

The background of the entire page is a top-down view of several petri dishes containing various microbial cultures. The cultures exhibit a wide range of colors and textures, including yellow, white, pink, green, and brown. Some dishes show dense, fuzzy growth, while others have more uniform, smooth surfaces. The dishes are arranged in a grid-like pattern, with some partially overlapping.

RESEARCH PROFILE

2013

Office of the Vice Chancellor for
Research and Graduate Dean

SIU Southern Illinois University
CARBONDALE

A photograph of the Southern Illinois University Carbondale clock tower, a prominent brick building with a white clock face and a dark, pointed roof. The tower is surrounded by trees with autumn foliage in shades of orange, red, and green. The sky is a clear, bright blue. The image is partially obscured by a dark grey overlay on the right side, which contains the main headline.

WE'RE REDEFINING WHAT IT MEANS TO BE A NATIONALLY RANKED RESEARCH INSTITUTION.

Southern Illinois University Carbondale (SIU) is a Carnegie high research activity university, and the only research university in the southern half of Illinois. In 2012, the St. Louis Business Journal again ranked SIU among the top three research universities in Missouri and Southern Illinois.

At SIU, graduate and undergraduate students alike are intimately involved in cutting-edge research conducted across the gamut of disciplines for arts, engineering, humanities, medicine, science and more. In 2012, the U.S. News and World Report ranked the SIU Graduate School a top Graduate School for business, education, engineering, health and medicine, social sciences, and sciences, placing in the top 90 among public universities.

Also in 2012, three additional undergraduates were selected for the 60-student USA Today All-USA College Academic Team, including two on the 20-person first team. In their personal statements, all of these students discussed their undergraduate research experiences as profound.

These results exemplify our motto that we have the brains of nationally ranked research university with the heart of a small college.

SIU's technology transfer efforts continue to grow, and spin off new businesses. In 2012, the Illinois Innovation Index indicated that startups from university technologies continue to grow in the state, and recognized SIU as one of the top two public universities, and top four overall, contributing to this growth.

For fiscal year 2012, more than 230 different funding agencies awarded grant and contract funding totaling in excess of \$75 million to 317 faculty, staff and students.

Research expenditures this year totaled \$71 million. Federal funding remained robust at \$40 million, despite the ending of the federal stimulus program and increased competition for research dollars from other universities. The State of Illinois provided \$18 million in funding for sponsored programs, while support from private industry exceeded \$4 million.

At SIU, faculty, students and staff target excellence in research efforts taking place on every continent in the world. At SIU, big things are within reach.

John A. Koropchak
Vice Chancellor for Research and Graduate Dean

TAKING SIU TECHNOLOGY AND INNOVATION TO THE WORLD.

Research and investigation at SIU Carbondale continue to result in success and growth in generating inventions and patents. Successful commercialization of these inventions is a testament to the value of research to society, and to SIU Carbondale's rich history of basic and applied research.

SUCCESS - BY THE NUMBERS!

SIU Carbondale and School of Medicine disclosed 281 inventions, issued 64 licenses/options and filed 148 patent applications resulting in 53 issued patents since 2000. During this time, SIU Carbondale and the School of Medicine have received more than \$5.3 million in royalties.

In FY2012 alone:

Inventions disclosed = 21
License income and royalties = \$710,882
U.S. Patent applications filed = 12
US patents issued = 4

DIVERSE RESEARCH PORTFOLIO

The University's research portfolio is quite diverse, as illustrated by some of the inventions introduced in 2012.

■ **Dissolving Solid Organic Materials** - Thermaquatica, Inc. is a startup company founded by faculty from the Department of Geology.

Based upon a practical process for the dissolution of solid organic materials, the business is located in the Southern Illinois Research Park. Thermaquatica recently received a seed stage round of investment from NIDUS Partners, LP of St. Louis. NIDUS, a leading Midwest early stage investment group, will provide operating funding, entrepreneurial experience, and marketing support to advance Thermaquatica's technology toward commercialization. The company has already made substantial progress in demonstrating the feasibility of the technology and establishing industrial collaborations. The work continues with support from an Illinois Clean Coal Institute grant, funded by the Illinois Department of Commerce and Economic Opportunity.

■ **Preventing Hearing Loss** - Kathleen Campbell, professor in the Department of Surgery at the SIU School of Medicine, has obtained FDA approval for Phase 3 U.S. clinical trials to be conducted with the U.S. Army. The Department of Defense is providing funding for the trials, which will focus on the use of D-methionine as a preventative agent for noise-induced hearing loss. D-methionine is a protective agent that also prevents or reduces platinum drug induced toxicities, aminoglycoside induced toxicities, and radiation induced oral mucositis. Additional clinical trials are under development.

PATENTS ISSUED THIS YEAR INCLUDE:

■ **Fractioning Peptides and Compounds** - U.S. Patent #8,143,571 Method for fractioning peptides and other compounds, issued March 27, 2012, to Dan Dyer and Gary Kinsel, College of Science, Department of Chemistry.

■ **Detecting Explosives** - U.S. Patent #8,153,065 Fluorescent organic nanofibrils based on arylene-ethylene macrocycles as sensory materials for explosives detection, issued April 10, 2012, to Ling Zang (former faculty) and Tammene Naddo, College of Science, Department of Chemistry and Biochemistry.

■ **Antibodies** - U.S. Patent #8,114,606 ARL-1 specific antibodies, issued February 14, 2012, to Deliang Cao, School of Medicine, Department of Medical Microbiology, Immunology & Cell Biology.

■ **Tinnitus Testing** - U.S. Patent #8,088,077 Tinnitus testing device and method, issued January 3, 2012, to Jeremy Turner, School of Medicine, Department of Surgery (along with James Michael Kinder of Julian, CA).

CELEBRATING TECHNOLOGY INNOVATION

SIU Carbondale continues to support and celebrate technology transfer on campus through the annual Technology and Innovation Exposition. The Tech Expo brings together SIU inventors and potential investors in an effort to promote and enhance the commercialization of technologies developed through University research. The fall 2012 Tech Expo featured faculty technology presentations, a discussion on the application of university innovations for sustainable development and a student idea competition.

ACHIEVING EXCELLENCE.

Innovation and discovery are an integral part of SIU. What follows are just a few of the initiatives, discoveries and highlights for the past year:

PROTECTING SOYBEANS (AGRICULTURAL SCIENCES)

Khalid Meksem, associate professor in the Department of Plant, Soil, and Agricultural Systems, received two awards totaling \$404,636. The United Soybean Board provided \$330,034 for work toward identifying novel genes for resistance to Soybean Cyst Nematode (SCN) and the development of friendly markers to help speed up the introgression of SCN disease resistance genes into elite cultivars. This work was reported in the Dec. 13, 2012, issue of *Nature*. Meksem also received \$74,600 from the University of Missouri Columbia to investigate how virulent populations of SCN are able to overcome or evade resistance. The long-term goal of this research is to utilize this information to develop soybean plants with broader and more durable resistance to SCN.

ALLEVIATING MATH ANXIETY (EDUCATION)

Jackie Cox, visiting clinical instructor with the College of Education and Human Services, received \$388,841 from the Illinois Board of Higher Education for the second year of a three-year project for professional development of kindergarten through eighth-grade teachers. The project encompasses relief of teacher anxiety issues surrounding math, teacher acquisition of mathematical knowledge and in-depth training and application of Cognitively Guided Instruction. The project will increase student achievement in mathematics and improve critical thinking skills by providing teachers with the administrative support structure, classroom tools, and knowledge of how students develop their mathematic thinking over time.

TREATING BEHAVIORAL ISSUES OF THE DEVELOPMENTALLY DISABLED (REHABILITATION INSTITUTE)

Joel Ringdahl, assistant professor with SIU's Rehabilitation Institute, received \$252,108 from the U.S. Dept. of Health and Human Services, the first year of a five-year \$1.2 million RO1 grant, for studies that will affect research on behavioral persistence by evaluating response-response and stimulus-response relations and their effect on response strength. This

research is relevant to the treatment of severe problem behavior exhibited by individuals with developmental disabilities. The outcomes of the studies will provide information on how to better design treatments that are resilient to treatment challenges and that will have lasting impact.

IMPROVING THE HEALTH OF MINERS (ENGINEERING)

Yoginder Paul Chugh, professor of mining and mineral resources engineering, and Kanchan Mondal, associate professor in Mechanical Engineering and Energy Processes, received \$135,988 from the U.S. Dept. of Health and Human Services for the final year of a four-year, \$515,000 research study to characterize respirable coal and silica dusts from select mines in the Interior Coal Basin. The overall goal of this study is to protect the health of underground coal miners by reducing their exposure to toxic coal and quartz dusts that can lead to respiratory diseases.

CALCULATING THE ASIAN CARP POPULATION (FISHERIES)

James Garvey, professor of zoology; David Glover, a post-doctorate research fellow; and Gregory Whitley, associate professor of zoology, received \$1.67 million from the Illinois Department of Natural Resources for SIU's Center for Fisheries, Aquaculture and Aquatic Sciences. The funds are for conducting a two-year study that will calculate a consistent estimate of Asian carp density, specie composition, and demographics past the edge of the invasion wave reaching down to the purported "source" of Asian carp near the confluence of the Mississippi and Illinois rivers to assess the success of ongoing removal efforts.

STUDYING GENETIC MATERIAL (MEDICINE/BIOCHEMISTRY AND MOLECULAR BIOLOGY)

Blaine Bartholomew, professor of biochemistry and molecular Biology, is the recipient of two grants totaling \$681,046 from the U.S. Dept. of Health and Human Services (DHHS). Included is \$363,750 for the 18th year (\$4 million in funding to date) of a DHHS project examining the role of chromatin remodeling in gene regulation and transcription activation. The remaining \$317,296 is for the eighth year (\$2 million to date) of a study to determine how the ISWI class of ATP-dependent chromatin remodeling complexes remodels and spaces nucleosome arrays, and how this process establishes a repressive chromatin structure.



UNDERSTANDING PROGESTINS (MEDICINE/PHYSIOLOGY)

Lydia Arbogast, physiology professor, received \$50,000 from Excellence in Academic Medicine to assist with her ongoing research on the effects of progestin compounds on catecholaminergic neuronal activity. Catecholamine neurons affect different physiological processes and this study will aid in understanding how progestins may have similar or different effects than natural hormones in regulating catecholamine neuronal activity. As an SIU researcher, Arbogast has received nearly \$4 million from the National Institutes of Health and the American Heart Association since 1998 for her research on molecular aspects of reproductive neuroendocrinology.

FIGHTING CARDIAC DISEASE (MEDICINE/BIOCHEMISTRY AND MOLECULAR BIOLOGY)

Sukesh Bhaumik, associate professor of biochemistry and molecular biology, received \$71,500 from the American Heart Association for the second year of a project for research involving the cellular mechanisms that remove lesions from the transcriptionally active genes, hence maintaining genome integrity for normal cellular functions. The results should provide crucial information for designing and developing drugs to prevent the onset of cardiac and other human diseases. Bhaumik has received nearly \$1 million from the National Institutes of Health, American Cancer Society, Edward Mallinckrodt Foundation and Excellence in Academic Medicine since 2006 for his research into the regulatory mechanisms of eukaryotic transcription and its coupling to DNA repair.

RNA SPLICING (MEDICINE/BIOCHEMISTRY AND MOLECULAR BIOLOGY)

Ramesh Gupta, chairperson of biochemistry and molecular biology, received \$291,000 from the National Institutes of Health for the fifth year of a study of RNA splicing in Archaea. Post-transcriptional RNA processing can regulate gene expression, which is essential for the control of cellular metabolism, growth, and differentiation. Archaea often have eukaryote-like processes thus serving as much simpler model systems to

gain insights into these complex cellular events. The overall comprehension of these processes in archaeal systems will provide an understanding of similar processes in human systems under normal conditions and the changes that may occur under diseased conditions.

OVARIAN CANCER STUDY (MEDICINE/PHYSIOLOGY)

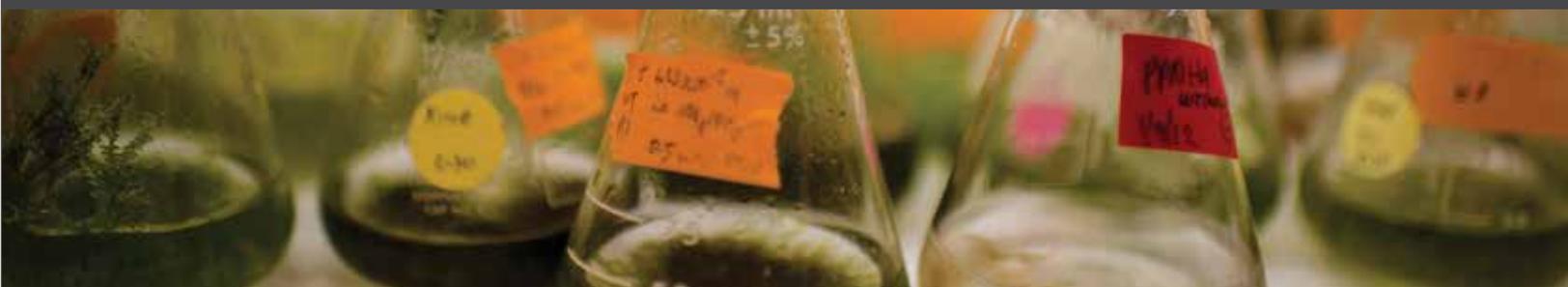
Kanako Hayashi, assistant professor of physiology, received \$50,000 from Excellence in Academic Medicine for a translational study to establish whether the drug Niclosamide has therapeutic potential against ovarian tumor growth and progression in a pre-clinical model. The study will first determine the effect of Niclosamide on cell functions in ovarian cancer cells. Then, to determine the effect of Niclosamide on ovarian cancer tumor growth and progression in vivo using an orthotopic xenograft animal model, they will determine the effective growth inhibitory dose range of Niclosamide.

ENHANCING BIODIVERSITY (SCIENCE/PLANT BIOLOGY)

Sara Baer, associate professor of plant biology, is the recipient of \$318,914 from the National Science Foundation for a five-year collaborative research project with Kansas State University to elucidate the degree to which deterministic factors and stochastic processes interact to enhance biodiversity in a restored community and whether biodiversity change scales to affect ecosystem function.

UNDERGROUND EDIBLE VEGETABLES (INTERDISCIPLINARY - PLANT BIOLOGY AND CIVIL AND ENVIRONMENTAL ENGINEERING)

Stephen Ebbs, associate professor of plant biology, and Xingmao Ma, associate professor of civil and environmental engineering, received \$499,048 from the U.S. Dept. of Agriculture for a four-year research project to comprehensively and quantitatively characterize the accumulation of specific Engineered Nanoparticles in selected below-ground vegetables and to develop models of dietary exposure risks based upon data for the nutritional bio-accessibility of the ENPs in those edible plants.

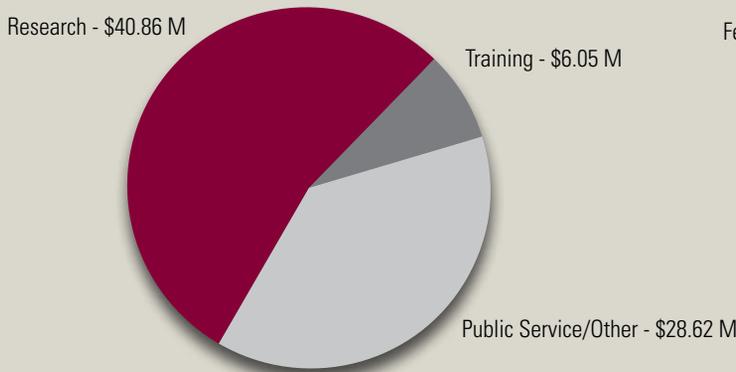


SUMMARY OF GRANT FUNDING, FY 2012¹

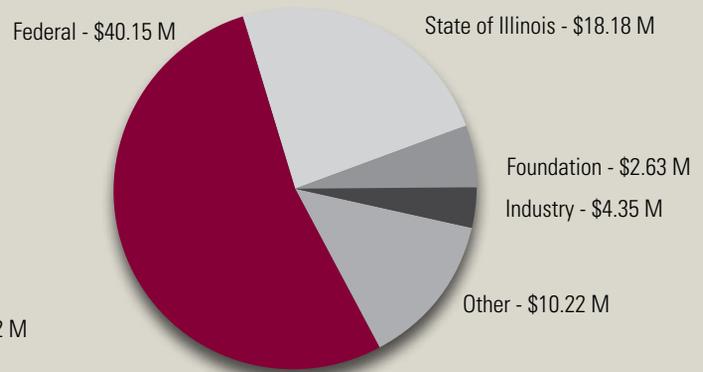
(July 1, 2011 - June 30, 2012)

Total funds awarded²	\$75,527,415
Number of grant awards received	563
Number of agencies awarding grants	234
Number of faculty, staff, and students receiving grants	317
Number of grant projects active during fiscal year³	1,187

Grant Funding by Project Type



Grant Funding by Source



Grant Funding by Source versus Project Type⁴

	Research		Training		Service/Other	
Federal	151	\$ 27,176,164	13	\$ 3,860,472	50	\$ 9,110,494
State of Illinois	59	\$ 5,633,149	12	\$ 1,501,349	40	\$ 11,046,846
Industry	61	\$ 4,212,606	2	\$ 101,383	3	\$ 37,200
Foundation	28	\$ 1,145,216	7	\$ 138,233	13	\$ 1,347,734
Other	56	\$ 2,694,217	19	\$ 447,051	49	\$ 7,075,302
Total	355	\$ 40,861,351	53	\$ 6,048,488	155	\$ 28,617,576

Research Expenditures in Science & Engineering (S&E) Fields, FY 2012

from all sources:
\$71,096,687

from grants:
\$36,482,986

from federal grants:
\$22,054,850

Derived from a report for the National Science Foundation, which ranks universities based on expenditures made by each institution for research projects in a given fiscal year, rather than on research grant dollars received during that year. S&E fields include agriculture, the social sciences, and psychology, but exclude education, humanities, the arts, law, library science, and all other non-science fields. "All sources" includes institutional funds and grants.

1. Reported by date awards processed during the fiscal year. Data subject to rounding errors. 2. All fiscal data exclude Financial Aid Office Awards. The term "grants" includes contracts and cooperative agreements. 3. Some projects are funded by one-time awards that cross fiscal years. 4. All federal data include federal flow-through funding (federal funds awarded via subcontracts to the University from non-federal sources). 5. Years 2003-2011 reported by date processed through that year's processing cutoff date (date varies). FY2012 reported by date processed during the fiscal year.

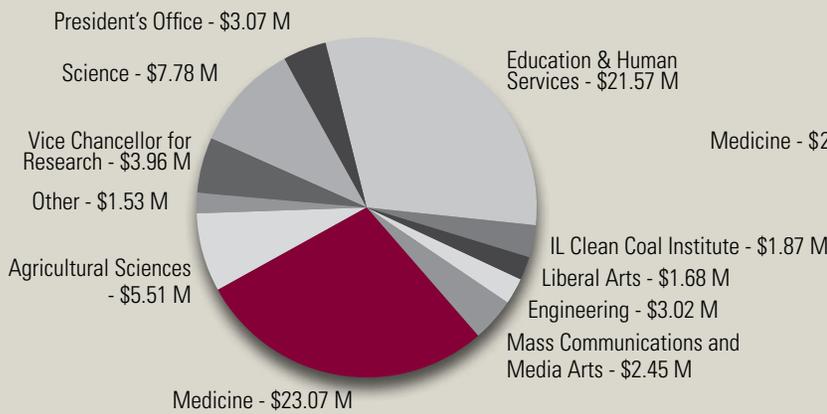
Top Sponsors, All Grant Funding

U.S. Department of Health and Human Services	\$14.92 M
Illinois Department of Children and Family Services	\$6.88 M
National Science Foundation.....	\$5.24 M
Illinois Department of Commerce and Economic Opportunity	\$4.55 M
Illinois State Board of Education.....	\$4.45 M
U.S. Department of Defense.....	\$4.04 M
U.S. Department of Agriculture	\$3.56 M
U.S. Department of the Interior.....	\$2.84 M
U.S. Department of Education.....	\$2.80 M
Illinois Department of Public Health.....	\$2.46 M

Top Sponsors, Research Grant Funding

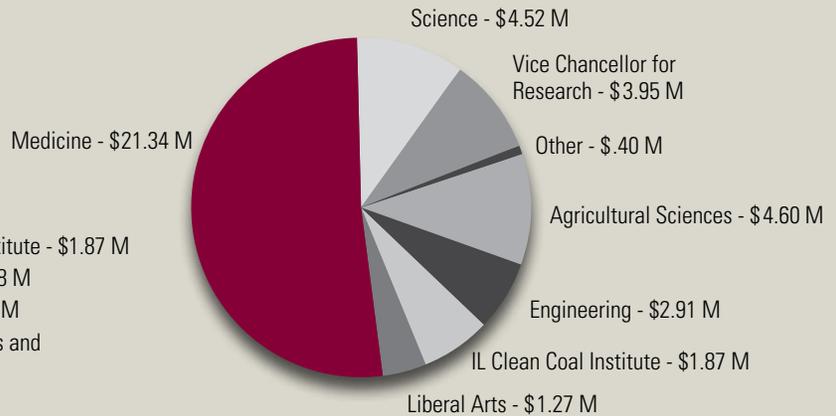
U.S. Department of Health and Human Services	\$12.55 M
U.S. Department of Defense.....	\$4.04 M
Illinois Department of Commerce and Economic Opportunity.....	\$3.1 M
National Science Foundation.....	\$2.91 M
U.S. Department of the Interior.....	\$2.84 M
U.S. Department of Agriculture	\$2.41 M
U.S. Department of the Navy.....	\$1.00 M
University of Illinois	\$0.92 M
North Central Soybean Research Program.....	\$0.56 M
U.S. Department of Justice	\$0.4 M

Grant Funding by Area



Other: Applied Sciences & Arts, Chancellor's Office, Law, Library Affairs, Plant & Service Operations, Provost, Security Office, University College, University Press.

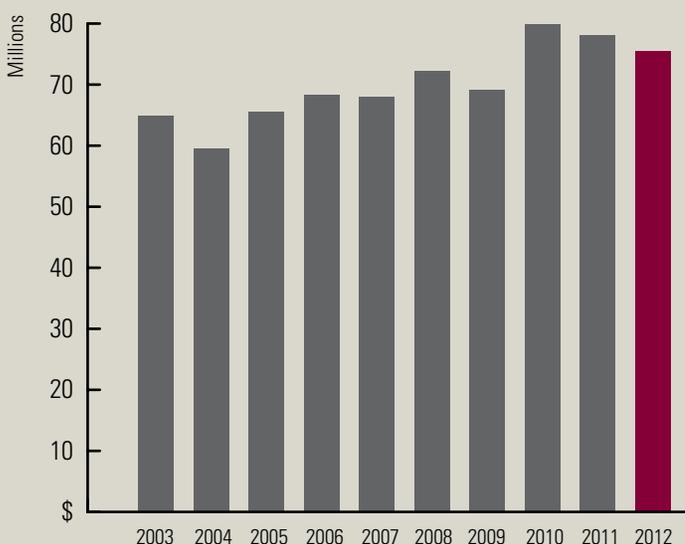
Research Grant Funding by Area



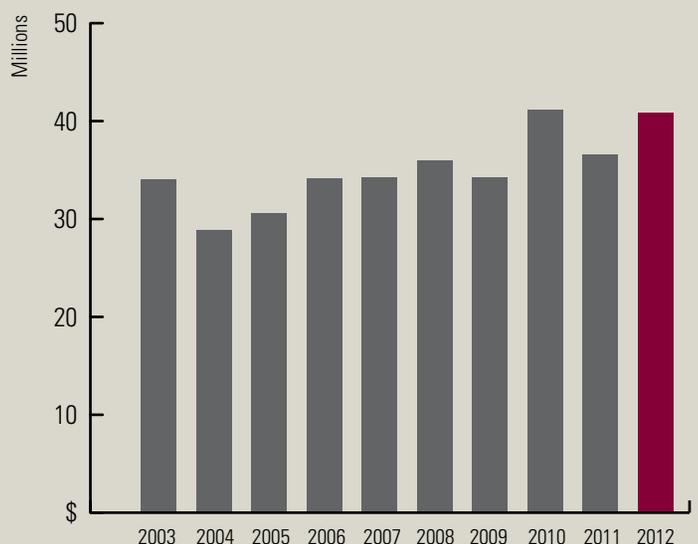
Other: Education & Human Services, Library Affairs, and other areas.

Medicine includes both Carbondale and Springfield campuses. Office of the Vice Chancellor for Research includes the Coal Research Center; Center for Fisheries, Aquaculture and Aquatic Sciences; Graduate School; and Cooperative Wildlife Research Laboratory.

Total Awards for Last Ten Fiscal Years⁵



Total Research Awards for Last Ten Fiscal Years⁵



Due to rounding, values in some charts do not sum.

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

RESEARCH CENTERS AND INSTITUTES

Advanced Energy Institute • advancedenergy.siu.edu/
Center for Advanced Friction Studies • frictioncenter.engr.siu.edu/FS/
Center for Alzheimer's Disease and Related Disorders (Springfield) • siumed.edu/alz
Center for Archaeological Investigations • cai.siu.edu
Center for Autism Spectrum Disorders • casd.siu.edu
Center for Delta Studies
Center for Dewey Studies • deweycenter.siu.edu
Center for Ecology • ecology.siu.edu
Center for Fisheries, Aquaculture and Aquatic Sciences • fisheries.siu.edu
Center for Health Law and Policy • law.siu.edu/healthlaw
Center for Integrated Research in Cognitive and Neural Sciences • siumed.edu/circns
Center for Rural Health and Social Service Development • crhssd.siu.edu
Center for Workforce Development • cdw.siu.edu
Coal Research Center • crc.siu.edu
Center for Embedded Systems • www.engr.siu.edu/ces/
Cooperative Wildlife Research Laboratory • wildlife.siu.edu
Global Media Research Center • gmrc.siu.edu
Illinois Soybean Center • coas.siu.edu/research/illinois-soybean-center
Materials Technology Center • mtc.engr.siu.edu
Meyers Institute for Interdisciplinary Research in Organic and Medicinal Chemistry •
chem.siu.edu/meyers-institute/Homepage.html
Middle Mississippi River Wetland Research Field Station • ecology.siu.edu/pages/fieldstation.html
Paul Simon Public Policy Institute • paulsimoninstitute.siu.edu
Pontikes Center for Management of Information
Safety Center • her.siu.edu/safetycenter.php
Simmons Cancer Institute (Springfield) • siumed.edu/cancer
Special Collections Research Center • lib.siu.edu/scrc

To learn more about SIU research, visit siu.edu/research, or contact:

Rita Cheng • (618) 453-1373 • rcheng@siu.edu
Chancellor

John W. Nicklow • (618) 453-7648 • nicklow@siu.edu
Provost and Vice Chancellor for Academic Affairs

John A. Koropchak • (618) 453-4526 • koropcha@siu.edu
Vice Chancellor for Research and Graduate Dean

Sue M. Rimmer • (618) 453-7369 • srimmer@siu.edu
Associate Vice Chancellor for Research

Wayne Glass • (618) 453-4520 • wglass@siu.edu
Director, Office of Sponsored Projects Administration

SIU Southern Illinois University
CARBONDALE