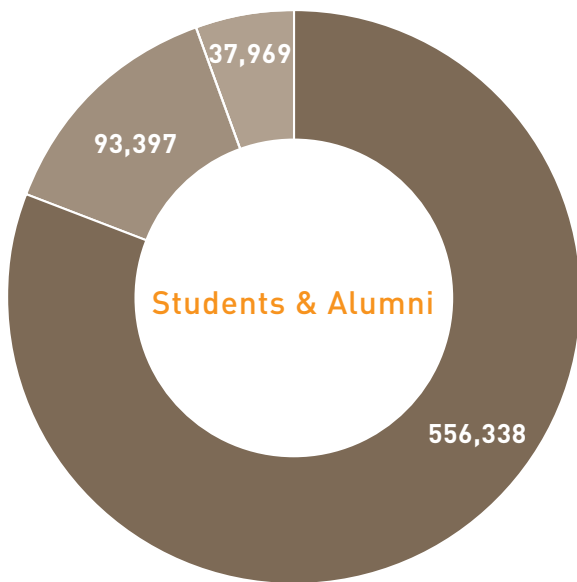
Mary Sue Coleman
University of Michigan

Irvin D. Reid
Wayne State University

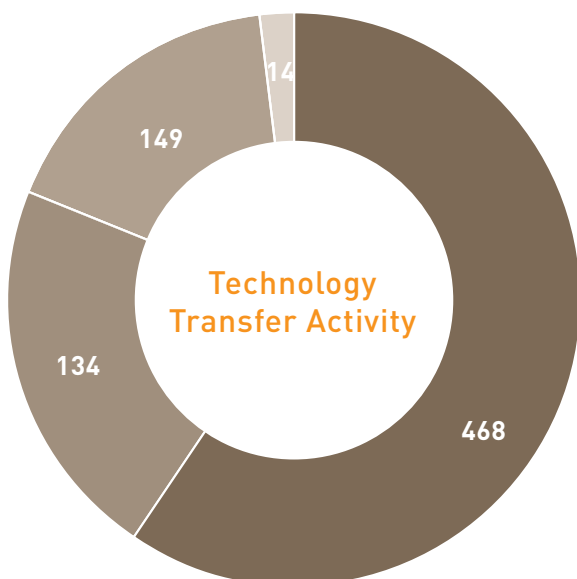
THE UNIVERSITY RESEARCH CORRIDOR

At a Glance

Aggregate data from Michigan State University, Wayne State University, and the University of Michigan for Sept. 2007, from the Anderson Economic Group Economic Impact Report:



- Total living alumni in Michigan
- Total undergraduate students
- Total graduate students



- Total invention disclosure
- Total licenses/options
- Total patents granted
- Total start-up companies

RESEARCH ACTIVITY

Total Federal Research Funding	\$ 832 million
Total URC Research Expenditures	\$ 1.37 billion
Percentage of Total University-based Research Expenditures in Michigan	94%

OPERATIONAL SCALE AND SCOPE

Total Operational Expenditures	\$ 6.50 billion
Full Time Equivalent Employees	46,398

NET ECONOMIC IMPACT OF URC

	Net Earnings In Millions
Non Payroll Operating	2,066.20
U-M Hospital	824.10
Faculty and Staff	3,606.50
URC Students	1,583.80
Alumni	4,787.70
TOTAL ECONOMIC IMPACT	\$12,868.20

OTHER QUICK FACTS:

- In the past five years, the URC universities have accounted for 632 patents and 79 start-up companies.
- In 2006, the URC universities educated 40 percent of the state's students enrolled at Michigan's public universities, 44 percent of all master's level students, 76 percent of all doctoral students, and 93 percent of all graduate professional students (medicine, law, pharmacy, and dentistry).
- Last year, the three universities sent 26,672 graduates into the work force, including more than 3,800 new engineers (only the much larger states of California and New York graduate more engineers each year than Michigan); more than 1,300 PhDs; more than 1,400 MBAs; and 957 new attorneys.
- The three universities award 54 percent of the state's science and engineering degrees, and are the only universities in the state to offer degrees in medicine (MD) and veterinary medicine. Healthcare is now Michigan's largest private employer and every year, the three graduate 500 MDs, more than 500 nurses, 100 dentists, and in 2007, 28 veterinarians.

NEW BUSINESS REPORT

The URC works to advance the state's economy in myriad ways. While the three universities' technology transfer offices focus on bringing new ideas to the marketplace, leading-edge research serves as a powerful magnet to attract new businesses to the state. Faculty, graduate students, researchers, and undergraduates create exciting new enterprises built on their discoveries in clinics, laboratories, and classrooms.

TAKING THE LEAD

SPARK, TechTown, and Prima Civitas

In recent years, each of the URC partners has been a driving force in rethinking, reshaping, and revitalizing Michigan's economic future. Their leadership efforts have resulted in three separate enterprises, all aimed at accelerating the growth of high-tech companies and jobs in the region.

In 2006, MSU led the way in creating the **Prima Civitas Foundation**, a public-private partnership that seeks to advance economic development, commercialize university research, train a 21st century work force, and make mid-Michigan a world center of innovative business activity. The foundation is headed by David Hollister, former Lansing mayor and past director of the state's Department of Labor and Economic Growth. In keeping with its name—which is Latin for “first city” or “first state”—Prima Civitas strives, in Hollister's words, “to help Michigan go further and faster.” Among its many activities, Prima Civitas manages the Mid-Michigan Innovation Team (MMIT), a network of community leaders that last year distributed \$15 million in federal grant moneys to help seed nine start-up programs in biomass, healthcare, advanced manufacturing, building and construction, and entrepreneurship.

Since 2004 a new kind of Detroit neighborhood has emerged in the 12 square blocks bounded by I-94, the Lodge Freeway, and Woodward Avenue. Thanks to Wayne State University and diverse partners in business and industry, a decaying urban landscape has been transformed into a vibrant, fast-growing research and development park known as **TechTown**. Anchored by a business incubator facility, tenants include a growing list of entrepreneurs, service providers, mentors, and investor groups as well as established high-tech companies from near and far. In addition to providing business support services and access to capital, the non-profit venture helps facilitate residential and commercial real estate development projects. TechTown also offers mentoring, tutoring, and internships for Detroit-area students.

Two years ago, the University of Michigan pledged up to \$1 million over a five-year period to help launch Ann Arbor **SPARK**—an economic development and marketing organization. Within six months, the project had received additional commitments of financial support exceeding its original \$3-million/3-year operating goal. By focusing on innovative high-tech ventures, SPARK



TechTown, WSU



One of URC's strengths is its ability to attract new businesses to Michigan—of vital importance to our economy and well being.

hopes to make the Ann Arbor region a hub of entrepreneurial activity and a magnet for innovative companies engaged in biotech, information tech, small tech, advanced manufacturing, and security. Today, its wide-ranging services encompass everything from business accelerator coaching to a popular entrepreneur boot camp program.

It also serves as a conduit to investors, employee recruitment and training, forums and workshops, and the resources of local colleges and universities. As a result, SPARK is well along in meeting its goal of doubling the number of technology companies—and tripling technology jobs—in the region by 2010.

ATTRACTING GLOBAL ENTERPRISES

Asterand Makes TechTown its World Headquarters

It took British-born Randal Charlton a mere seven years to transform his biotech start-up Asterand into the world's leading supplier of human tissue samples for medical research. It took him even less time—just two years—to move the company's headquarters across the Atlantic to Michigan, drawn by the strength of the state's life sciences expertise. In 2004, Asterand left the lab space it was leasing from Wayne State University to become the first tenant of the first building in TechTown, Detroit's research park and business incubator. Since then, Asterand's staff has grown by 50 percent and its revenues are climbing exponentially.

Charlton considers TechTown an ideal base of operations for his global enterprise. "When European companies come here," he says, "they're in the heart of America, rents are about one-fourth of what they are on the East and West coasts, employees can be well-compensated, and they cost the companies at least 25 percent less because of the lower cost of living." In January 2007, Charlton joined WSU as Entrepreneur in Residence and Special Assistant to the President for Economic Development. He is also interim director of TechTown.

NEW BUSINESS REPORT

In addition to bringing new business to Michigan, the University Research Corridor plays a critical role in fostering and retaining intellectual capital.

BENEFITING FROM “THE GOOGLE EFFECT”

Silicon Valley Satellite Spurs High-Tech Migration

In 2006, Google’s decision to move its AdWords online advertising division to Ann Arbor was great news for the city and the entire region. Within the next five years, the company plans to build a new office for its Michigan affiliate and fill the space with as many as 1,000 employees. Not long after Google’s announcement, Michigan Economic Development Corporation President and CEO James Epolito predicted that the firm’s presence would put Michigan on the map “among an elite class of locations for those companies needing a high-tech workplace.” Time seems to be proving him right. In the year since Google’s announcement, Ann Arbor has welcomed a number of high-tech émigrés to its business community, among them **Barracuda Networks**.

Founded in 2002 and headquartered in California, Barracuda has made an international name for itself by providing state-of-the-art network security technologies for e-mail, Internet, IM, and other applications. In announcing plans for an Ann Arbor software development office, Barracuda CEO and U-M alumnus Dean Drako explained that Ann Arbor was selected for to outstanding universities in the area. As he notes, “We believe that the location of the new facility in Michigan will give us access to a very strong talent pool and will enable us to continue to develop new and innovative solutions for our customers.”

In September, the Spanish aerospace firm Aeronova announced plans to move to Ann Arbor, citing the quality of life and the pool of talent, including from U-M’s College of Engineering. The move will create 600 new jobs.



Google's Ann Arbor Offices



The MSU Campus

BOOSTING THE BIOECONOMY

Idled Pfizer Sites Become R&D Centers, Business Incubators

The decision of Pfizer Inc. to scale back its Michigan operations spurred an immediate and strategic response on the part of business and civic leaders as well as leading universities. Guided by visionary thinking, determined optimism, and mutual good will, their combined efforts are making it possible to leverage the Pfizer legacy in ways that position Michigan for success in the post-petroleum era.

Under the terms of a recent agreement with **Michigan State University** and **Lakeshore Advantage**, a Pfizer pilot plant and research facility in Holland will be donated to MSU and developed as a bioeconomy research and commercialization center. Valued at \$50 million, the three-story building includes laboratories for up to 100 researchers, a 125-seat auditorium, a library, atrium, and offices. Research at the MSU center is expected to focus on areas such as biofuel refining and the economical production of useful biomass as well as social, environmental, and workplace safety issues in the emerging bioeconomy. The facility will also be home to a bioeconomy business accelerator, providing private-sector companies with access to the latest equipment and research findings.

Similar developments are underway in Ann Arbor, where the University of Michigan is preparing to become the major leaseholder for 34,400 square feet of lab space formerly occupied by Pfizer. Plans call for U-M to

sublease a portion of the space to Ann Arbor SPARK, the area's economic development agency, for use as a wet lab facility. These labs will offer biotech companies the kind of climate-controlled, sterile, and specially ventilated spaces required for advanced chemical and biological research. This acquisition will benefit both the university and the wider community by providing urgently needed space for faculty researchers, along with incubator facilities for start-up companies and prospective entrepreneurs.

Life science companies throughout the region are also benefiting from the **Michigan Innovation Equipment Depot**, a program developed by Pfizer Global Research and Development in cooperation with Ann Arbor SPARK and MichBio, an Ann Arbor-based association for the life sciences. Through this partnership, used lab equipment from Pfizer facilities is being made available to start-up and early-stage life science companies throughout the state. This technology is often crucial to product research, development, and manufacturing. Participating companies lease the equipment for just one percent of the fair market value. Requests are processed by Michigan SmartZones™, a wide-ranging collaboration of academic, business, and government organizations with the goal of stimulating technology development in the knowledge-based economy.

NEW BUSINESS REPORT

Moving research from campuses to the marketplace is the domain of technology transfer offices at URC's three universities. These offices make it possible to take core research out of the laboratory and into new and innovative enterprises.

HUGE STRIDES IN NANOTECHNOLOGY

NanoBio Corp. Develops Novel Products, Attracts Major Investors



More than ten years ago, Dr. James R. Baker, Jr. and his U-M research team were hoping to create nanoscale particles capable of delivering genetic material directly into bacteria as an aid in

fighting disease. What they developed instead was a nanoemulsion—largely comprising soybean oil, detergents, and purified water—with an ability to destroy bacteria, viruses, and other pathogens by tearing the outer membrane of the infectious organisms. Amazingly, this same emulsion was non-toxic to humans, animals, and the environment.

Baker, who directs the Michigan Nanotechnology Institute for Medicine and the Biological Sciences, patented hundreds of different formulations of the nanoemulsion. In 1999, he launched **NanoBio Corp.**, which currently holds the exclusive license for his NanoStat™ technology platform. The company's first products, now in clinical trials, include topical treatments for herpes and nail fungus. Work is also underway on oral vaccines for the prevention of influenza, anthrax, smallpox, and hepatitis B.

During its first six years of operation, NanoBio attracted roughly \$30 million in research grants, seed money, and venture capital. In 2007, the company was awarded \$2.4 million by the State of Michigan 21st Century Job Fund. It also secured \$30 million in private equity financing from Perseus, L.L.C., one of the nation's leading life science investment firms. "NanoBio is uniquely positioned to develop major new drugs and vaccines to treat infectious diseases," notes Perseus' Senior Managing Director Norman C. Selby. "Our goal with this investment in NanoBio is to build a leading biotechnology company with a broad portfolio of new pharmaceutical products."

“ . . . by focusing intensely on opportunities to develop new technology and partner with businesses that can bring such technology to the marketplace, these schools can indeed help create jobs.”

(Lansing State Journal editorial, 9/18/07)

THE RESEARCH CAMPUS

The URC campuses provide resources and catalysts for facing challenges that directly affect our state's residents such as healthcare and public welfare, energy, and the environment. The campuses are also rich in intellectual resources, and offer businesses valuable proximity to technology, consulting services, and a highly capable work force. They give rise to communities that attract enterprises and employees looking for a superb quality of life.

UNRAVELING THE MYSTERIES OF CHRONIC DISEASE

Michigan Diabetes Research Consortium Spurs New Medical Discoveries



Longtime Wayne State University faculty member James Granneman knows the importance of corporate-academic partnerships in medical research. In 1998, he left his faculty post to spend

nearly three years as a research fellow in cell biology at Parke-Davis/Pfizer Global. He returned to WSU in 2001 to direct the new Center for Integrative Metabolic and Endocrine Research in the School of Medicine.

In 2002, Granneman received \$3.5 million from the Michigan Life Sciences Corridor to launch the Michigan Diabetes Research Consortium, with scientists from the U-M and MSU. Nearly 20 million Americans are afflicted with diabetes, and Michigan ranks fourth nationally in the incidence of the disease, with annual costs to the state in excess of \$5 billion. Through collaboration, the consortium is able to coordinate and integrate advanced research while leveraging federal, state, and private resources. The long-term goal is threefold: to elucidate the cause of diabetes, develop potential therapies, and discover new drugs.

MSU LEADS NEW CENTER

Assessing the Risks of Bioterrorism and Infectious Disease

Thanks to a \$10 million grant from the EPA and Dept. of Homeland Security, MSU will develop the Center for Advancing Microbial Risk Assessment (CAMRA). The Center hopes to provide tools to combat bioterrorism and ward off global outbreaks of infectious diseases.

Joan Rose, a world-renowned scientist at MSU, was named co-director. "We continue

to struggle with these microbial risks and infectious disease outbreaks, including those spread intentionally via terrorism," she says.

The center is funded for five years and includes investigators from MSU and U-M, as well as Drexel University, Carnegie Mellon, Northern Arizona, the University of Arizona, and the University of California at Berkeley.

THE RESEARCH CAMPUS

Most scientists and policy makers would agree that, of all the problems facing humankind at this moment in history, the most urgent is climate change: specifically, the challenge of developing viable alternatives to fossil fuel. Individually and collectively, the URC partners are forging ahead in this area, launching initiatives and developing a host of promising technologies.



FUELING THE FUTURE

Faculty Make Major Advances in Alternative Energy Research

In February, U.S. Energy Secretary Samuel Bodman addressed researchers from URC institutions, North American automakers, and hundreds of other participants as part of a two-day symposium in Ann Arbor. “Energy Science, Technology, and Policy: Facing the Challenge” was sponsored by the recently launched **Michigan Memorial Phoenix Energy Institute (MMPEI)**. The Institute serves as a center for research in alternative energy technology, and houses the U-M Hydrogen Research Center intended to help hydrogen researchers move more quickly from concept to experiment.

In East Lansing, a partnership of **MSU**, **Chrysler** and **NextEnergy, Inc.**—the state’s non-profit alternative energy accelerator—is helping to turn brownfields green and creating a possible new source of biofuel. MSU Professor of Crop and Soil Sciences Kurt Thelen and his research team are studying whether certain oilseed crops such as soybeans, sunflower, and canola—as well as other crops such as corn and switchgrass—can be grown on abandoned industrial sites for use in ethanol or biodiesel fuel production. They are also investigating the possible bioremediation effect on contaminated soil.

If the experiment is successful, it could significantly expand the land available for biofuel production. MSU Chemical Engineering and Materials Science Professor Bruce Dale is exploring the possibility of generating fuels from poplar and corn stalks. Dale is known worldwide for his research on making ethanol from post-harvest crop waste.

In a move that will further strengthen Michigan’s competitive advantage in biofuels, WSU is partnering with NextEnergy, Inc. to launch the **National Biofuel Energy Lab in TechTown**. Staffed by WSU faculty and graduate students, the lab is funded by a \$2.5 million grant from the U.S. Department of Energy. The new facility is an integral component of NextEnergy’s Biodiesel Value Chain Initiative, an R&D effort focused on methods of fuel optimization, state-of-the-art biodiesel production, and innovative agricultural techniques for growing energy crops.

In Ypsilanti, a company founded by Khalil Najafi and Kensall Wise, professors in the U-M College of Engineering, is at work developing a fuel concentrator sensor based



The Wayne State University Police Department is now operating **the world's first fuel cell-powered police vehicle**. The experimental car, outfitted with Chrysler's revolutionary Mercedes F-Cell, is one of approximately 100 vehicles in the company's fuel cell vehicle fleet. In addition to generating valuable data for Chrysler's research scientists, the car serves as a learning laboratory for WSU engineering students enrolled in the **Alternative Energy Technology Program**, the first master's degree program of its kind in the U.S.

on micro-electromechanical systems (MEMS) technology. Since 1995, **Integrated Sensing Systems, Inc. (ISSI)** has been a leader in the design and manufacture of MEMS products for medical and scientific sensing applications.

The small, affordable sensor now under development will be used in fuel cell vehicles as well as consumer electronics.

URC AND CORPORATE RESEARCH PARTNERS ATTRACT \$9.7 MILLION IN NEW FEDERAL GRANTS

Each year, the three members of the URC account for more than 94 percent of all federal research dollars awarded to Michigan universities, and 2007 was no exception. During an August appearance in Benton Harbor, U.S. Department of Energy Secretary Samuel Bodman announced eleven research grants to improve the fuel efficiency of light-duty vehicle

engines. Of that number, five were awarded to URC partners collaborating with Michigan companies. All the projects are part of President Bush's 20-in-10 Initiative, which aims to displace 20 percent of gasoline usage by 2017 through the increased use of clean, renewable fuels and improvements in vehicle efficiency.

Professor Bruce Dale, MSU



THE RESEARCH CAMPUS

The URC universities are committed to creating an educated workforce for the state of Michigan—one that draws from every area of the state. Nowhere is that commitment more evident than in Detroit, where the URC influence is a reality.

POWERING AHEAD IN BIOBASED TECHNOLOGIES

MSU Receives \$50 Million Grant for Great Lakes Bioenergy Research Center

Advancing America's energy security through renewables will be the mission of the **Great Lakes Bioenergy Research Center (GLBRC)**, one of three new U.S. Department of Energy Bioenergy Research Centers. Funded by a \$125 million, five-year federal grant, the GLBRC will entail a partnership between Michigan State University and the University of Wisconsin-Madison. Research at the GLBRC and two other centers—led by the Oak Ridge National Laboratory in Tennessee and the Lawrence Berkeley National Laboratory in California—will focus on accelerating development of cellulosic ethanol and other fuels. Building on the university's vast

experience in plant and agricultural sciences, MSU faculty will conduct basic research aimed at solving some of the most complex challenges involved in converting natural materials to energy.

Michigan Governor Jennifer Granholm praised the federal initiative, noting: "This announcement combines two of the most critical components of our plan to revitalize the state's economy—a thriving higher education community and growth in alternative energy research and development right here in Michigan." The Center is expected to generate approximately 100 jobs in the state.

“Only a few states have three research universities as strong as Michigan's. The brain-power contained in the three universities ought to be a powerful magnet for drawing venture capitalists and entrepreneurs to the state.... Knowledge is the capital of the 21st century, and the schools that make up this University Research Corridor give Michigan a rare advantage.”

(Detroit News editorial, 5/31/2007)





U-M's Detroit Center



Rendering of WSU's Danto Engineering Development Center

MSU has offices and staff in every one of Michigan's 83 counties.

STAYING COMMITTED AND CONNECTED TO DETROIT

U-M and MSU Detroit Centers Provide Homes for Dozens of Programs

In 2005, the University of Michigan celebrated the opening of its new Detroit Center on the ground floor of Orchestra Place. Since then, the facility has provided space for its Admissions Office, classes, meetings, exhibitions, lectures, and collaborative work while serving as a home base for students and faculty working on projects in Detroit.

In 2007, Michigan State University established the MSU-Detroit Partnerships Office in the YouthVille facility on Woodward Avenue. The office is a hub for MSU research in Detroit and Wayne County, focusing on youth, community, and economic development.

REVITALIZING DETROIT

South University Village Continues the Transformation of Midtown



As a major presence in Midtown Detroit, Wayne State University has long been committed to civic improvement and urban renewal. In late 2006, that commitment gained considerable momentum when the

Michigan Economic Development Corporation (MEDC) formally approved Brownfield tax credits to support a \$34 million development in the Midtown area, a project that represents a public-private partnership between WSU and local developers.

Phase one of the **South University Village** project will create a new campus gateway that transforms the surrounding neighborhoods, adding loft-style apartments, stores, restaurants, and a parking structure. Phase two of the project, scheduled for completion in 2010, will add another \$20 million of new residential construction.

WSU President Irvin D. Reid notes that South University Village will continue the work of "building an exciting and vibrant campus community."

THE RESEARCH CAMPUS

In an era of intense global competition—when other countries are graduating five to ten times more engineers than the U.S.—innovation and entrepreneurship have become the key differentiating qualities for Michigan’s colleges and their students.

A LOOK AT THE FUTURE

URC Trains Talent for New Marketplace by Fostering Entrepreneurship

In January 2007, the U-M College of Engineering (CoE) began focusing on strategies for creating an “entrepreneurial ecosystem” that will support student entrepreneurship and drive the commercialization of new concepts, discoveries, and products. The College is developing a first-of-its-kind **Certificate Program in Entrepreneurship** for undergraduate and graduate students. This integrated approach will blend course work in engineering and business with a series of seminars featuring venture capitalists, scientists, executives, attorneys, and technology transfer specialists.

Since 1999, the **Zell Lurie Institute for Entrepreneurial Studies** has focused the resources of U-M’s top-ranked Ross School of Business to provide students education and experience in entrepreneurship. Through competitions and access to capital, Zell Lurie and its **Center for Venture Capital and Private Equity Finance** enable students to build business plans and launch entrepreneurial ventures while earning their degrees. In addition, the school’s two student-led investment funds—with over \$3 million—provide an immersion experience in business assessment and the investment process.

Hosted by Wayne State University’s Venture Development Office, the annual **E2detroit**



Symposium gives entrepreneurs and small business owners a unique opportunity to learn from and interact with regional leaders in business and government. Keynote speakers share ideas about the tools and relationships necessary to launch and grow a successful enterprise. In addition, E2detroit assists entrepreneurs in locating qualified management, funding sources, and facilities.

For the past five years, MBA students at Wayne State University have been honing their entrepreneurial skills—in the classroom, in the field, and across campus—by participating in the **Entrepreneur Management Course**. The course includes action-based learning experiences with successful entrepreneurs, venture capitalists, and start-up consultants. In the field, students work with start-up companies to target new market opportunities and identify barriers to market entry and product development. On campus, they work



U-M's Biomedical Sciences
Research Building



“
Innovation is the central issue in economic prosperity.”

Michael E. Porter, head of the Institute for Strategy and Competitiveness at Harvard Business School

closely with researchers and faculty inventors, conducting business feasibility and market research studies. At the end of the course, the students pitch their business ideas to a panel of venture capitalists and angel investors.

In 2004, Wayne State University became the first and only part-time MBA program in the nation to offer its students an action-learning course focused on entrepreneurship. **Cross-Functional Business Analysis: Technology Transfer** provides future business leaders with hands-on experience in evaluating the commercial feasibility of actual research projects.

In the 2006-07 academic year, students had a chance to evaluate the technology behind **SenSound, LLC**, a start-up venture launched by Sean Wu, Charles DeVlieg Professor of Mechanical Engineering at the WSU College of Engineering. Wu's software creates a 3-D image of sound in space and time that can pinpoint the exact source of noise in numerous products with a high degree of resolution and accuracy. The technology has potential applications for the manufacture of automobiles, planes, ships, consumer appliances, and industrial machinery. Two teams of MBA students researched and analyzed product viability, market size, competition, and other key commercialization factors.

Last year, MSU's Broad School launched a new Institute for Entrepreneurship comprised of two centers with faculty expertise: a Center for Venture Capital, Private Equity and Entrepreneurial Finance (CVCPE) directed by Finance Professor Zsuzsanna Fluck, and a Center for Entrepreneurial Strategy directed by Roger Calantone, the Eli Broad Chaired University Professor of Business. These centers fuel the research, teaching, and outreach missions of the School and Institute.

“
Michigan's three research universities are worth a strong investment from the state if they continue to create new economic activity that leads to new jobs.”

(*Lansing State Journal* editorial, September 18, 2007)

The Institute for Entrepreneurship helps stimulate economic development in the state of Michigan as well as support MSU's own innovative ideas—based on a wide range of research projects—and turning them into commercial ventures and products. Beginning in the 2007-08 academic year, the Broad School will broaden its programs to offer an undergraduate specialization in entrepreneurship.

The following is a brief summary of the findings reported by the Anderson Economic Group. The full report may be viewed at www.urcmich.org/economic/

QUANTITATIVE ANALYSIS

First Annual Economic Impact Report
Commissioned by Michigan's University Research Corridor
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University of Michigan
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WHAT IS THE URC? The University Research Corridor (URC) is an alliance of Michigan’s three largest academic institutions: Michigan State University, the University of Michigan, and Wayne State University. The purpose of this alliance is to accelerate economic development in Michigan by educating students, attracting talented workers to Michigan, supporting innovation, and encouraging the transfer of technology to the private sector.

The University Research Corridor universities are located in five separate communities. Michigan State University is located in East Lansing, in close proximity to the state’s capital. The University of Michigan’s main campus is in Ann Arbor with branch campuses in Flint and Dearborn. Wayne State University is located in Detroit, the largest city in the state. Outreach and programs conducted by the three universities make their presence felt throughout the state.

THE AEG REPORT Michigan’s University Research Corridor universities asked Anderson Economic Group to undertake a comprehensive study that quantifies the economic impact of the URC’s activities on the state of Michigan’s economy. This report is to be the first in a series of annual reports and is intended to measure and benchmark the contributions of the URC universities to the state. The information in this report will help explain how the URC universities spend their time and money and track the URC’s performance year-to-year. The focus of this year’s report is how the URC compares to other prominent university clusters. We selected six comparison university clusters in five states. We compared Michigan’s URC with some of the best universities (public and private) in each of these states. We present the list of peer university clusters in the table below.

COMPARISON PEER UNIVERSITY CLUSTERS			
Michigan’s URC	Michigan State University	University of Michigan	Wayne State University
Northern California	University of California, San Francisco	University of California, Berkeley	Stanford University
Southern California	University of California, Los Angeles	University of California, San Diego	University of Southern California
Illinois	University of Chicago	University of Illinois at Urbana-Champaign	Northwestern University
Massachusetts	Harvard University	Massachusetts Institute of Technology (MIT)	Tufts University
North Carolina	Duke University	University of North Carolina (Chapel Hill)	North Carolina State University
Pennsylvania	Penn State University (all campuses)	University of Pittsburgh (all campuses)	Carnegie Mellon University

Source: Anderson Economic Group, LLC

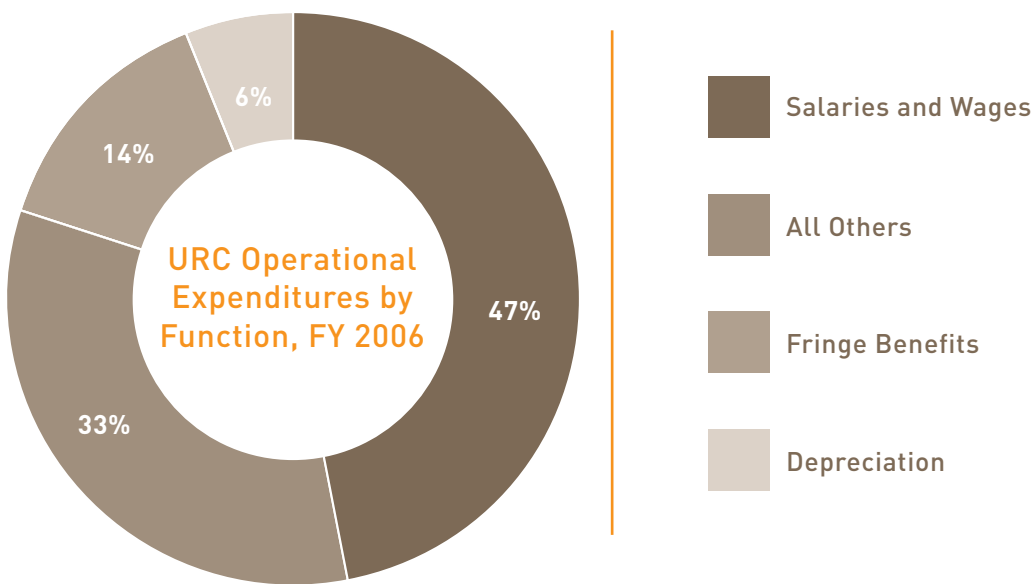
ECONOMIC IMPACT, DEFINED We define net economic impact as the additional earnings to state residents caused by the operation of these institutions. In calculating the net economic impact, we follow a careful methodology that counts expenditures only once, takes into account substitution of one activity within the state by another, and uses very conservative multipliers for indirectly caused activity. Among other conservative assumptions, we assume most URC students would attend college even if these research institutions were not located in Michigan, and that many employees of the URC would find other jobs in Michigan even if the URC institutions were not located here. Details of the methodology for the economic impact of the operational expenditures by URC universities is detailed in Appendix B of the full report, under “Operational Expenditures Methodology.”

In FY 2006, Michigan’s residents were over \$12.8 billion richer due to the URC. These new earnings to Michigan residents stem from expenditures by the URC universities on non-payroll items (such as supplies and equipment) and by the employees, students, and alumni. We were careful only to include expenditures by URC employees, students, and alumni directly caused by the URC. This net economic impact total, amounting to 6.9% of all wage and salary income in Michigan, takes into account the economic activity that would have occurred in Michigan even without the URC. In addition to \$12.8 billion in new earnings, the URC generated 68,803 jobs in Michigan.

NET ECONOMIC IMPACT OF URC, FY 2006	
IMPACT CATEGORY	NEW EARNINGS IN MICHIGAN (MILLIONS)
Non-payroll Operating (e.g. Supplies, equipment)	2,066.20
University of Michigan Hospital	824.10
Faculty and Staff	3,606.50
URC Students	1,583.80
Alumni	4,787.70
TOTAL ECONOMIC IMPACT	\$12,868.20

Source: Anderson Economic Group, LLC

ECONOMIC IMPACT The University Research Corridor makes significant contributions to the state's economy. The University Research Corridor spent \$6.5 billion on operations in FY 2006 (July 1, 2005 to June 30, 2006) and employed 46,398 full-time equivalent faculty and staff throughout Michigan. Most operational spending went towards instruction (21% of total), research (14%), and the University of Michigan's hospital (29%). Almost half (47%) of all operational expenditures went toward the salaries and wages for faculty and staff. Fringe benefits made up 14% of expenditures, while depreciation accounted for 6%. The remaining 33% went to pay for supplies, equipment, and any other expenditure not included in the previous categories.



URC expenditures encourage even more economic activity throughout the state of Michigan than indicated by the total spending figure. The dollars the URC spends on supplies, equipment, and salaries of staff and faculty are then re-spent as businesses and households throughout Michigan purchase other goods and services.

We define net economic impact as the new economic activity directly or indirectly caused by the URC, excluding any economic activity associated with Research Corridor Universities that merely replaces or displaces other economic activity in the state. For example, we exclude all expenditures by URC universities that go to firms outside of Michigan, and expenditures by students that would have attended another college in Michigan if the URC did not exist.

In order to quantify the economic impact of Michigan's Research Corridor universities' operational expenditures, we asked ourselves: What would the loss be to the state if the Research Corridor universities left Michigan? We then studied the loss in terms of jobs and earnings.

Operational expenditures pay the salaries of professors, researchers, doctors, administrative staff, as well as purchase supplies, equipment, and maintenance of buildings. As the URC makes purchases, the money is then re-spent throughout

Michigan, creating a “multiplier” effect, and generating more economic activity for the state. In FY 2006, the URC’s operations resulted in \$8.0 billion in new earnings to households and 68,803 jobs in the state. This takes into account the economic activity that would replace lost URC economic activity. For example, we account for the substitution of some URC staff and faculty to other jobs in Michigan, and therefore subtract some faculty and staff payroll.

Net Economic Impact of URC Operational Expenditures, FY 2006	
Impact Category	New Earnings in Michigan (in billions)
Non-payroll Operating Expenditures by the URC	2.07
University of Michigan Hospital	0.82
URC Faculty & Staff Expenditures	3.61
URC Student Expenditures in Michigan	1.58
TOTAL ECONOMIC IMPACT FROM OPERATIONS	\$8.08

Source: Anderson Economic Group, LLC

REVENUE SOURCES Michigan’s URC universities received \$7.8 billion in revenue in FY 2006. This is 35% more than the three universities received in FY 2002. Almost every source of revenue increased during the four year time period. State appropriations, which is considered non-operating revenue, made up 64% of these funds in FY 2002 but only 37% in FY 2006. State appropriations to the URC universities has fallen steadily the past five years. By comparison, state government spending from state resources increased 6.2% between FY 2002 and FY 2006.

COMPARISON WITH COMPETITORS To judge how the URC compares with other university clusters in the nation, we selected a handful of the best-known groups of universities in Northern and Southern California, Illinois, Massachusetts, North Carolina, and Pennsylvania. Each of these clusters has three universities from the same state and are well known for their research and development activities. For example, the Northern California cluster includes UC San Francisco, UC Berkeley, and Stanford University; the North Carolina cluster includes Duke, University of North Carolina at Chapel Hill, and NC State; and the Massachusetts cluster includes MIT, Harvard, and Tufts. Reference the complete list in the chart on page 19.

STUDENT ENROLLMENT AND COMPLETIONS The URC's 133,331 students in the fall of 2005 make it the largest research university cluster, in terms of enrollment, in our analysis. The next highest is the Southern California cluster (UCLA, USC, and UC San Diego) with just over 93,000 students enrolled in the fall of 2005.

The URC universities award a variety of degrees each academic year. In terms of number of degrees granted, the URC ranks #1 in total number of degrees conferred in Physical Science, Agriculture and Natural Resources, and Medicine Biological Science. The URC is in the top three in total number of degrees awarded in Engineering, Math and Computer Science, and Business Management and Law.

R&D EXPENDITURES In 2005, academic institutions in Michigan spent \$1.45 billion on research and development, with the URC universities spending 94% of this amount, or \$1.37 billion. Approximately 60% of funding for these R&D expenditures came from federal sources. In other words, the URC universities brought \$832 million in federal dollars into the state of Michigan for research.

In 2004, the URC had the third highest R&D spending of seven university clusters at \$1.32 billion, topped only by the two California clusters. In 2005, however, North Carolina had surpassed the URC's spending of \$1.37 billion by \$5 million. The URC's fall from third to fourth place can be explained by North Carolina's significant growth in R&D expenditures between 2004 and 2005. Most of the university clusters had similar levels of expenditures in 2004, but the North Carolina cluster increased expenditures 11.7 % while the URC increased expenditures only 3.7%.

The URC universities receive less federal funding than all clusters except North Carolina and Illinois, and rely on institutional funds for a significantly higher proportion of their R&D expenditures than all six clusters.

Beyond the direct impact of the initial R&D spending, the innovations that are the outgrowth of R&D also lead to the production and sale of new products and services that have further economic impacts. The pharmaceutical, medical, computer technology, consumer electronic, telecommunication, agricultural products, and manufacturing industries are among the many benefiting from research and development conducted at universities. Research and development is also important to universities for the role it plays in attracting and retaining high quality professors and students, which in turn benefits business enterprises in need of a high quality workforce and research partnerships.

SOURCE OF FUNDING FOR R&D EXPENDITURES (IN MILLIONS), 2005

	TOTAL R&D EXPENDITURES	FEDERAL GOVERNMENT	STATE & LOCAL GOVERNMENT	INDUSTRY	INSTITUTIONS	OTHER
Michigan's URC	1,369	61%	5%	4%	25%	5%
Northern California	2,024	64%	3%	5%	15%	13%
Southern California	1,952	65%	2%	4%	19%	10%
Illinois	1,181	66%	4%	2%	22%	6%
Massachusetts	1,159	82%	0%	8%	2%	8%
North Carolina	1,374	59%	10%	13%	16%	3%
Pennsylvania	1,337	71%	6%	8%	12%	2%
<i>All U.S. Universities</i>	<i>\$45,750</i>	<i>64%</i>	<i>6%</i>	<i>5%</i>	<i>18%</i>	<i>7%</i>

Source: National Science Foundation: Integrated Science and Engineering Resources Data System
 Analysis: Anderson Economic Group, LLC

GROWTH IN TOTAL ACADEMIC R&D EXPENDITURES

University Cluster	ANNUAL GROWTH 2000 - 2005 (CAGR)	ANNUAL GROWTH 2004 - 2005
Michigan's URC	7.7%	3.7%
Northern California	7.4%	5.1%
Southern California	7.7%	2.3%
Illinois	8.4%	3.8%
Massachusetts	5.8%	3.1%
North Carolina	8.7%	11.7%
Pennsylvania	9.2%	5.5%
<i>All U.S. Universities</i>	<i>8.8%</i>	<i>6.5%</i>

Source: NSF, Integrated Science and Engineering Resources Data System
 Analysis: Anderson Economic Group, LLC

TECH TRANSFER An important indicator of the success of university research and development is how effective that university is at transferring technology to the private sector. In terms of volume, the URC ranks fourth in average number of invention disclosures and patents, and sixth in number of licenses granted.

In terms of effectiveness of R&D expenditures, as measured by licensing revenue per expenditure, the URC is better than all comparison clusters except Northern California and Massachusetts. This means a higher percentage of URC expenditures result in a product that is licensed and sold than most of the other comparison clusters.

The URC has helped cultivate an average of 15 start-ups annually between 2002 and 2006. This is more than was cultivated by the North Carolina and the Illinois clusters, equal to that of the Pennsylvania cluster, and lower than those of the Massachusetts, Northern California, and Southern California clusters.

AVERAGE ANNUAL PATENT AND LICENSING ACTIVITY, 2002-2006					
	INVENTION DISCLOSURES	PATENT GRANTS	LICENSES/ OPTIONS	LICENSING REVENUE (IN MILLIONS)	REVENUES PER EXPENDITURES
Michigan's URC	437	126	118	\$39	2.9%
Northern California	647	199	185	\$172	8.5%
Southern California	789	242	174	\$28	1.6%
Illinois	412	135	104	\$19	1.6%
Massachusetts	706	204	206	\$59	5.1%
North Carolina	383	111	143	\$10	0.8%
Pennsylvania	387	123	134	\$13	1.0%

Source: Universities' websites, Association of University Technology Managers 2005 Survey

AVERAGE ANNUAL NUMBER OF START-UPS CULTIVATED AT UNIVERSITY CLUSTERS, 2002-2006	
Michigan's URC	15
Northern California	31
Southern California	28
Illinois	13
Massachusetts	29
North Carolina	11
Pennsylvania	15

Source: Universities' websites

MEDICAL EDUCATION The URC sponsors the only medical schools in the state of Michigan that provide Doctor of Medicine (M.D.) and Doctor of Osteopathic (D.O.) degrees. In 2005, the URC graduated 639 students from its allopathic (M.D.) and osteopathic (D.O.) medical schools. This is 12.1% more than 2001. Many of these graduates remain in Michigan for their residency and internship programs (i.e. graduate medical education or GME). In 2005, 60% of URC allopathic medical school graduates remained in Michigan for their graduate medical education. Hospitals that teach these students receive payments for GME. In 2005, hospitals affiliated with the URC received \$526.7 million in GME payments (72% of all state GME payments). Hospitals with URC graduates received \$569.4 million or 78% of all state GME payments.

Doctors who attended medical school or a residency program in Michigan are more likely to remain in the state to practice than active physicians in the average U.S. state. Over half (55.1%) of active physicians in Michigan completed a residency program in Michigan, compared to the national average of 44.7%. The same trend holds for medical schools: 38.2% of active physicians in Michigan in 2005 had attended a medical school in Michigan compared to 29.6% in the average U.S. state.

URC MEDICAL SCHOOL GRADUATES, 2001-2005

University	DEGREE GRANTED	2001	2002	2003	2004	2005	% CHANGE FROM 2001
Michigan State University	M.D.	99	109	68	121	117	18.2%
Michigan State University	D.O.	128	115	128	134	122	-4.7%
University of Michigan	M.D.	160	161	154	165	162	1.3%
Wayne State University	M.D.	183	238	218	245	238	30.1%
TOTAL	M.D. & D.O.	570	623	568	665	639	12.1%

Source: National Center for Education Statistics, IPEDS

Analysis: Anderson Economic Group, LLC

DENTISTRY In 2005, the University of Michigan’s School of Dentistry program graduated 104 students with a DDS degree. The same year, 27 students graduated with a dental hygienist degree.

VETERINARY MEDICINE Michigan State University hosts the only school of veterinary medicine in the state and one of only 28 veterinary schools in country. The College has issued 216 students a Doctorate in Veterinary Medicine since 2000.

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URC's Presence in Michigan

