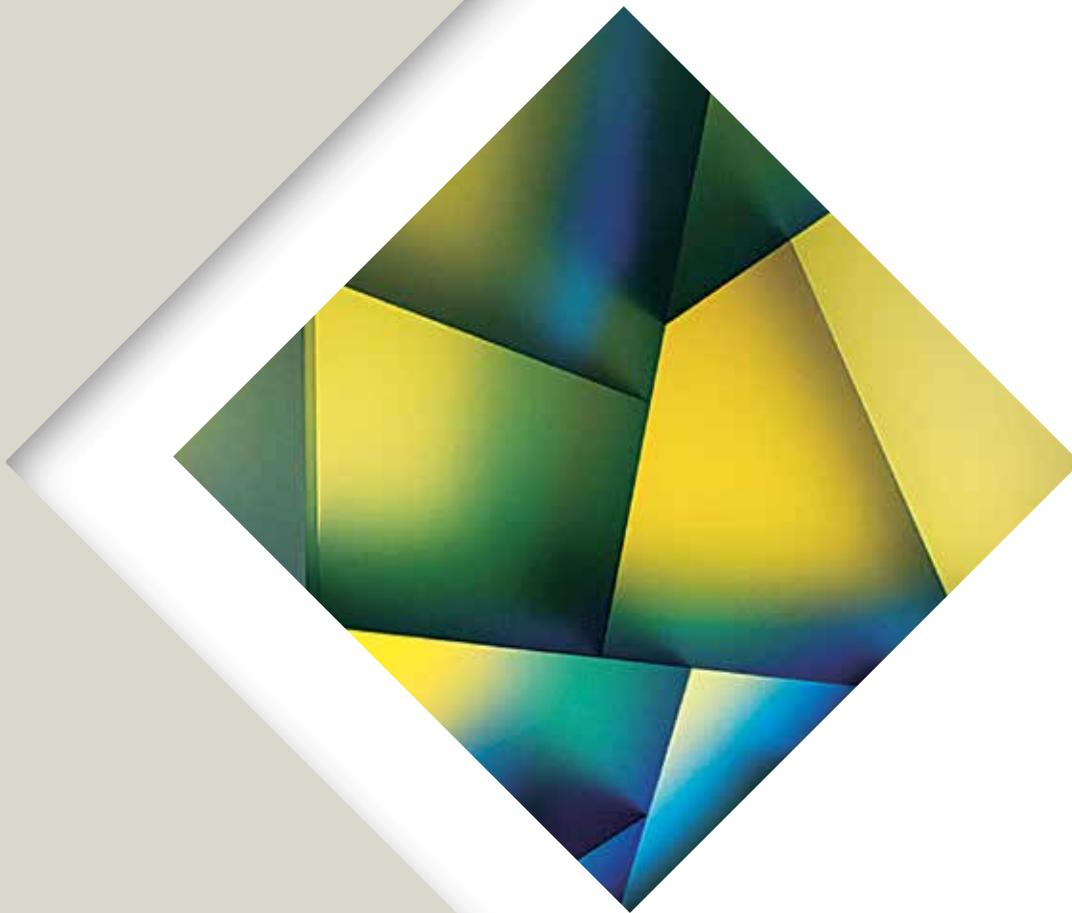


2016 | **RESEARCH PROFILE**
OFFICE OF THE VICE CHANCELLOR FOR RESEARCH
SOUTHERN ILLINOIS UNIVERSITY CARBONDALE



Cover Picture Credit:

Associate professor of glass Jiyong Lee's "Segmentation" series is inspired by microscopic images from life science that visualizes the internal complexity of cells under the skin of their simple forms. The segmented, geometrical forms of his work represent cells, embryos, and biological and molecular structures – each symbolizing the building blocks of life, as well as the starting point of life. The uniquely refined translucent glass surfaces suggest the mysterious qualities of cells – and, on a larger scale, the cloudiness of their futures.



Welcome to research and creative activity at SIU Carbondale.

We had a great year for bringing external support to campus. Sponsored research funding for fiscal year 2016 increased by 21 percent relative to that for fiscal year 2015, in spite of declining grant support from the state. Federal grants and industry funding increased, with overall faculty productivity as measured by dollars captured per full-time equivalency (FTE) reaching an all-time high. Leaders in grants continued to be our School of Medicine and College of Education and Human Services. Many of our grants were multidisciplinary, bridging academic units. SIU Carbondale recently received a highly competitive National Science Foundation grant for STEM (science, technology, engineering and math) scholarships for our students tackling environmental, engineering and societal issues in energy. Our Advanced Coal and Energy Research Center received a \$4.6 million grant for enhancing our energy research and workforce in the region. Many other grants that benefit our research and teaching, and that leverage SIU Carbondale's strengths in the environment, medicine, chemistry, materials technology and agriculture, are pending.

During the past year, research and innovation opportunities at SIU Carbondale increased. We joined the National Academy of Inventors to provide more exposure and engagement opportunities for our inventors. Our Office of Technology Transfer completed a formal policy for developing and transferring commercially viable technology across the SIU system. Our spacious McLafferty Annex Research Building is now online, with resident researchers already securing grants and training

students. A new Innovation and Sustainability Hub in the Student Center is bringing together students engaged in sustainability, STEM, business, design and many other fields to dream big thoughts and take action. More students than ever are engaged in hands-on activity through our Center for Undergraduate Research and Creative Activities and directly from sponsored projects. Research creates experiences for our students and faculty, making us unique for a university of our size, accessibility and regional identity.

The future of research at SIU Carbondale is promising, despite chronic budgetary woes. We are conducting our first research and technology road show in Chicago in October 2016 to connect with industry partners, investors and alumni who are interested in growing innovation on campus and beyond. Our second annual Da Vinci Days celebration this spring will showcase the scholarship of our students and faculty through a series of collaborative, multidisciplinary events. The federal funding climate continues to be tight – but, given past performance, our faculty will successfully compete on the national stage. We are fortunate to have such talented and hard-working scholars at SIU Carbondale.

James E. Garvey
Interim Vice Chancellor for Research and Graduate Dean



Experience SIU Innovation

Innovation is core to research, teaching and learning at SIU.

Founded in 2005, the SIU Center for Innovation serves as a catalyst for innovation and entrepreneurship on campus and as a gateway to regional innovation and entrepreneurship ecosystems. The center works collaboratively to further develop student and faculty involvement in creativity, innovation and venture creation, building upon the university's innovative and entrepreneurial culture on campus and elsewhere. Recent activities include supporting high school entrepreneurship in southern Illinois through the Creating Entrepreneurial Opportunities (CEO) programs in the region; hosting a series of pop-up classes on innovation and sustainability with the SIU Sustainability Office; and participating in the national University Innovation Fellows program.

Earlier this year, the center, Research Park and Sustainability Office opened the Innovation and Sustainability Hub in the SIU Student Center. This flexible outreach space showcases innovative programs and events on campus, highlights sustainability initiatives, and provides a collaborative space in the heart of campus for activities and information dissemination. The Innovation and Sustainability Hub is located in the former Starbucks space in the north end of the Student Center.

SIU WAS RANKED

No. 27 on Forbes' list of America's Most Entrepreneurial Universities 2015 and was the third-largest research institution in the Missouri/Southern Illinois region by the St. Louis Business Journal.



The SIU Center for Innovation is a program of the College of Business and is managed by Lynn Andersen Lindberg through a collaboration with the SIU Research Park.

National Academy of Inventors

- In 2015, SIU was invited to join the National Academy of Inventors (NAI), an organization that serves as the academic arm of the U.S. Patent and Trademark Office. In November, five of SIU's most active inventors and entrepreneurs were inducted as the first SIU NAI chapter cohort. Just one month later, Dr. Yoginder "Paul" Chugh, now an emeritus professor of mining and mineral resources engineering, was named as a Fellow of the NAI. This prestigious honor reserved for inventors who are the most prolific and whose work contributes substantially to societal welfare, quality of life and economic development.



Lynn Andersen Lindberg, MBA

Dr. James Garvey, interim vice chancellor for research (third from left), inducts the first members of SIU's National Academy of Inventors chapter. From left to right: Dr. Ken Anderson, Dr. Matt McCarroll, Dr. David Lightfoot, Dr. Yao Gong and Dr. Yoginder "Paul" Chugh.

University Innovation Fellows

- The University Innovation Fellows program empowers students to become leaders of change in higher education. Fellows are creating a national movement to ensure that all students gain the necessary attitudes, skills and knowledge to compete in the economy of the future. Originally developed through a five-year National Science Foundation grant, the UIF is a program of Stanford University's Hasso Plattner Institute of Design.
- Southern Illinois University supported its first Fellow, Katie Dzugan, a three-degree graduate of SIU, in 2013. There are five active Fellows on campus, with four more in training this fall. In addition to completing six weeks of training and participating in the annual meet-up at Stanford, each student develops and implements a project on campus that provides a solution to a problem or gap on campus that they identified.
- SIU Fellow Deborrius Jeffries' reflection on his experience becoming a Fellow and participating in the meet-up: *"Be motivated by the idea that you might fail, and as a result you'll receive a unique opportunity to learn from it. ... Be driven by dreams and not fears. Go out and do the right thing!"*



University Innovation Fellows experienced being "Nooglers" by participating in design thinking and other innovation-focused activities on the Google Mountain View, California, campus in March 2016.

Summary of Grant Funding, FY 2015 and FY 2016

(July 1, 2014-June 30, 2016)

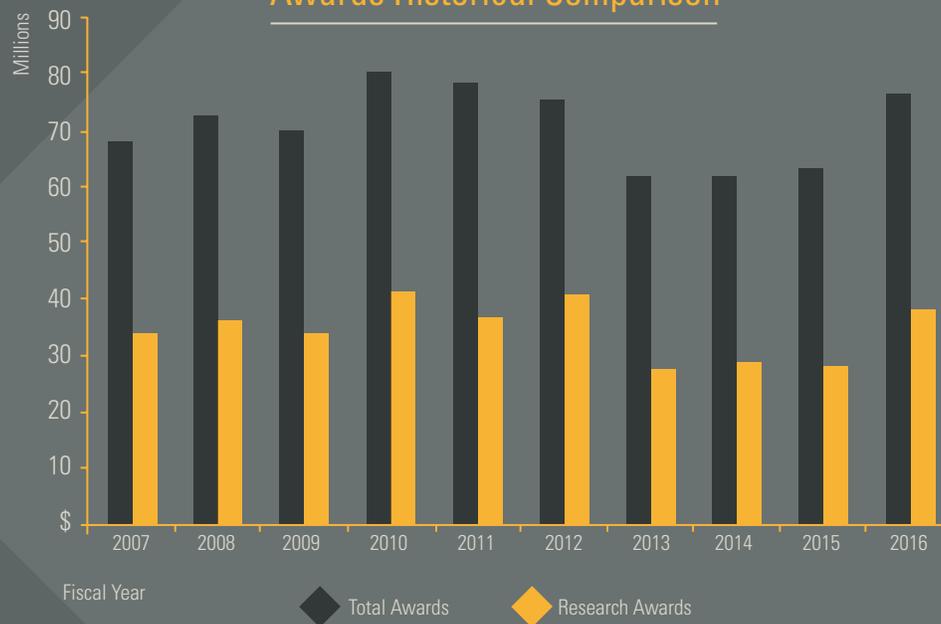
Summary of Grant Funding

	2015	2016
Total grant/contract dollars awarded	\$63,087,870	\$ 76,525,457
Number of grant/contract awards received	439	393
Number of sponsors	193	185
Number of faculty, staff and students receiving awards.....	260	258
Sponsored projects active during fiscal year	904	774

*All fiscal data exclude Financial Aid Office awards. The term "grants" here includes contracts and cooperative agreements.

**Some projects are funded by one-time grant awards that cross fiscal years

Awards Historical Comparison



Grant Funding by Project Type

	2015		2016	
	Number	Dollars	Number	Dollars
Research	255	\$ 27,980,223	250	\$ 38,492,089
Training	56	\$ 4,618,075	45	\$ 2,995,927
Public Service/Other	128	\$ 30,489,573	98	\$ 35,037,442

Additional grant funding data are available at ospa.siu.edu.

Research Expenditures in Science & Engineering (S&E) Fields, FY 2014⁶

from all sources:
\$65,256,000

from grants:
\$32,735,000

from federal grants:
\$16,288,000

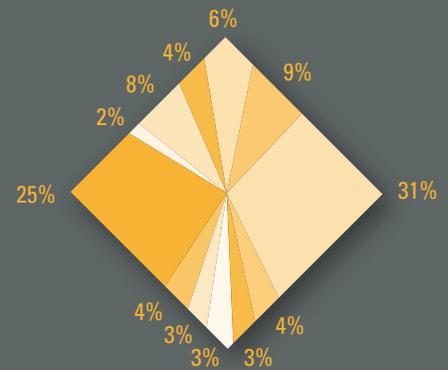
6. As reported to the National Science Foundation for FY 2014. S&E fields include agriculture, social science and psychology, in addition to the sciences and engineering. SIU Carbondale was ranked No. 171 among more than 634 research universities included in the NSF survey.

All federal figures in this publication include federal flow-through funding (federal funds awarded via subcontracts from nonfederal agencies). Figures in some tables and charts do not sum due to rounding.

Top Sponsors, All Grant Funding

	2015	2016
U.S. Department of Health and Human Services	\$12,582,888	\$16,866,950
Genentech Inc.		\$8,497,568
Illinois Department of Children and Family Services	\$6,588,578	\$5,851,545
Clean Coal Review Board		\$4,613,895
Illinois Department of Commerce and Economic Opportunity		\$4,521,823
Murphysboro School District #186	\$4,165,997	\$4,444,318
Memorial Medical Center Foundation	\$3,313,293	
U.S. Department of Defense		\$2,751,566
National Science Foundation	\$2,150,746	\$2,473,152
Illinois Department of Human Services	\$1,930,246	\$1,906,842
Illinois Department of Public Health	\$1,312,945	\$1,541,179
Illinois Manufacturing Excellence Center		\$1,385,258
Illinois Department of Transportation	\$1,355,985	

Awards by Unit, 2015

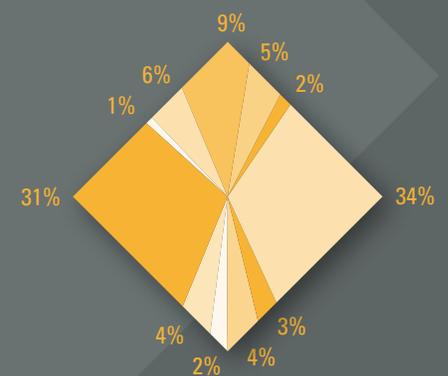


- 6% Agricultural Sciences
- 31% Education & Human Services
- 3% Illinois Clean Coal Institute
- 3% Mass Communications and Media Arts
- 25% Medicine-Springfield
- 8% Science
- 4% Chancellor's Office
- 4% Engineering
- 3% Liberal Arts
- 4% Medicine-Carbondale
- 2% Other
- 4% Vice Chancellor for Research

Top Sponsors, Research Grant Funding

	2015	2016
U.S. Department of Health and Human Services	\$6,666,732	\$6,995,082
Genentech Inc.		\$8,497,568
Clean Coal Review Board		\$4,613,895
Memorial Medical Center Foundation	\$3,261,130	
U.S. Department of Defense		\$2,751,566
Illinois Department of Commerce and Economic Opportunity	\$2,728,615	
National Science Foundation	\$1,661,935	\$1,875,056
Illinois Department of Natural Resources	\$1,264,644	\$1,089,906
MedImmune		\$903,345
U.S. Department of the Navy		\$879,326
U.S. Department of Energy	\$804,102	
U.S. Department of Justice		\$786,409
United Soybean Board	\$742,421	\$782,522

Awards by Unit, 2016



- 5% Agricultural Sciences
- 34% Education & Human Services
- 4% Liberal Arts
- 4% Medicine-Carbondale
- 1% Other
- 8% Science
- 2% Chancellor's Office
- 3% Engineering
- 9% Vice Chancellor for Research
- 2% Mass Communications and Media Arts
- 31% Medicine-Springfield
- 6% Science

Grant Funding by Source

	2015		2016	
Federal	163	\$ 26,875,896	153	\$ 35,140,838
State of Illinois	87	\$ 16,331,417	45	\$ 12,216,853
Industry	75	\$ 6,249,103	77	\$ 17,859,010
Foundation	36	\$ 4,799,234	31	\$ 871,500
Other	78	\$ 8,832,220	87	\$ 10,437,256

"Other" includes College of Applied Sciences and Arts; School of Law; SIU Plant and Service Operations; Office of the Provost; Office of the Vice Chancellor; University College; and Office of the Vice Chancellor for Administration and Finance.

Office of the Vice Chancellor for Research includes Advanced Coal and Energy Research Center; Center for Fisheries, Aquaculture and Aquatic Sciences; Illinois Clean Coal Institute; and Cooperative Wildlife Research Laboratory. Office of the Chancellor includes diversity programs.



Experience SIU Facilities

Welcome to the Annex

The 65,000-square-foot McLafferty Annex Collaborative Research Facility is the latest addition to SIU's research infrastructure. Built as a permanent shell but initially used to store books during the renovation of Morris Library, the unfinished space inside the McLafferty Annex is being converted to world-class interdisciplinary research laboratories and workspaces. An Aquatic Research Laboratory, Fermentation Science Institute and laser facility are in operation, with plans to add a giant stationary magnet research facility and a glassworks studio. With geothermal heating, a floor plan designed to emulate water flow and endless flexibility, the McLafferty Annex will allow for continued cost-efficient expansion of research, training and learning opportunities for SIU faculty, students and the broader community.



Ph.D. candidate Anthony Porreca, facilities manager Andy Coursey and professor Ed Heist, associate director of fisheries, inspect a pallid sturgeon in SIU's new aquatic research laboratory.

SIU's aquatic research and education mission reflects our unique geography, linking our nation's vast freshwater resources with fragile coastal-marine habitats. Located at the northern tip of the Mississippi Delta Region near the confluence of two of the world's great rivers, southern Illinois' regional identity is entwined with aquatic resources and sciences. SIU's state-of-the-art Aquatic Research Laboratory is the premier facility of its type in the region. The 7,000-square-foot laboratory is used to raise marine and freshwater animals for ecology, aquaculture and conservation research, and for student training. Facility users work closely with partners in government, academia, natural resources management and conservation to answer pressing questions in marine and freshwater science while producing generations of experts to care for the world's aquatic resources.



Dr. Matt McCarroll, director of SIU's Fermentation Science Institute, displays hops and malted barley used to brew beer.

The Fermentation Science Institute (FSI) is an interdisciplinary center performing research at the nexus of food science, chemistry, microbiology and engineering. The FSI is an important resource for regional winery, brewing and agricultural industries, and it recently was approved to offer an undergraduate degree program by the Illinois Board of Higher Education. Much of the FSI's construction materials and equipment were donated by alumni, partners and supporters of fermentation education and research.

Technology Transfer Activities

Technologies and innovation created by SIU faculty, students and staff result in a diverse intellectual property (IP) portfolio and complex industry partnerships. The Office of Technology Transfer (OTT) helps to protect SIU IP and attract commercialization partners to ensure that SIU inventions can positively influence the health, well-being and economic development of the region, as well as people across the world. Since 2014, five startup companies have spun off from SIU technologies, with even more IP licensed by established companies. Companies such as Rational Vaccines, Metarmor, Intermetallic Diamond Drilling Solutions, Blueline Biotech and Magnetic Cool promote new job opportunities and regional economic development, in addition to solving some of the world's most pressing problems.

Working with SIU is now easier than ever, thanks to a centralization of OTT in 2016. The office now supports the entire SIU system with improved efficiency and accountability, in addition to offering services to smaller third-party not-for-profit institutions. By providing this important service to hospital partners, regional institutions of higher education, state agencies and other entities, the OTT looks to become a model for similarly sized research institutions in addressing the innovation needs of the community.

For more information, visit siusystem.edu/tech-transfer.

Issued Patents:

Chugh, Yoginder.

Water Sprays for Dust Control on Mining Machines.

U.S. patent No. 8,979,212, issued March 17, 2015.

Kanneganti, Raghuveer; Fadhil, Ahmed; Gupta, Lalitmore.
Systems and Methods for Computationally Distinguishing
Handwritten Pencil Marks from Preprinted Marks in a
Scanned Document.

U.S. patent No. 9,019,570, issued April 28, 2015.

Halford, William.

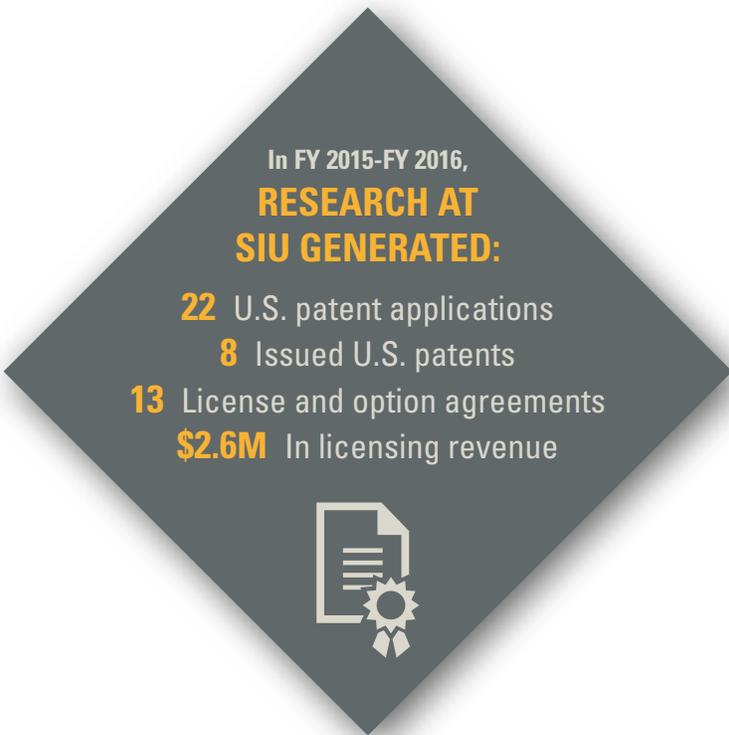
Herpes Simplex Virus Mutant ICPO.

U.S. patent No. 8,802,109, issued Aug. 12, 2014.

Mo, Yin-Yuan; Wang, Fangting.

Genetic Selection System for Identification of
microRNA Target Genes.

U.S. patent No. 8,852,926, issued Oct. 7, 2014.



Turner, Jeremy.

Tinnitus Testing Device and Method.

U.S. patent No. 8,888,712, issued Nov. 18, 2014.

Koc, Rasit.

Synthesis of Metal Borides.

U.S. patent No. 9,073,758, issued July 7, 2015.

Mohanty, Manoj; Mahajan, Ajay; Wang, Haibo; Zhang, Baojie.
Automated System for Coal Spiral.

U.S. patent No. 9,126,205, issued Sept. 8, 2015.

Ramkumar, Vickram; Mukherjea, Debashree; Rybak, Leonard.

Use of Transplatin to Prevent Hearing Loss.

U.S. patent No. 9,248,150, issued Feb. 2, 2016.

Experience SIU Research

Beyond the Bench

Research and creative activity at SIU goes well beyond engineering and science R&D. Hundreds of faculty scholars in music, art, design, liberal arts and other diverse disciplines lead discovery in collaboration with students and peers around the world. For example, SIU's Phenomenology Research Center is a world leader in the study of the human experience. Moral emotions, expression and human rights, race and the body, social theory and more are explored with interdisciplinary collaborators to better understand consciousness and experience.

SIU is a research leader in the electrical-materials-energy ecosystem, with numerous centers dedicated to industry partnerships and applied research. Contact individual centers for more information on how to work with SIU to meet your business' R&D needs.

NSF Consortium for Embedded Systems Industry/University Cooperation Center

- The consortium is a nationally recognized center for research and development in the emerging area of embedded computing system technologies. The consortium was established in 2009 and is funded by the National Science Foundation as a partnership between Southern Illinois University Carbondale and Arizona State University. Federal agencies and industrial members, including Intel, Caterpillar, Toyota, Raytheon and more, fund research projects through the center. For more information, visit enr.siu.edu/ces.

Power Research Program

- The Power Research Program performs research and development in the areas of power systems, power electronics, the "smart grid" and the Internet of Things. The center was



established with founding member Ameren as an extension of SIU's Department of Electrical and Computer Engineering. For more information, contact Dr. Constantine Hatziaodoniou at **618/549-5031** or hatz@siu.edu.

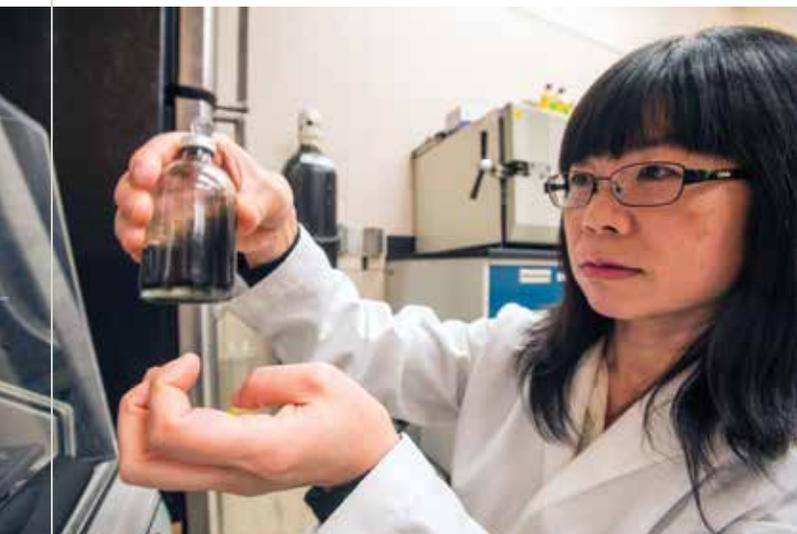
Materials Technology Center

- The Materials Technology Center (MTC) was established in 1983 as a result of a high-technology thrust by the state of Illinois. The center, which was charged with stimulating materials-related research on the Carbondale campus, accomplishes this mission through initiating interdisciplinary research in the colleges of engineering and science, disseminating these results and sponsoring technical seminars. The center encourages research in new areas by administering a competitive grant program that funds startup projects for faculty entering new areas of materials research, and it provides technical, administrative and financial support to startup and established research programs.
- Research at the MTC spans computational materials design, sensors and biosensors, energy storage, carbon-carbon composites, catalysis, magnetic materials, alternative and traditional energy structural materials, polymers and polymer-matrix composites, chemical vapor deposition and infiltration, and plasma-induced deposition techniques. For more information, visit mtc.siu.edu.

Advanced Coal and Energy Research Center

- SIU's Advanced Coal and Energy Research Center (ACERC) helps to solve the big problems related to energy and sustainability in America and the world. From developing algae-based biofuels to improving coal mine safety, ACERC supports research and training through miniature grants, community education and outreach, and student internships. For more information, visit acerc.siu.edu.

To learn more, or to partner with SIU, visit vcresearch.siu.edu, call **618/453-5289**, or email ovcr@siu.edu.



At SIU, The Arts Are Alive.

Art is a permanent feature of SIU's human landscape, with an active and dedicated group of practitioners.



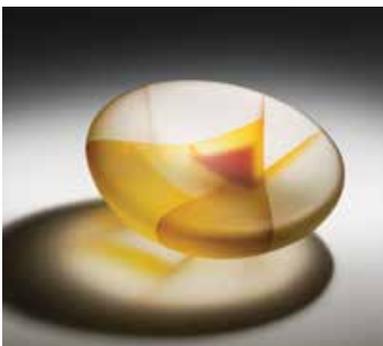
Jerry Monteith, professor of sculpture, is in a show at Gallery 210 at the University of Missouri at St. Louis. The show is titled "Exposure: 10 Years" and is a selection of works

exhibited in Gallery 210's annual "Exposure" exhibition over a 10-year period.



Xuhong Shang, professor of painting, has been invited to an international curated exhibition titled "Artist Statement" that is scheduled to open Oct. 14, 2016, at the CICA Museum in South Korea

and Shanghai Hongqiao Contemporary Art Museum for his solo museum retrospective of 20 years of studio experimentation.



Jiyong Lee, associate professor of glass, was invited to international exhibitions including the Museum of Decorative Arts in Paris, France; a solo exhibition at Clara Scremini Gallery in Paris, France; Tianyuan

International Glass Art Festival in Tianyuan, China; The Handwerk Gallery of Craft Council in Munich, Germany; and The Corning Museum of Glass in Corning, New York.



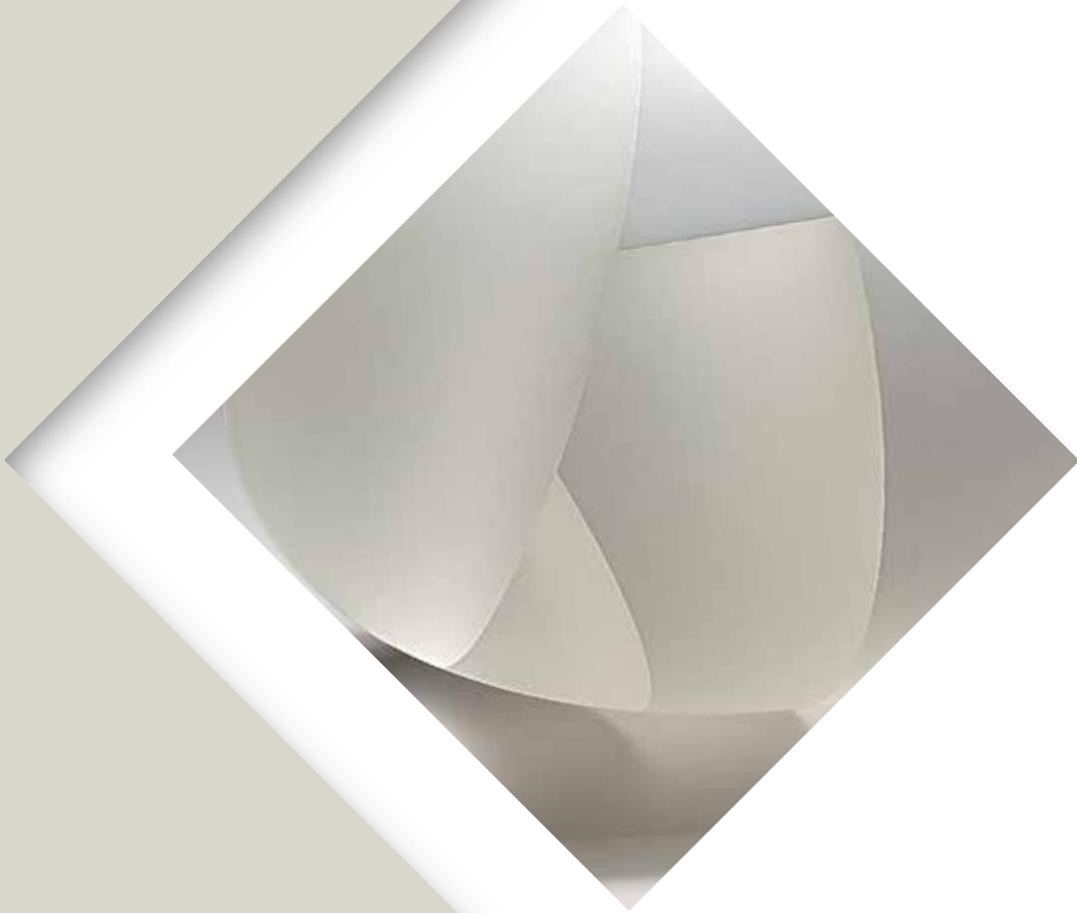
Pattie Chalmers, associate professor of ceramics, had a solo exhibition at Mudmaid Museum at Practice Gallery in Philadelphia and numerous group exhibitions, including "Labilia" at H.F. Johnson Gallery of Art, Carthage College, Kenosha, Wisconsin,

and "Unresolved" at The Galleries of the Cabarrus Arts Council in Concord, North Carolina.



Travis Janssen, assistant professor of printmaking, has work included in "Beyond the Norm," an international print exhibition juried by Susan Tallman, editor of the journal Art in Print, at University Galleries, Illinois State University in Normal. In 2015, his work was included in

two highly competitive juried exhibitions at the International Print Center New York, with each competition resulting in roughly 50 works selected from more than 2,000 entries.



SIU Southern Illinois University
CARBONDALE

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