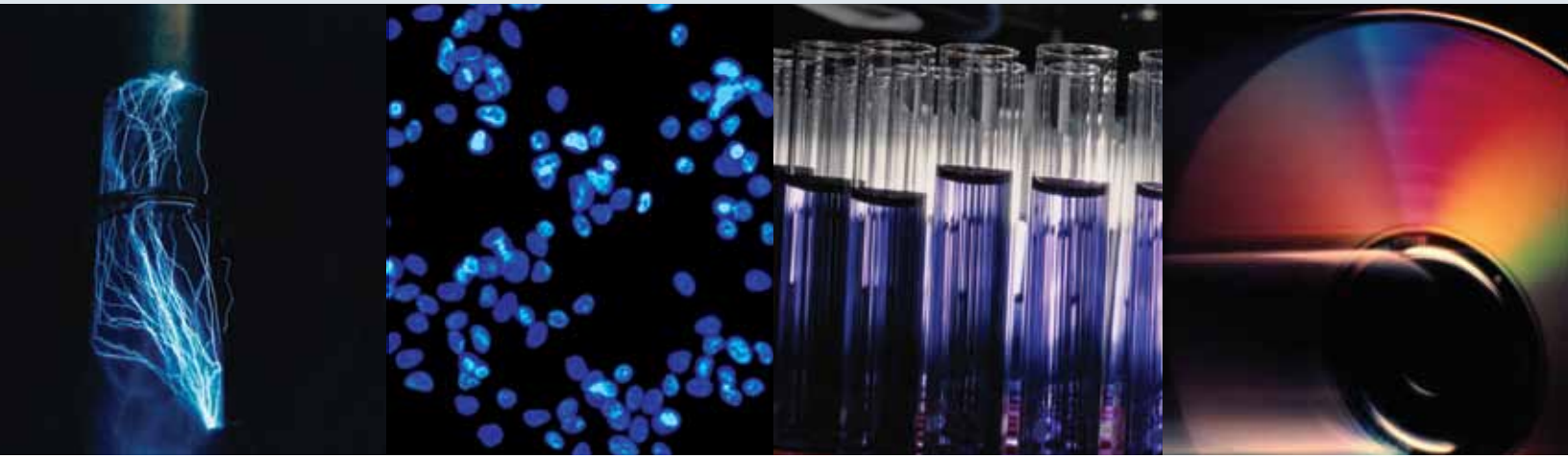
Michigan's

URC

University Research Corridor



Annual Report

2010

Empowering Michigan

MICHIGAN STATE UNIVERSITY

UNIVERSITY OF MICHIGAN

WAYNE STATE UNIVERSITY

WHO WE ARE

Michigan's University Research Corridor (URC) is an alliance of the University of Michigan, Michigan State University, and Wayne State University with a vision to help transform Michigan's economy. The URC is an intellectual and economic engine for the state, generating net economic impact greater than $14.8 billion. The alliance attracts 93 percent of all external academic research and development dollars that are spent in the state of Michigan and, collectively, the URC partner institutions expended more than $1.6 billion dollars in research activity this past year.

The URC is among the top R&D clusters in the nation (compared with regions of the USA such as Route 128 in Boston, Research Triangle in North Carolina, and Silicon Valley in Northern California) for producing patents, new business, and graduates with high-tech related degrees needed in growing new fields. In addition, the three universities serve as a magnet in helping to attract and retain businesses in the state of Michigan.

TABLE OF CONTENTS

MESSAGE FROM THE PRESIDENTS

When we established the University Research Corridor in 2006, our state had not yet seen the worst of the country's economic freefall that hit Michigan particularly hard. And yet our willingness to collaborate through these hard years, to encourage a greater level of new business growth, has become symbolic of our state's strong will to move toward economic prosperity. We are seeing significant progress! This report includes stories of URC researchers working together, of start-up companies that have been born from new science and technologies, and of a new kind of entrepreneurial partnership with the statewide business community. We pledge our continued support to leverage the URC's tremendous human resources and to spark innovation inside and outside our campuses for Michigan's greater good.

Lou Anna K. Simon, Michigan State University

Allan Gilmour, Wayne State University

Mary Sue Coleman, University of Michigan

FROM THE URC EXECUTIVE DIRECTOR

The University Research Corridor marked important milestones in 2010, including the establishment of new headquarters in Lansing, at 500 E. Michigan Avenue. The new space has enabled URC partner institutions and other collaborators to meet and work in a central location, and in many ways has signaled the URC's transition from a "virtual" alliance to a concrete one.

Our vision remains the same: Help create the 21st century Michigan. Working among all three of our research universities and with partners across the state, we can contribute to a vibrant statewide economy as we leverage our intellectual capital as well as our facilities and technologies. We are working actively to attract and grow knowledge economy businesses, connect research activity to new enterprises, educate a talented workforce, and plant seeds for the industries of tomorrow.

The pages of this annual report will document some of this year's progress. You'll read about our collective work in advanced manufacturing, the URC's net economic impact to the state, our new partnership with Business Leaders of Michigan called Accelerate Michigan, our sponsorship of the World Stem Cell Summit as well as the world's largest new business competition, and some exciting new collaborative research among our universities.

Our commitment to encourage greater collaboration and spark new economic opportunity is well underway, and though our goals are aspirational they are certainly well within our reach—and we see great progress already for our state! We look forward to working with many of you in the years ahead.

Jeff Mason
Executive Director

URC Growth Fuels Economic Opportunity

Even as the state and national economies struggled in the recession, Michigan's University Research Corridor grew in areas critical to the state's resurgence: Increasing net economic impact to the state, educating more students, and boosting R&D gains, according to the latest in a series of URC benchmarking reports.

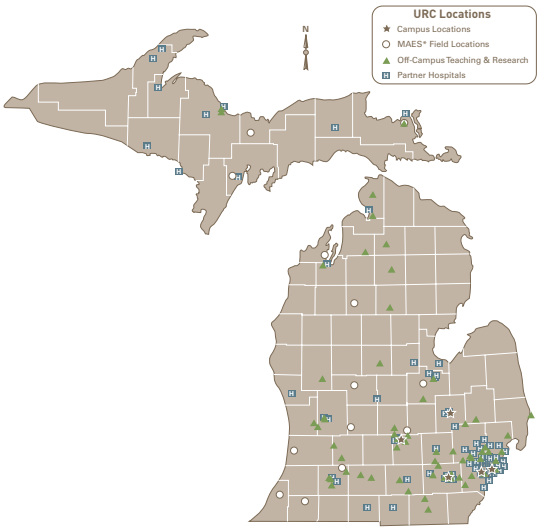
The 2010 Empowering Michigan report shows URC partners Michigan State University, the University of Michigan, and Wayne State University have improved in several key measures since the first study in 2007. The study, comparing Michigan's URC with leading innovation clusters around the world and building on data collected over the past four years, was conducted by Anderson Economic Group.

The study shows that the URC's net economic impact on the state has grown from $12.9 billion to $14.8 billion since 2006. "Even as state support has dropped, Michigan's research universities remain the number one cluster in the U.S. in terms of enrollment, and number three in terms of high-tech degrees. These universities provide a net benefit to the state that is 16 times the cost to taxpayers. This gives Michigan the talented workforce we need for the jobs of tomorrow," said Patrick Anderson, founder and principal of Anderson Economic Group.

The fourth annual Empowering Michigan report demonstrates the URC's growth in areas such as research expenditures, enrolled students, and technology transfer, as well as compares the universities' collective assets apples-to-apples with other "knowledge regions" featuring research universities in close proximity.

"The URC has been a bright spot in the state's economic picture, even in the teeth of the recession. Michigan has the second fastest research and development growth rate among competitive innovation clusters," said URC Executive Director Jeff Mason. "Just as importantly, we're getting stronger relative to the competition, which puts us in a good position to help propel the state's economic growth in the future."

The report has tracked a significant increase in patents, licenses, and start-up companies over the past four years, evidence of new initiatives the URC universities have undertaken to better support business growth.



CREATED BY: ANDERSON ECONOMIC GROUP, LLC

More Than the Sum of its Parts

The 2010 Empowering Michigan report finds the URC is:

—GROWING. The URC served more students than any other comparable innovation cluster, adding 5,517 extra student slots since 2006 for a total of 137,152 (77 percent from Michigan, 14 percent from other states, and 9 percent from more than 100 other countries).

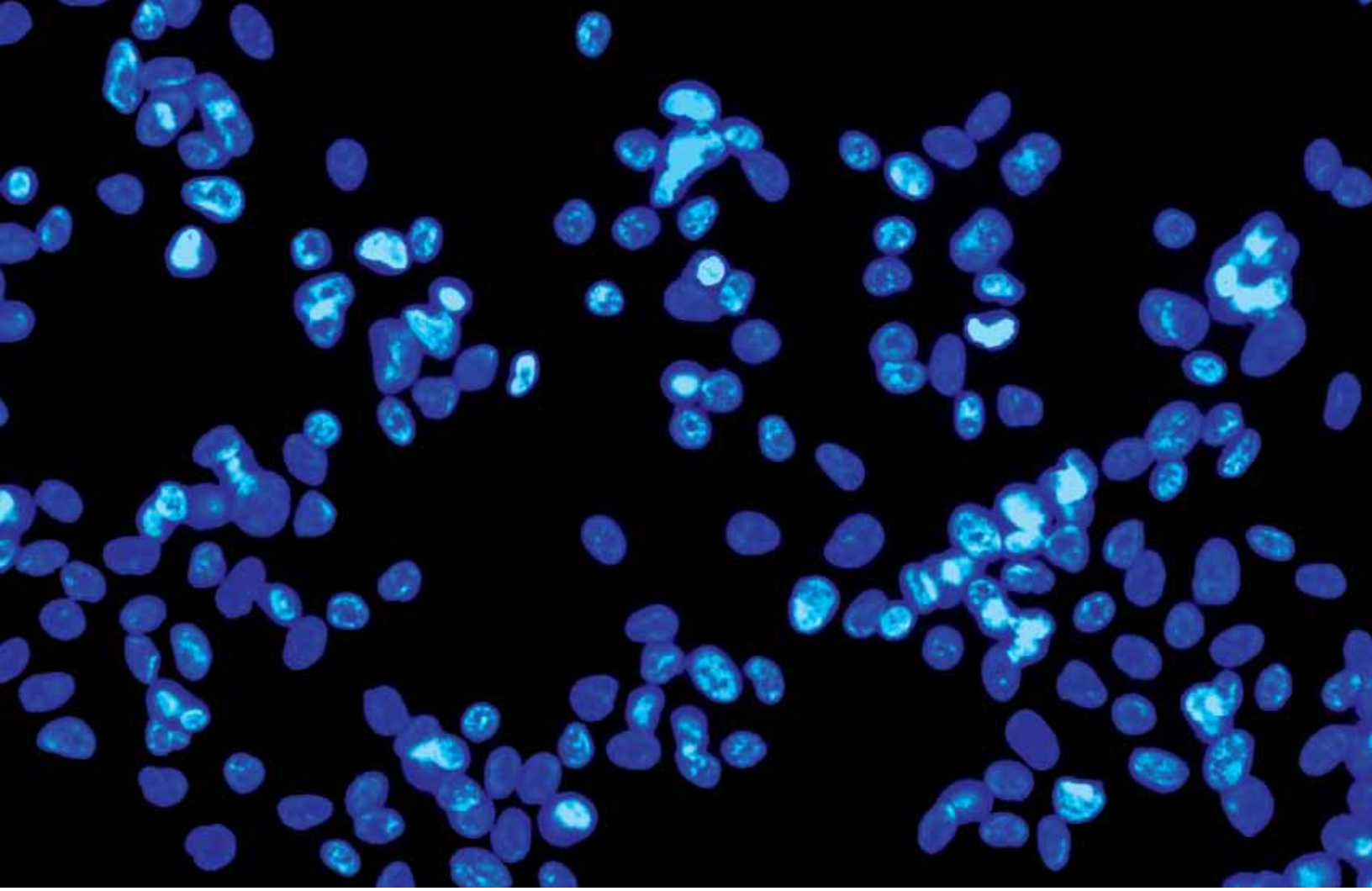
—SERVING ALL OF MICHIGAN. The URC has grown its economic impact on Michigan from $12.9 billion in 2006 to $14.8 billion in 2009. In 2009 there were over 550,000 URC alumni living in Michigan, or 7.2 percent of the state's adult population. This group earned $26 billion that year.

—RETURNING REVENUE. The universities generated $401 million in 2009 state tax revenue (up $50 million from 2006) even as state support for higher education declined. That figure is close to half of the $888 million the three research universities received in state appropriations that year.

—GENERATING NATIONAL R&D IMPACT. Michigan's URC is one of seven innovation clusters in six U.S. states that together accounted for 22 percent of R&D investments made by all U.S. higher education institutions. The URC expended over $1.6 billion in R&D, up $263 million over 2006. This is the second fastest growth rate among the peer institutions measured.

—LEADING INNOVATION. Innovation clusters are regions with a high density of high-tech industries and innovation, typically measured by patent applications, business licensing revenue, and related high-tech assets. Over the past five years, the URC was among the top three clusters for generating patents (136) and has generated twice as much licensing revenue than the more commonly recognized Research Triangle cluster.

—COMPETITIVE INTERNATIONALLY. This year's report also compares the URC with three comparable international innovation clusters, finding the URC doing far more research than similar clusters in Japan and Israel while trailing Great Britain's primary innovation cluster.



World Stem Cell Summit Points to Promise

Michigan's University Research Corridor presidents welcomed scientists, life sciences advocates, patients, and leaders from around the world to Detroit October 4–6 to open the 2010 World Stem Cell Summit, the largest multi-track stem cell conference held to date. Sixteen scientists and faculty members from all three universities presented at the event, which brought together the worldwide stem cell community to detail progress being made with stem cell research.

The University of Michigan prefaced the summit with an October 3 announcement that U-M researchers created the state's first embryonic stem cell line, a milestone on the path to creating new disease treatments.

Bernie Siegel, executive director of the Genetics Policy Institute and founder of the annual summit, noted that it is good if scientists can cure a mouse of diabetes, but not if it takes 30 years to get the cure through the regulatory process. The summit, he says, brings together scientists, policymakers, business people, and patients "so we can eliminate that gap and create bridges of understanding."

"Changing the world starts with imagination but it doesn't end there... To a layman like me, stem cell research is a radical idea like going to the Moon was... Remember those words, 'it's never been done' because the whole world is waiting to see what you will do that has never been done before."

— Allan Gilmour, President of Wayne State University

URC Forges New Business Partnership

Where University Innovation and Business Needs Meet

Accelerate Michigan is a newly formed partnership between the URC and Business Leaders for Michigan (BLM) that aims to help Michigan become a "Top Ten" state for economic growth. BLM is composed of the senior executives from the state's largest companies and employers.

Accelerate Michigan was developed over the past year based on benchmarking industry-university partnerships in other states and identifying the most critical factors that have driven innovation-based growth in areas such as Silicon Valley, Massachusetts' Route 128 Corridor, and North Carolina's Research Triangle. The work was conducted by McKinsey & Company.

The partnership stands on three major pillars: Fostering a culture of entrepreneurship, growing capital and investment opportunities for early-stage businesses, and identifying high-potential clusters of innovation in the state.

"It's no longer about publish or perish, it's about partner or perish," said U-M President Mary Sue Coleman.

"We have identified concrete deliverables to encourage business growth and university connectivity to the state's business needs," says Jeff Mason, executive director of Michigan's University Research Corridor.

The work plan includes the lead sponsorship of the Accelerate Michigan Innovation Competition, a new business plan competition open to entrants worldwide (see related story); "match-making" between university research and business needs; creation of university commercialization and venture capital funds; and the development of an angel investment strategy to better connect investors with entrepreneurs. In addition, the partnership will identify "innovation clusters" with great potential for business growth that align federal research spending plans, university research strengths, business needs, and the state's strengths.

World's Largest Business Plan Competition

The first project sponsored by the new URC-BLM partnership was a winner: The Accelerate Michigan Innovation Competition. The world's largest business plan competition targeted early-stage businesses with proven technology and potential to generate an immediate impact on Michigan's economy, as well as student concepts with longer-term business viability. The new competition was created by the Business Accelerator Network for Southeast Michigan with seed funding from the New Economy Initiative. The Accelerate Michigan partnership provides the lead sponsorship funding necessary to support the competition in future years.

"It's a great opportunity to encourage entrepreneurial activity across the state, and just as importantly to put an international spotlight on the State of Michigan as a hub for innovation. We have a powerful network of economic development organizations in the state, and this is just one example of what we can contribute collectively."

– Doug Rothwell, executive director of BLM

Advanced Manufacturing "Alive and Well" in Michigan

More than 381,000 people at 11,000 Michigan firms are working in high-tech, highly productive advanced manufacturing jobs—nearly two-thirds of the state's manufacturing base, according to a 2010 University Research Corridor study.

The URC institutions support advanced manufacturing at every step of the product development lifecycle from the idea stage to design and testing to commercialization to business operations, the study shows. And though "manufacturing" in Michigan has been closely associated with the automobile industry, the new report demonstrates that advanced manufacturing in Michigan also means areas such as pharmaceuticals, chemicals, sensors, circuits, and robots.

In FY 2009, the URC invested more than $101.9 million in advanced manufacturing R&D and had active research awards of more than $425 million. The study was released as part of a three-campus URC bus tour (see sidebar) showcasing the proximity between the three partners and research strength of Michigan's world-class research intensive universities.

The report, prepared by East Lansing-based Anderson Economic Group (AEG), shows Michigan's particular strengths in research-related advanced manufacturing: a third of the research and testing jobs in the Midwest are in Michigan and more than half of the state's advanced manufacturers are seeing productivity gains exceeding the U.S. average while employing 10 percent of the state's workforce.

"This report provides, in great detail, hard evidence that manufacturing is alive and well in Michigan today, and that much of the manufacturing now done in Michigan is high-tech, high productivity advanced manufacturing," said AEG founder Patrick Anderson. The report acknowledges that 27 percent of the U.S. private sector jobs lost nationwide over the past decade were in Michigan and that the state's overall manufacturing employment has dropped by more than a third since 2001. Still, advanced manufacturing fared much better than manufacturing as a whole, seeing fewer losses and greater wage gains

"Manufacturing continues to play a very important role in the state's economy, but will require a more skilled workforce than in our parents' generation," said MSU President Lou Anna Simon.

The report catalogs numerous companies that have partnered with or grown out of URC research as well more than 30 centers or laboratories working directly with advanced manufacturing firms.

URC On the Road

The URC sponsored a three-campus bus tour in July to showcase the proximity of the three universities as well as several advanced manufacturing research facilities and projects.

"The future of manufacturing can be found all around the URC, from the lab space where science turns into discovery to commercial technologies creating new companies and job growth," said URC Executive Director Jeff Mason. "We wanted to quantify, catalogue, and show rather than tell how our research universities can help Michigan speed up the transformation from an old manufacturing economy to a knowledge-based economy with hundreds of thousands of high-wage, high-skilled advanced manufacturing jobs."

The tour included visits to Wayne State's Smart Sensors and Integrated Microsystems Lab, MSU's National Superconducting Cyclotron Laboratory and U-M's new North Campus Research Complex, home to an advanced manufacturing complex and 2 million square feet of research space.

URC Universities Are Open for Business

Michigan's research universities are open for business. That's the loud-and-clear message at the heart of three major initiatives designed to better connect business needs and university resources: The Front Door at Wayne State University, the University of Michigan's Business Engagement Center (BEC) and Michigan State University's MSU Business-CONNECT.

"Companies are increasingly turning to universities for an integrated suite of services. This type of a customer-focused model—combining faculty expertise, research and development, and help with business challenges on all levels—resonates well with our business partners. Additionally, companies greatly appreciate having a dedicated relationship manager to help them navigate the large university," said Daryl Weinert, executive director of U-M's Business Engagement Center.

Weinert says demand for this type of connection to university resources is high, and the needs are growing. "The volume has remained heavy since our inception in 2007. And in fiscal year 2010, the BEC had 235 new engagements with companies that had never before connected with the school. That's one each business day." Weinert added that this is in addition to the more than 1,000 ongoing company relationships managed by BEC staff.

Each of the universities cite common goals for this new model of collaboration with businesses, including joint research projects, technology utilization and commercialization, student recruitment, faculty consulting, utilization of facilities, strategic philanthropy, and professional development.

"For companies large or small, Business-CONNECT is the front door to the university, whether that businessperson is seeking a research partnership, wants to gain access to academic expertise, or needs to recruit and hire highly qualified employees from among our graduates—our goal is to demystify a complex organization, provide quick access to the right resources, and initiate productive relationships between MSU and business partners," explains Charles Hasemann, executive director of MSU Business-CONNECT.

Still a new initiative for MSU, Business-CONNECT has been staffed and in operation just since last July. "Since then, we have had approximately 180 interactions with companies or entrepreneurs, and worked through negotiations on about 100 contracts," said Hasemann.

The newest player among the URC institutions is Wayne State University's The Front Door. Launched in 2009, the university is adding resources to expand The Front Door's capacity to foster business relationships, and is searching for a full-time executive director to manage its ambitious set of goals.

The Front Door was established to strengthen the university's ties to business and community partners and, in collaboration with Wayne State's business incubator at Tech Town, to help reignite innovation in Michigan. "Businesses of all sizes recognize the advantages of the industry-academic partnerships available here," said intereim director Nancy Kraemer Christ.

THE URC IN 2010

The University Research Corridor had a busy and productive 2010. Here is a quick sampling of special events, sponsorships, awards, and activities:

JANUARY

Environmental Health Sciences Symposium: The University Research Corridor hosted an all-day conference at Wayne State's McGregor Memorial Conference Center in Detroit, Michigan to develop inter-institutional, multidisciplinary research collaborations in environmental health science problems important to Michigan and the U.S.

FEBRUARY

Stem Cell Michigan gather at TechTown: The primary mission of Stem Cell Michigan is to create a community of stem cell scientists across Michigan, with the intent of fostering the exchange of ideas and research findings and encouraging the formation of collaborations that will advance the cause of stem cell science.

APRIL

WWJ Event: Igniting Innovation: WWJ Newsradio 950 and the URC presented a business conference attended by over 250 entrepreneurs and business leaders focusing on Michigan's history of innovation and how Michigan can reinvigorate that innovative spirit.

Scott C. Soderberg, U-M Photo Services

JUNE

Mackinac Policy Conference: URC Executive Director Jeff Mason presented on a panel, "Jobs, Jobs, Jobs: Jobs in New Industries, Jobs with New Opportunities" discussing emerging industries and the economic drivers that will transform and reinvent Michigan.

JULY

In combination with a media tour highlighting research activities on the three campuses, the URC released a study showing that more than 381,000 people at 11,000 Michigan firms are working in high-tech, highly productive advanced manufacturing jobs—nearly two-thirds of the state's manufacturing base—and that the URC institutions support advanced manufacturing at every step of the product development lifecycle from the idea stage to design and testing to commercialization to business operations.

SEPTEMBER

Business Leaders for Michigan (BLM) and the University Research Corridor (URC) announced the formation of Accelerate Michigan to help support efforts to make Michigan a "top ten" state for economic growth.

OCTOBER

Michigan's University Research Corridor presidents welcomed more than 800 attendees to the World Stem Cell Summit held in Detroit, Michigan. The Summit brought together scientists, policymakers, business people, and patients to create dialogue, share research, and create bridges of understanding.

NOVEMBER

The University Research Corridor was awarded the 2010 Catalyst award from Michigan Emerging for making the state a better place to live, work, and play. The Michigan Emerging Conference, a featured event of Global Entrepreneurship Week/USA, was designed to promote and connect innovators and entrepreneurs and the support system that exists in Michigan.

A University Research Corridor Symposium

Symposium Series Designed to Encourage Collaboration

A new URC Symposium Series is designed to bring together faculty from the three URC universities as well as additional partners to foster greater levels of research collaboration. The first such event, "Environmental Health Sciences," attracted more than 100 researchers to develop inter-institutional, multidisciplinary research collaborations in environmental health sciences programs important to the state of Michigan. The second symposium focused on cerebral palsy research initiatives (see full article on following page). Two additional events are now being organized: "Creating, Enhancing, and Sustaining Livable Communities" and "Water Science and Technology."

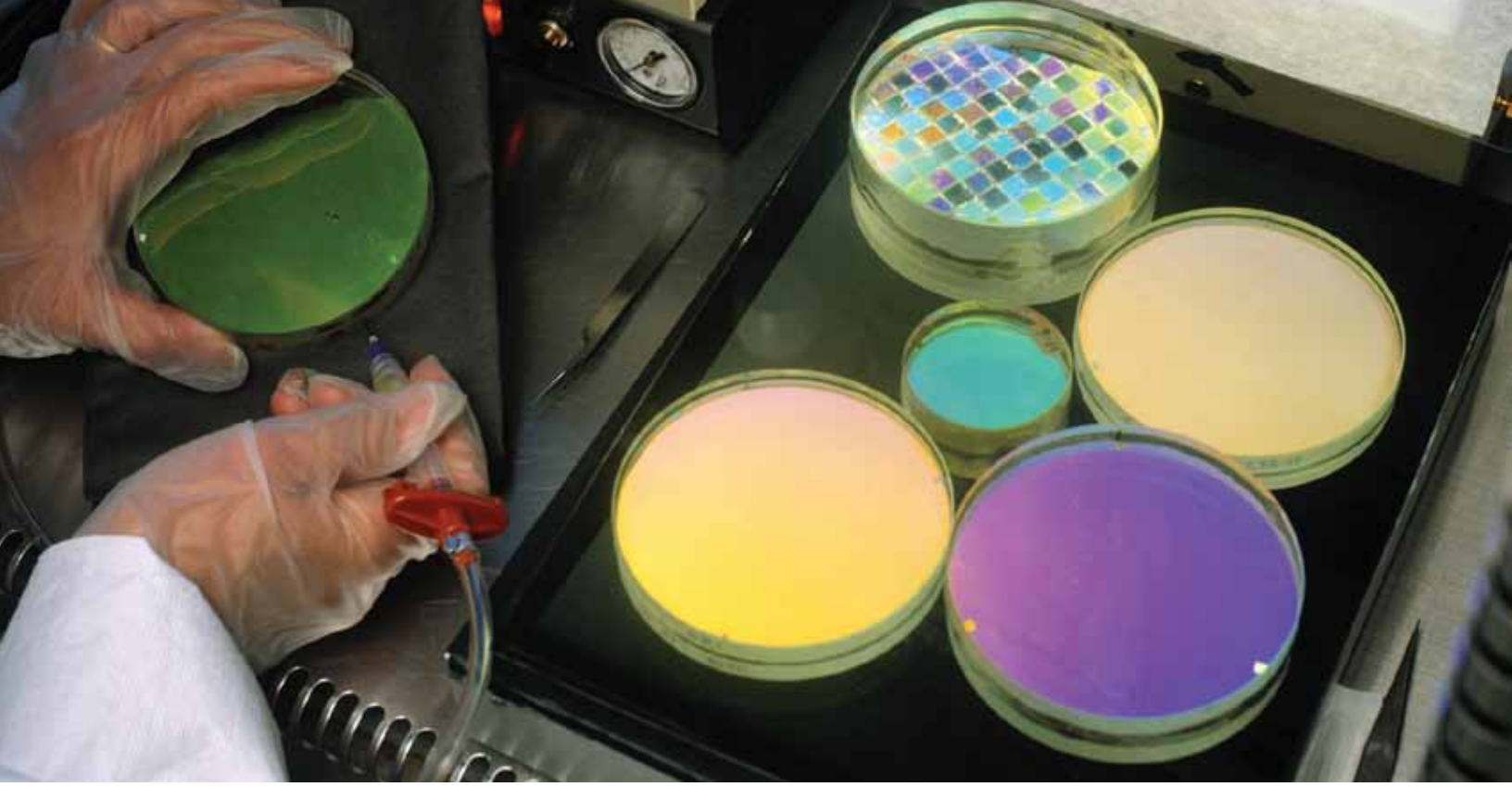
"We received a total of 36 proposals last spring for symposia sponsorship," says URC program director Vince Nystrom. "University researchers see great potential in working together and fostering a greater level of research activity in areas of mutual interest. The URC Symposium Series is designed to further facilitate their efforts."

Fighting Cerebral Palsy

It is the most common severe motor disability of childhood, and it often appears in tandem with other disabling conditions such as epilepsy, cognitive impairment, and impaired vision or hearing. Each year, 8,000 U.S. children will be born with cerebral palsy (CP).

The good news: With research collaborations among the URC, medical centers, and other partners, the state of Michigan is becoming a national leader in CP research. The second in the URC Symposium Series, "Developing Multicenter Collaborative Research with the Cerebral Palsy Community," was held in East Lansing on October 19 to explore some of the most promising areas of research and encourage even greater levels of collaboration in this important field.

The state's three major research universities have developed complementary research emphases addressing the affliction. "At Wayne State University, a number of laboratories are exploring some of the things that go wrong that might lead to cerebral palsy; at U-M, there is a very robust research program on the best ways to treat and manage the disease; and here at MSU, we examine risk factors from pregnancy and around birth as clues to what might be causing cerebral palsy," says Dr. Nigel Paneth, principal investigator of a CP research team and University Distinguished Professor in the Departments of Epidemiology and Pediatrics and Human Development, College of Human Medicine, Michigan State University.



Neonatal Biobank Offers Future Hope

More than 10 years ago, the Michigan Commission on Genetic Privacy and Progress made an exciting discovery—every newborn baby in the state has blood taken at birth. That blood is stored on a card and tested for 49 different diseases, but most of what is collected is still undisturbed.

The commission members consulted with the URC universities as well as the Van Andel Institute in Grand Rapids and formed the Michigan Biotrust for Health, a partnership to facilitate the use of newborn blood screening samples in medical and public health research. The Biotrust hub is the Michigan Neonatal Biobank, housed at the Tech Town business and technology incubator at Wayne State University in Detroit.

The Biobank is responsible for securing, storing, and recording the location of each of the blood spot cards. The samples are stripped of any identifying information before they leave the Michigan Department of Community Health (MDCH), which conducts the initial newborn screening and maintains ownership of the cards. The MDCH also directs their use by reviewing research proposals to ensure its standards are being met.

EACH MEMBER OF THE BIOTRUST PARTNERSHIP HAS A ROLE:

- Michigan State University provides technical expertise in de-identifying the blood spots and also with linking them to state databases that track cancer, death, birth defects, and other issues.
- The University of Michigan performs outreach to communities to facilitate understanding of the Biobank's role in research and in protecting the anonymity of the sample, and provides expertise regarding the ethical, legal, and social implications of the Biobank.
- The Van Andel Research Institute developed the software that is used to inventory and track the samples housed at the Biobank, and consults on optimal storage.
- Wayne State University's TechTown provides the climate-controlled storage space and the inventory, tracking, and shipping systems.

The Biobank provides access to information that would be unobtainable any other way, and possesses the potential for great good, said Nancy Christ, director of the Michigan Neonatal Biobank. "We're able to go back in time. Being able to get these retroactive samples is a gold mine of information."

Scott R. Galvin, U-M, Photo Services

Transportation Consortium Launched

Transportation research has always been a long-term interest of the University Research Corridor, but now the URC will step up its involvement by building partnerships through a new transportation research consortium.

The goal is to find ways to transform the regional, state, national and, ultimately, global transportation industries.

Transforming Transportation: Economies & Communities (TTEC) is a new program to promote multidisciplinary, multi-institutional research that supports industry, community, and government policymaking and planning.

"The intent of the initiative is to build research teams composed of university, community, business, and government partners in an effort to better understand transport of people and products in ways that also stimulate innovative approaches to economic development," said Hiram Fitzgerald, associate provost for university outreach and engagement at MSU.

"Michigan is an iconic hub of transportation and innovation, and is situated geographically near the center of the United States and Canada. Our technological assets and strategic geographical position can be combined with the intellectual strengths of Michigan's three great research universities to help make Michigan a major player in fulfilling the world's transportation needs in the future."

Photo courtesy of NASA, http://visibleearth.nasa.gov

URC Universities Lead $4.2 Million Great Lakes Climate Project

The University of Michigan and Michigan State University will jointly lead a federally funded effort to help Great Lakes-region residents anticipate and adapt to climate change.

The interdisciplinary effort will be funded by a five-year, $4.2 million grant from the National Oceanic and Atmospheric Administration.

The new Great Lakes Regional Integrated Sciences and Assessments Center (GLISA) will focus initially on the watersheds of lakes Erie and Huron and three critical topics: agriculture, watershed management, and natural resources-based recreation and tourism.

The Great Lakes center is one of six new Regional Integrated Sciences and Assessments awards, totaling $23.6 million, announced by U.S. Commerce Secretary Gary Locke.

"Climate change is expected to dramatically impact the Great Lakes region. Tourism and agriculture, in particular, are extremely vulnerable, and disruption to those sectors will have wide-ranging detrimental effects for an already struggling Great Lakes economy," said U-M aquatic ecologist Donald Scavia, co-leader of the new center, along with Michigan State's Thomas Dietz.

"This new collaboration allows us to build a team of top scientists to devise effective adaptation strategies," said Scavia, director of U-M's Graham Institute, special counsel to the U-M president for sustainability, and a professor at the School of Natural Resources and Environment.

Fourth Annual Economic Impact Report:

Empowering Michigan

Executive Summary and Selected Data

The following is an executive summary and selected data of the quantitative analysis commissioned by Michigan's University Research Corridor. Since 2007, the URC has asked Anderson Economic Group to undertake a comprehensive study that benchmarks the economic impact of the URC's activities on Michigan's economy. This 2010 report is the fourth in the series. Please note: The URC publicly released the fourth of these reports, entitled *Empowering Michigan,* in October of 2010. The 2010 economic impact study included R&D expenditure data from 2008. Shortly after the publication of this study the National Science Foundation released university R&D data for 2009. This update report uses the recently-released 2009 research and development expenditure data and updates measures found in the 2010 URC annual economic impact study. The full report may be viewed at www.urcmich.org.

Key Benchmarks

This report presents benchmarks using the most recent data available. We used fiscal year 2009 (July 1, 2008 to June 30, 2009) financial data to estimate the economic impact of the URC's operations on Michigan's economy in 2009. The rankings of technology transfer activities are based on the average of the annual data for the previous five years from the date of the report. For example, the ranking for start-up companies is based on the average number of companies the URC helped start each year between 2005-2009. A ranking of "1" indicates the university cluster with the highest tech transfer activity for that indicator. The URC's economic impact in Michigan was $14.8 billion in 2009. In four years, the URC's economic impact has grown by $1.9 billion. The URC's highest ranking tech transfer activity is the number of patent grants awarded, ranking third in this year's report. See Table 1 below.

TABLE 1. Key Benchmarks of the URC

	Benchmark: 2007 Report (2006 data)	2009 Report (2008 data)	2010 Report (2009 data)	Change Since Benchmark Year of 2007
Operational Expenditure	$6.5 billion	$7.3 billion	$7.5 billion	+ $1 billion
Fall Enrollment (Degree-Seeking Only)	131,635	132,008	137,152	+ 5,517 students
Net Economic Impact[a]	$12.9 billion	$14.5 billion	$14.8 billion	+ $1.9 billion
Tax Revenue Impact on MI State	$351 million	$414 million	$401 million	+ $50 million
Total R&D Expenditures	$1.369 billion	$1.405 billion	$1.632 billion	+ $263 million
Rank of Technology Transfer Activities[b]				
No. of Start-up Companies Cultivated[c]	5	5	5	+0 Improvement
Patent Grants Awarded[d]	4	3	3	+1 Improvement
Technology Licenses Issued	5	5	5	+0 Improvement

Analysis: Anderson Economic Group, LLC; See remainder of report body for detailed sources and calculations.

a. American Recovery and Reinvestment Act (ARRA) funds awarded to URC universities accounted for $57.4 million or 0.8% of operational expenditures.
b. Rankings are based on five year averages of annual activity and are out of seven clusters. The 2007 report uses 2002-2006 data, the 2009 report uses 2004-2008 data, and the 2010 report uses 2005-2009 data.
c. The 2009 report ranking reflects revised start-up data. We removed the number of start-ups that did not involve a licensed technology, lowering the number of URC cultivated start-ups from 28 to 17.
d. The benchmark year (2007 report) ranking reflects revised patent grant data.

The URC universities collectively spent almost $7.5 billion on operations in FY 2009. The $7.5 billion was used to pay the salaries of 50,176 full-time-equivalent staff and faculty, purchase supplies and equipment, and maintain buildings and equipment. This figure—$7.5 billion—is about 2% of all economic activity in the state, as measured by Michigan's gross state product.

In 2009, there were 550,595 known alums of an URC university living in Michigan, making up 7.2% of Michigan's population over the age of 18 years. These alums earned an estimated $26 billion in salary and wages in 2009, or 15.3% of all wage and salary income in Michigan. See Table 2 below for the scale of the URC.

TABLE 2. Scale of the URC, FY 2009

Category	Impact
Number of Enrolled Students (degree seeking)	137,152
Full-Time-Equivalent Employees	50,176
Operational Expenditures (e.g. supplies, payroll, equipment)	$7.5 billion
Known Alumni Living in Michigan	550,595[a]
Wage and Salary Earnings of URC Alumni in Michigan	$26 billion

Data Sources: National Center for Education Statistics, IPEDS; URC Universities
Analysis: Anderson Economic Group, LLC
a. The number of alumni living in Michigan is lower than the 572,123 alumni in Michigan reported in the 2009 report. This is due to improvements in the alumni databases of the URC that led to downward revisions. See Methodology in A-1 of the full report.

Economic Impact, Defined

We define *net economic impact* as the additional earnings to state residents caused by the operations of these institutions. In estimating 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 that 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 left Michigan.

We detail our methodology for the economic impact of the operational expenditures by URC universities in "Operational Expenditures Methodology" in Appendix A in the full report. In FY 2009, the URC's operations contributed $14.8 billion to the Michigan economy. This was due to expenditures by the URC universities on non-payroll items (such as supplies and equipment) and by employees, students, and alumni. See Table 3 below.

TABLE 3. Net Economic Impact of URC, FY 2009 (in billions)

Impact Category	Net Economic Impact
Non-payroll Operating Expenditures	$3.2
Faculty & Staff Wages and Benefits	$4.7
URC Student Expenditures	$2.1
Incremental Alumni Earnings[a]	$4.8
TOTAL ECONOMIC IMPACT	$14.8

Source: Anderson Economic Group, LLC
a. We estimate that $4.04 billion of earnings by URC alumni living in Michigan in 2009 were additional earnings directly caused by the education they received at an URC university. See "Methodology" on page 26 of the full report.

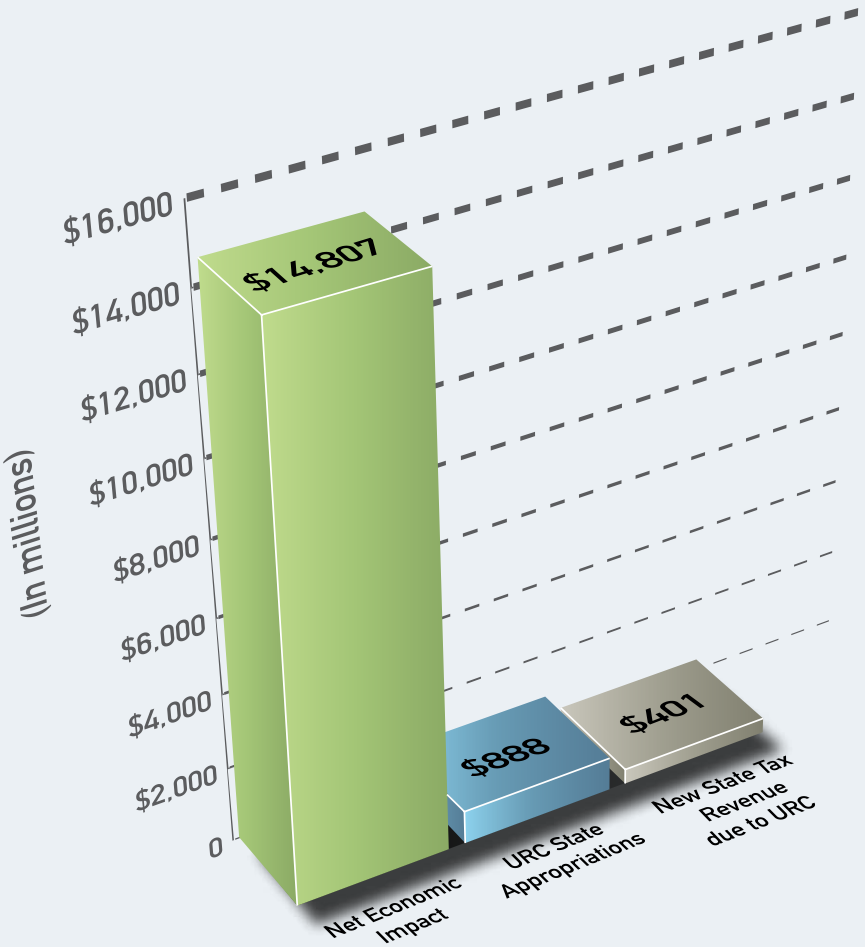
New State Tax Revenue Due to URC

In 2009, we estimate that $2.8 billion in wages of URC employees and over $4 billion of the $26 billion in URC alumni earnings in Michigan were caused by the URC by keeping more college graduates in Michigan's labor force and by helping URC graduates earn more than they would have otherwise. We estimate that the tax revenue the state received because of these earnings, that otherwise would not exist in the state, is $401 million. This includes new tax revenue the state receives from personal income, sales and use, property, and gasoline taxes.

Comparison of Economic Impact with State Appropriation

Comparing the URC's net economic impact on the state to the State of Michigan's funding of the URC universities illustrates how much greater the benefits of the URC are compared to the state's cost. The $14.8 billion in net economic impact is over 16 times greater than the state's funding for URC universities, as shown in Figure 1 below, "URC Net Economic Impact and New State Tax Revenue vs. State Appropriations." Additionally, the State of Michigan receives $401 million in tax revenue from URC employees and alumni that it would otherwise not have received if the URC universities were not located in Michigan.

FIGURE 1



Sources: AEG Estimates; House Fiscal Agency
Analysis: Anderson Economic Group, LLC

To gauge how the URC's performance on research and development activities compares with other universities, we created a set of six university clusters across the nation against which we could benchmark the URC. Table 4 shows the three universities in each cluster. These clusters include some of the best universities nationwide. We created clusters with similar size, research focus, diversity, and geographic proximity as the URC universities.

We benchmark the URC against these peer university clusters on student enrollment and degree completions, research and development expenditures, and technology transfer activities. We use the most recent data available, which in some cases may lag by two years.

TABLE 4. Comparison Peer University Clusters

Cluster	Universities		
Michigan's URC	**Michigan State University**	**University of Michigan (all campuses)**	**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)[a]	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

a. Lincoln Lab is not included in spending reported by MIT, because it is not classified as academic R&D. Research at Lincoln Lab includes communications, space surveillance, missile defense, tactical surveillance systems, and air traffic control.

The URC's 132,008 students in the fall of 2008 (the most recent year for which we have data for all university clusters) make it the largest research university cluster, in terms of enrollment, in our analysis. The next largest is the Pennsylvania cluster with just over 120,000 students enrolled in the fall of 2008.

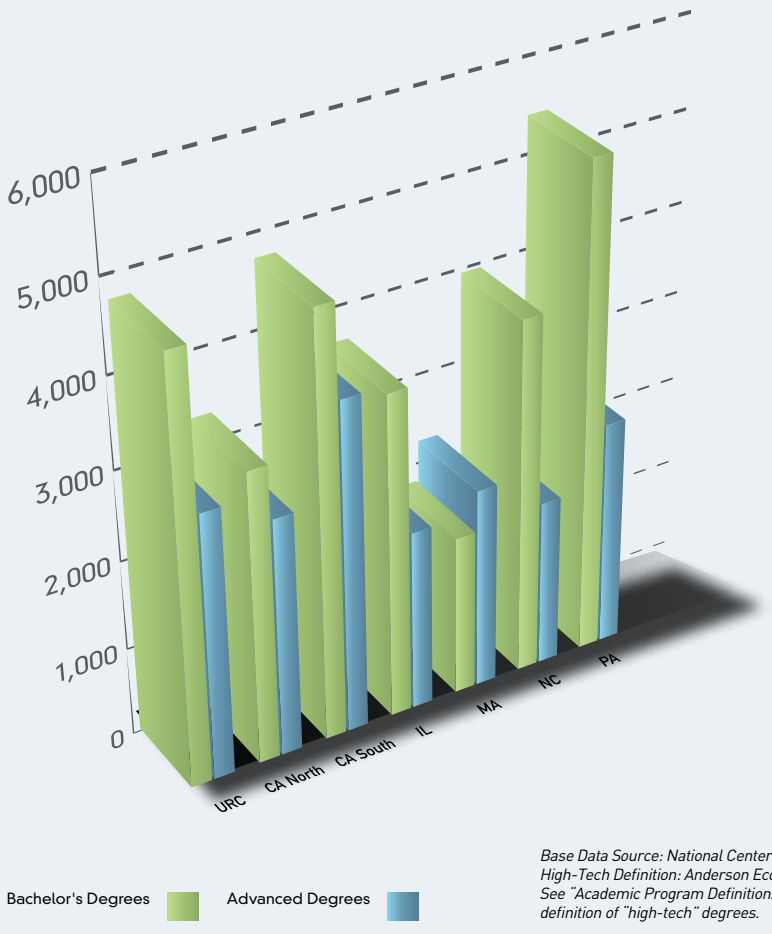
The URC ranks second among the university clusters with 28,095 degrees conferred during the academic year of 2008-09. The Pennsylvania cluster awarded more undergraduate degrees than the URC (28,195). Only the Illinois cluster (11,167) awarded more advanced degrees than the URC (9,949).

The URC ranks particularly well in awarding a high number of degrees in certain subject areas. The URC confers more bachelors, masters, doctoral, and professional degrees in medicine and biological science than any of the other comparison university clusters. After accounting for total number of undergraduate degrees conferred, the URC ranks second in business management, law, medicine, and biological science. As a share of total graduate degrees conferred, the URC ranks first in medicine and biological science and second in physical science, agriculture, and natural resources.

Michigan has a vibrant high-tech industry, and the URC universities graduate a large number of students with degrees that prepare them for jobs in these industries.

We define "high-tech" as degrees in biological and biomedical sciences, physical sciences, computer sciences, architecture, engineering, mathematics and statistics, and some agricultural sciences. As shown in Figure 2 below, the URC awarded the third largest number of high-tech degrees (7,857). Only the Southern California (8,599) and Pennsylvania (8,093) university clusters awarded more high-tech degrees than the URC.

FIGURE 2



Base Data Source: National Center for Education Statistics, IPEDS
High-Tech Definition: Anderson Economic Group, LLC
See "Academic Program Definitions" on page 9 of full report for a definition of "high-tech" degrees.

From 2008 to 2009, R&D expenditures by universities grew by an average of 5.8% across the U.S. The 2009 R&D expenditures by the seven university clusters totaled over $12.4 billion, making up approximately 23% of the R&D expenditures by all U.S. universities. The share of funding sources for all universities on average has remained unchanged from 2008 to 2009, as shown in Table 5, below. Each of the seven clusters shown below experienced an increase in funding amounts from almost every source compared to the previous year.

The URC universities spent $1.6 billion on R&D in 2009. Over half of these expenditures (56%) were funded by the federal government. In FY 2009, $917 million in federal dollars flowed into Michigan for R&D. This money was spent on employee salaries and supplies and equipment, in part from Michigan businesses. The California clusters experienced a decline in the amount of federal government funding from 2007 to 2008. While it was brought back to previous levels in 2009, its share of federal funding fell.

TABLE 5. Source of Funding for R&D Expenditures (in millions), 2009

	Total R&D Expenditures	Federal Government	State and Local Government	Industry[a]	Institution[b]	Other
Michigan's URC	1,632	56%	3%	4%	30%	7%
Northern California	2,304	53%	4%	8%	18%	17%
Southern California	2,302	59%	3%	8%	18%	13%
Illinois	1,456	61%	3%	3%	25%	8%
Massachusetts	1,346	76%	0%	10%	2%	12%
North Carolina	1,831	55%	11%	13%	18%	3%
Pennsylvania	1,594	67%	5%	8%	16%	3%
All U.S. Universities	54,935	59%	7%	6%	20%	8%

Expenditures: Fiscal Year FY 2009
Analysis: Anderson Economic Group, LLC
a. Industry funding are grants and contracts for R&D activities from non-profit organizations.
b. Institutional funding includes research funded from non-profit organizations, corporate foundations, endowments, and fellowships to students.

Between 2008 and 2009, the URC increased its R&D expenditures by 10.1%. Only the North Carolina cluster (10.4%) exceeded the URC in R&D expenditure growth, as shown in Table 6. This growth rate was higher than the average increase by all U.S. universities of 5.8%, and significantly higher than the URC's increase the year before when expenditures grew by 5.5%. While Michigan's nine year average annual growth rate is slower than most of the other clusters, the URC has spent recent years closing this gap. Last year the URC was fifth in R&D expenditure growth since 2000. Michigan is now fourth (out of seven) in average annual increase in R&D expenditures between 2000 and 2009.

TABLE 6. Growth in Total Academic R&D Expenditures

	Annual Growth 2000-2009 (CAGR)	Annual Growth 2008-2009	Rank: Growth Rate 2008-09
Michigan's URC	6.2%	10.1%	2
Northern California	5.5%	6.4%	5
Southern California	6.1%	3.1%	7
Illinois	7.0%	8.5%	3
Massachusetts	4.9%	7.5%	4
North Carolina	8.2%	10.4%	1
Pennsylvania	7.1%	5.7%	6
All U.S. Universities	6.9%	5.8%	

Data Source: National Science Foundation, Division of Science Resources Statistics, Academic Research and Development Expenditures: Fiscal Year FY 2009
Analysis: Anderson Economic Group, LLC

An important function of successful university R&D is its effectiveness at transferring technology to the private sector. The URC ranks third in average annual number of patents awarded and fifth in number of licenses granted. The URC ranks fifth in licensing revenue per dollar of expenditure. This indicates a higher percentage of URC expenditures resulted in a product that is licensed and sold than two of the other comparison clusters. In addition, over the past five years, the URC has helped cultivate on average 14 start-up companies annually.

TABLE 7. Average Annual Patent and Licensing Activity, 2005-2009

	Start-up Companies Cultivated	Rank	Patent Grants	Rank	Licensing Revenue (In Millions)	Rank	Revenues per Expenditures	Rank
Michigan's URC	14	5	136	3	$31.8	5	2.1%	5
Northern California	21	3	198	1	$187.9	2	8.7%	2
Southern California	29	2	126	4	$53.1	4	2.4%	4
Illinois	13	6	101	5	$225.8	1	16.9%	1
Massachusetts	31	1	192	2	$80.0	3	6.4%	3
North Carolina	11	7	85	7	$14.1	7	0.9%	7
Pennsylvania	18	5	88	6	$16.2	6	1.1%	6

Data Source: Universities' websites, technology transfer offices, Association of Technology Managers (AUTM) Surveys
Analysis: Anderson Economic Group, LLC Note: See "Average Annual Patent and Licensing Activity, 2005-2009" on page 17 of the full report for complete source notes and methodology.

KEY R&D FINDINGS

R&D expenditures by the seven university clusters in our benchmarking study totaled approximately $12.4 billion in FY 2009, making up almost 23% of the R&D expenditures by all U.S. universities.

Below we provide key findings of our analysis.

- *In 2009, URC universities spent over $1.6 billion on R&D, bringing $917 million in federal dollars to Michigan.*

About 56% of R&D expenditures by the URC were federally funded in 2009. This meant $917 million federal dollars flowed into the state for URC employee salaries, supplies, and equipment.

- *Between FY 2008 and 2009, R&D expenditures by the URC increased 10.1% compared to 5.8% for all universities nationwide.*

In FY 2009, the URC universities spent $150 million more on R&D than they did in the previous fiscal year for a 10.1% increase. As shown in Table 6 on page 19, nationally all U.S. universities increased research expenditures by 5.8%. The URC's increase between fiscal years was the second highest of the seven university clusters. Only the North Carolina universities experienced a more dramatic increase in R&D expenditures at 10.4%.

- *In four years, R&D expenditures by the URC has increased by $253 million.*

In 2006, the first year the URC began tracking its performance relative to other universities, the URC spent just under $1.4 billion. As of 2009, the URC spent over $1.6 billion—an increase of over 18%.

- *The URC universities devote the largest portion of their R&D spending to the life sciences and engineering.*

In 2009, the URC spent $1 billion, or 63% of its R&D expenditures, on the life sciences. The life sciences industry is an important industry in Michigan employing 80,000 people (2% of total employment in Michigan). The second largest expenditure, 16% or $261 million, is in engineering R&D.

- *URC licensing revenue is low relative to its R&D expenditures.*

In both 2008 and 2009, the URC ranked fifth (out of seven) in licensing revenue generated by each dollar of R&D expenditure. The URC performed better than the North Carolina and Pennsylvania clusters. The URC's recent increase in R&D expenditures may generate greater licensing revenue in the future.

Net economic impact	$14.8 Billion
Operational expenditures	$7.5 Billion
Wage and salary earnings of URC alumni in Michigan	$26 Billion
Research expenditures	$1.632 Billion
Start up companies cultivated since 2004	71
Patents granted*	136
Licenses/options*	131

*Average per year between 2005 - 2009

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