2015

Discovery: Research Annual Report 2015

Office of Vice President for Research

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Research and discovery are at the heart of our mission at the University. It drives performance and content in the classroom, laboratories, and studios. It guides our social responsibility to be part of the solutions facing our region, state, and nation. It defines who we are as a national research institution of higher learning.

This past year was a great one for WMU Discovery. An increase in collaboration and multidisciplinary teamwork led to a sharp increase in the 2014-15 grant totals, $8 million above the previous year.

We have worked to encourage and facilitate large collaborative, multidisciplinary partnerships. Success here has helped to establish Western Michigan University as a leader in flexible electronics, education, autism, and transportation research among others. The expertise and value of our faculty have been nationally recognized. You can see the results of their work here within the pages of the 2015 Discovery Annual Report.

WMU has a long, storied tradition rooted in the idea that each of us can make a difference. Today that difference involves knowledge generation that is spread through education, technology transfer, and commercialization that impacts the national and global environment and makes a difference in the local community and broader region. This year’s report showcases the reach of our research as it helps those here in our community and offers the opportunity to change other regions. The Autism Excellence Center is a good example of how our expertise makes a difference to families here in SW Michigan. But beyond that, we seek to educate and build capacity so that families in need of resources across the nation can be served by our discoveries.

We are a learner-centered, discovery driven, and globally engaged University. We invite you to join us in this commitment to our mission. Together we can make a difference by the discovery work we do daily here at WMU. To learn more about the University and our research endeavors, visit wmich.edu/research.

John M. Dunn, Ed.D.
President

Daniel M. Litynski, PhD
Vice President
Office of the Vice President for Research

"Autists are the ultimate square pegs, and the problem with pounding a square peg into a round hole is not that the hammering is hard work. It's that you're destroying the peg." Paul Collins, author
An increase in collaboration and multidisciplinary teamwork has led to a sharp rise in grants to Western Michigan University. Externally funded awards, much of them for research, pushed the grant total for the 2014-15 fiscal year past $35 million, an increase of nearly $8 million over the previous year. The grant total in June, the last month of the University fiscal year, came in at $3.7 million.

The year-end grant total—$35,166,490—is roughly $8 million above the $27,179,910 tallied for fiscal year 2013-14.

“Our office has been encouraging and facilitating large collaborative, multidisciplinary, multi-institutional and multi-national partnerships to successfully receive large grants and to create and support research centers,” says Dr. Daniel Litynski, WMU vice president for research. “WMU’s outstanding faculty can and do compete and collaborate with the best institutions and experts in the nation in our areas of expertise.”

A good example of large collaborative efforts funded during the period is a more than $3.2 million First in the World grant from the U.S. Department of Education to use unique opportunities afforded by the Kalamazoo Promise to build an institutional culture focused on increased access and degree completion for underrepresented, underprepared or low-income students.

The grant, co-directed by Drs. Andrea Beach, professor of higher education leadership, and Dr. Charles Henderson, a professor with a joint appointment in WMU’s Department of Physics and its Mallinson Institute for Science Education, is meant to create and validate through ongoing research, student success programs that can tackle the problem of low rates of degree completion. The goal is to create programs that other universities can adopt, knowing there is sound research data behind the strategies embraced and replicated.

A $4 million award from the Michigan Department of Community Health to boost autism research and training.

The grant, awarded to Drs. Stephanie Peterson and R. Wayne Fuqua, chair and professor of psychology, respectively, is being used to establish the WMU Autism Center of Excellence, increase enrollment in behavior analysis training programs and provide more services to children with autism and their families.

Grants of $923,700 and $1.4 million from the U.S. Department of Transportation established and support the Transportation Research Center for Livable Communities in cooperation with four other universities. The project is being carried out by a multidisciplinary team of researchers headed by Dr. Jun-Seok Oh, professor of civil and construction engineering and the grant’s principal investigator, and Dr. Osama Abudayyeh, professor and chair of the Department of Civil and Construction Engineering and associate dean of the College of Engineering and Applied Sciences. Other key colleagues are from civil and construction engineering, blindness and low vision studies, psychology and geography and urban planning, computer science and special education. Those two grants, along with additional grants of $1.4 million and $469,600 will fund the center through September 2018.

A series of grants awarded to CAPE—the University’s Center for the Advancement of Printed Electronics, which has been honored for its groundbreaking work in advancing the field of flexible electronic and printed electronic technologies. Recent work headed by Dr. Massood Atashbar, professor of electrical and computer engineering, and Dr. Margaret Joyce, professor of chemical and paper engineering, was integrated earlier this year into a new center called the Flexible Electronics Applications and Technology—FEAT—Center. This is now a regional and thematic node which is part of a national $171 million Department of Defense manufacturing innovation initiative known as the Flexible Hybrid Electronics Manufacturing Innovation Institute.
Autism Resource Launched at WMU as part of $4 Million from State of Michigan

Michigan Lt. Gov. Brian Calley and a number of Michigan legislators and state officials were at Western Michigan University this fall to help open a major new resource for Michigan families—Western’s Evaluation Center for Autism and Neurodevelopmental disorders—known as WECAN.

Located in WMU’s Unified Clinics on the University’s Oakland Drive Campus, the new center is part of WMU’s multifaceted Autism Center of Excellence. Families will be able to visit WECAN and work with an interdisciplinary diagnostic team specializing in autism spectrum disorder to have children’s skills assessed along with family needs. They’ll receive a diagnosis along with individualized treatment recommendations, if appropriate. The assessment will be based on high-quality, autism-specific assessment tools, observation, interviews and the team’s clinical expertise.

“Western Michigan University is the best in this field, anywhere in the nation and probably anywhere in the world,” said Calley in his comments as he lauded the University’s work in training professionals and providing services for children and families. “It totally changes the direction of people’s lives... And Kalamazoo is way ahead of the curve in putting together partnerships and expertise together with the local educational system.”

WECAN is one of several elements of the WMU Autism Center of Excellence, which was funded by a special $4 million appropriation by the Michigan Legislature that is administered through the Michigan Department of Health and Human Services. The funding for service and training is designed to increase Michigan’s capacity to train professionals and expand services so that families will not have to wait so long for diagnosis and treatment. WECAN opened for client appointments in mid-September.

“WECAN will be equipped to deliver the “gold standard” of diagnostic evaluations and other assessments for children with autism,” says Dr. Stephanie M. Peterson, chair of the psychology department, who with Dr. Wayne Fuqua, professor of psychology, co-directs the Autism Center of Excellence. Peterson says the WECAN will have the advantage of bringing interdisciplinary teams to the evaluation task. Team members will include a licensed psychologist specializing in autism spectrum disorder and behavior analysis, a speech/language pathologist, an occupational therapist and a developmental pediatrician. A psychiatrist and social worker will also be on the team as needed. Dr. Ann Tyler will direct WECAN.

“WECAN will play a pivotal role in our southwest Michigan community and beyond by assisting both medical and educational professionals to identify the most efficient route to diagnosis for intervention eligibility and benefits,” Tyler says. The WECAN opening is the second major step in recent weeks in the development of WMU as a resource for autism related services. During August, WMU trustees approved the purchase of a new off-campus building to house the Kalamazoo Autism Center. That facility will provide the space needed for an education and treatment program for children diagnosed on the autism spectrum. The center is currently located in a smaller private facility.

WMU AUTISM CENTER OF EXCELLENCE

Initiatives

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From invention to commercialization
Technology Development Funds awarded in 2015 provided researchers with support to move their discoveries along the pipeline from invention to commercialization. Three projects received $60,000 in internal support.

Faculty receive awards

Emerging Scholar Award
This award acknowledges the accomplishments of WMU faculty members who are among the rising stars in U.S. higher education. It celebrates the contributions of those who are in the first decade of their WMU careers and have achieved national recognition and demonstrated outstanding promise to achieve renown in their continuing work.

Luigi Berto is an associate professor of history. He is a medieval Latin historian who has carved out an international reputation for his body of new scholarship. In the past seven years, he has produced two books of original historical interpretation and scholarly editions and translations of medieval Latin texts, among other scholarly writings.

Berto’s nominators cited him for the remarkable quantity and quality of his research. They also noted that leading authorities praise the rigor of his scholarship and say it is helping to shape his field of study.

Distinguished Faculty Scholar Award
This honor is WMU’s highest award for a faculty member. It recognizes those whose work constitutes a significant body of achievement that is widely recognized within the national and international academic communities.

Chansheng He is a professor of geography who has been a WMU faculty member since 1995. He is an expert in water resource modeling and assessment as well as integration of geographic information system and simulation modeling for watershed management.

Nominators lauded him for his outstanding leadership and tireless efforts in addressing and raising awareness about a wide range of issues related to water resources management. They also praised him for his innovative yet practical research, high level of professional and scholarly activity, and resourceful collaborations.

Development of a Smartphone-Based, Fully Printed and Flexible/Conformable, Impact Sensing System
Principal Investigator: Dr. Massood Atashbar
Award amount: $20,000

Concussions occurring from head impacts in football have been identified as a major issue for the NFL and the NCAA, governing college football, and for football teams at all levels of play. This project uses printed, flexible, electronic sensors lining the inside of a helmet, along with a circuit to collect data from the sensors, to determine the location and intensity of an impact to the player’s head. The data is sent wirelessly to a computer or cell phone allowing coaches, trainers and parents to track impacts. This data will also allow medical personnel to more accurately diagnose when a player has a concussion. This technology can be applied to other sports and to concussions from explosions and munitions encountered by military personnel.

Use of Tanapoxvirus Recombinant Variants for the Treatment of Breast Cancer
Principal Investigator: Dr. Karim Essani
Award amount: $20,000

The objective of this project is to test the effectiveness of genetically-engineered, human, tanapoxvirus (TPV) for treatment of breast cancer. Several recombinant versions of this virus have been shown to regress human colorectal cancer tumors in a xenograft mouse model. Because these cancercelling TPV target molecular pathways that are common in most cancers including breast cancer, they will be tested for treatment of human breast cancer tumors that are xenografts in the mammery glands of mice.

Preparation of Conductive, Doped, Nano-Zinc Oxide Ink as a Replacement for Indium Tin Oxide (ITO)
Principal Investigator: Dr. Paul D. Fleming III
Award amount: $20,000

This project focuses on creating an electrically conductive ink that is transparent using aluminum doped zinc oxide (AZO) nanoparticles to replace Indium tin oxide (ITO). ITO is used in photovoltaic cells and other electronics where transparency is required, but it is expensive and is difficult to apply because it has to be spin coated in multiple layers on glass. An ink made from inexpensive AZO not only reduces the cost of materials, but also allows the conductive material to be printed in thick layers in a single processing step.
The creation of a lifesaving medical tool for use in developing nations has resulted in a Western Michigan University student team capturing the top spot in the Collegiate Inventors Competition, a program of the National Inventors Hall of Fame sponsored by the U.S. Patent and Trademark Office and the AbbVie Foundation.

WMU May 2015 alumnus Stephen John and senior Joseph Barnett were named winners of the undergraduate gold medal during an event held Nov. 17 at the patent office’s headquarters in Alexandria, Va. With the win against undermedal during an event held Nov. 17 at the patent office’s headquarters in Alexandria, Va. With the win against under

The invention was developed over the past two years. John and Barnett teamed up to create NeoVent after John learned from a Respiratory Therapists Without Borders official about the need for a low-cost medical device that could deliver biphasic positive airway pressure ventilation to prevent lung collapse in premature babies experiencing respiratory distress in hospitals lacking the costly medical equipment that typically provides this life-saving therapy.

Babies born preterm sometimes have underdeveloped lungs and need some degree of respiratory life support. But, due to expense, ventilation equipment commonly available in developing nations is not always readily available in medical centers in underserved parts of the world. Lessons learned abroad motivated Barnett and John to ensure medical centers in developing countries are well equipped.

In October, Barnett traveled to Beijing to attend the Grand Challenges Global Health Summit, an international meeting co-hosted by the Gates Foundation, USAID, and China’s Ministry of Science and Technology, among others. The summit was intended for leaders in global health to collaborate on healthcare solutions for the underserved. Barnett’s trip was sponsored by the Lemelson Foundation, which has partnered with Barnett and John to get their technology to hospitals in the developing world.

Earlier this year, John and Barnett were named winners of the: Lemelson-MIT National Collegiate Student Prize Competition; Brian Patrick Thomas Entrepreneurial Spirit Award at WMU; 2015 James Dyson Award, U.S. Division; and 2015 Biomedical Engineering Society competition for undergraduate biomedical and bioengineering students.

Barnett and John’s invention, NeoVent, which has now earned five national innovation prizes, is a respiratory support mechanism designed to treat critically ill infants, particularly those who live in developing nations. NeoVent converts a low-tech respiratory device into one that provides the additional benefit of a ventilator, but at much lower cost. The invention could help thousands of babies in underdeveloped parts of the world.

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Meet the team

Stephen John grew up in Nepal and returns every summer to volunteer at the United Mission Hospital in Tansen. In Nepal, he helped repair medical equipment in a biomedical department and worked on clinical trials of NeoVent. In May, he graduated summa cum laude from WMU with two under-graduate degrees—one in biomedical studies and another in mechanical engineering. He began medical school at the University of Michigan this fall.

Joseph Barnett started working with students in Honduras after hearing of a shortage of medical equipment. He plans to attend medical school.

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Barnett and John were helped by a Research and Creative Activities Award they received from WMU’s Lee Honors College, and they were a part of WMU’s Haworth College of Business student business accelerator, Starting Gate. Starting Gate helped them set goals, develop a business plan, meet regularly with mentors, attend workshops and pitch to investors.

The latest competition

Established in 1990, the Collegiate Inventors Competition encourages innovation, entrepreneurship and creativity by recognizing undergraduate and graduate students for breakthrough inventions.

“Each year, these emerging innovators transform their ideas into solutions for real world problems,” says Michelle K. Lee, under secretary of commerce for intellectual property and director of the U.S. Patent and Trademark Office—USPTO. “They are an inspiration to those of us committed to promoting innovation and the value of intellectual property.”

Winners were announced at an awards ceremony hosted by Mo Rocca, CBS Sunday Morning correspondent and host of The Henry Ford’s Innovation Nation. Leading up to the ceremony, finalists showcased their inventions and interacted with thousands of USPTO patent and trademark examiners, sponsors, media and the public at the Collegiate Inventors Competition Expo, held Nov. 16-17.

NeoVent, idea to reality

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### Distributions of Facilities and Administrative Funds Recovered

#### External Funding Year-to-Date Award Recipients

**July 1, 2014 to June 30, 2015**

<table>
<thead>
<tr>
<th>College of Arts and Sciences (3%)</th>
<th>College of Education and Human Development (3%)</th>
<th>College of Engineering and Applied Sciences (3%)</th>
<th>College of Fine Arts (5%)</th>
<th>College of Health and Human Services (6%)</th>
<th>President and Vice President for Academic Affairs (12%)</th>
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<td>$11,642,298</td>
<td>$8,295,377</td>
<td>$4,828,662</td>
<td>$1,388</td>
<td>$4,218,487</td>
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**Distribution of Facilities and Administrative Funds Recovered**

<table>
<thead>
<tr>
<th>Distribution of Facilities and Administrative Funds Recovered</th>
<th>General Fund</th>
<th>WMU Research Foundation</th>
<th>University Research Support</th>
<th>OPR Research Support</th>
<th>Development Support</th>
<th>Colleges and Other Units</th>
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<tr>
<td>TOTAL FUND RECOVERED</td>
<td>$3,591,712</td>
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<td>$1,388</td>
<td>$1,388</td>
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**Academic Units Research Support**

- College of Arts and Sciences: $1,410,844
- College of Education and Human Development: $1,000,000
- College of Fine Arts: $1,000,000
- College of Health and Human Services: $1,000,000
-President and Vice President for Academic Affairs: $1,000,000

**Research Development**

- University Research Support: $1,400,000
- OPR Research Support: $1,000,000
- Development Support: $1,000,000
- Colleges and Other Units: $1,000,000

**University Cost Recovery**

- General Fund: $1,000,000

**Foreign (2%)**

**Domestic (98%)**

**TOTAL (as of 6/30/2015)**

- $5,186,491

### External Awards to Faculty and Staff in 2014-15

**July 1, 2014 to June 30, 2015**

<table>
<thead>
<tr>
<th>Institution and Source</th>
<th>Name</th>
<th>Title</th>
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<td>University of Michigan</td>
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<td>University of Michigan</td>
<td>Atashbar, Massoud Zandi</td>
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<td>Al-Fuqaha, Ala I.</td>
<td>Computer Science</td>
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<td>Aktan, Halil M.</td>
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<td>Butt, Steven E.</td>
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<td>Wong, Jun</td>
<td>Computer Science</td>
<td>$2,440</td>
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FACULTY RESEARCH AND CREATIVE ACTIVITIES AWARD 2015 RECIPIENTS

Abdel-Qader, Ikhlas
Electrical and Computer Engineering
A Hybrid Reinforcement Learning System Using Vision and Haptic Feedback for the Visually Impaired
$10,000

Berto, Luigi Andrea
History
Between Empires and Dangerous Neighbors: Constructing and Remembering the Identity of the City-State of Naples (750-900)
$9,992

Ciccantell, Paul
Sociology
Cooperation and Competition in British Columbia and West Virginia
$8,761

Hanson, Nicholas
Health Promotion and Health Education
Now That You’re Having Fun, the Effect of Exercise on the Subjective Experience of Pain
$9,959

Kane, Donald
Biological Sciences
An Analysis of Civil War Crimes in the National Archives
$10,000

Little, Adriane
English, School of Art
Virginia Woolf Was Here: Constructing and Remembering an Academic Identity
$8,748

Liu, Tianbo
Mechanical and Aerospace Engineering
Wind Turbine for Power Generation
$10,000

Mattison, Andrew
School of Music
"The Riel Project": Improving Music Performance by TED-ED
$9,298

Ross, Denise
Psychology
Fun: The Effect of Exercise on the Subjective Experience of Time Flies When You’re Having Fun
$10,000

Steiner, Susan
Biosciences
Effectiveness of a Classroom-based Intervention for Vision and Indoor Outdoors
$10,000

Wilson, Patrick
School of Art
Monofluid Foundation: Sculpture and Imaging from India’s Urban Frontier
$9,985

Wszel, Kristina
Anthropology
Learning to Be Bilingual in a Dual Language Elementary School
$10,000

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Center for Cybersecurity and Monastic Studies
Great Lakes Center for Environmental and Molecular Sciences
Center for the Study of Ethics in Society
Upjohn Center for the Study of Geographical Change
University Center for the Humanities
Michigan Institute
Michigan Reenactment Repository for Research and Education
Science and Mathematics Program Improvement (SAMPI)

Haworth College of Business
Center for Entrepreneurship and Innovation
Global Business Center
Center for Health Information Technology Advancement (with the College of Health and Human Services)
Center for Sustainable Business

College of Education and Human Development
National Research Center for Grandparents Raising Grandchildren

College of Health and Human Services
Center for Disability Services
Center for Gerontology
Center for Health Information Technology Advancement (with the Haworth College of Business)
Center for Health Data Research, Analysis and Mapping
Foster Center for Research
University-Community Empowerment Center

Office of the Provost and Vice President for Academic Affairs
Center for Research on Instructional Change in Postsecondary Education

Office of the Vice President for Research
Resources Research and Communication Center
Evaluation Center
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While every effort has been made for accuracy, there is still the possibility for errors or omissions. We apologize for any that might occur. Please contact us with any corrections for our next issue.

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Photography
Mike Lanka