

RESEARCH AND CREATIVE ACTIVITIES PROFILE

SPRING 2018



Southern Illinois University System
ONE SYSTEM | MANY LOCATIONS | STATEWIDE IMPACT

Spring is here! It is traditionally a time of new beginnings -- when things “bloom” to life. This seasonal cycle is very similar to the process of conducting scholarly research – an opportunity for innovative ideas to “blossom” from the research conducted by SIU faculty/staff/students. However, the quantity and quality of research activities could be compromised by the reduction of essential national and state funding sources. Therefore, our campuses must cultivate alternate financial support to allow them to continue their cutting-edge research.

One area of notable SIU pride is our work throughout the system on technology transfer. This concept deals with patents and licenses issued as well as the creation of start-up companies. In a report entitled, “Concept to Commercialization: The Best Universities for Technology Transfer,” (DeVol, Lee Ratnatunga, April 2017), SIU is among some elite universities – with a national ranking of 76 out of 225 research universities – including Ivy League and Big Ten institutions. This is a shining example of our campuses’ outstanding researchers and their level of productivity.

A second area of continuing SIU pride is the focus on student research. All three campuses have vibrant programs in which faculty mentor student researchers as they pursue new hands-on knowledge – whether it be in a traditional classroom laboratory, an area hospital in central Illinois, or in the jungle of Indonesia.

So as we celebrate the spring season, let’s take great pride in the blossom of knowledge that SIU has generated throughout its decorated history, knowing there will be many more “springs” to come.



Brad Colwell, Ph.D., J.D.
Vice President for Student & Academic Affairs
Southern Illinois University System



SIU MEDICINE

SIUe



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ADVANCING A TREATMENT FOR ALZHEIMER'S DISEASE

More than five million Americans currently are living with Alzheimer's. By 2050, this number could rise as high as 16 million.

To date, Alzheimer's has no cure and current medications have only short-term benefit. Without the development of better disease-modifying drugs, the financial, societal and emotional costs of this disease will continue to grow.

Focused efforts to combat this devastating disease are at the forefront of research in the SIUE School of Pharmacy. With a \$2.65 million Research Project Grant (RO1) from the National Institute of Aging, a division of the National Institutes of Health (NIH), Ken Witt, PhD, principal investigator and associate professor of pharmaceutical sciences, is leading a team of researchers composed of medicinal chemists, pharmacologists and pharmaceuticals experts to develop a drug for the treatment of Alzheimer's. Initial investigations by the research team began more than 10 years ago.

"The NIH has placed a significant amount of responsibility in our hands. We have reached the critical point of developing, testing and retesting various drug candidates in a series of early stage models. Now, we can truly make things happen," Witt said.

Using the process of lead optimization, Witt and his team are identifying and chemically modifying compounds with desirable characteristics for treatment of the disease. The goal is to target specific properties of the compound to increase the desired outcome—in this case, a rise in amyloid beta levels that can potentially enhance brain function related to learning and memory—while limiting side-effects to the patient.

"The high cost of drug discovery is often the result of the undesirable off-target effects that can force the whole project to be reset," Witt said. "Our job is to optimize critical parameters early on in the process so that, by the time the drug is tested in human trials, there is a greater chance of success."

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~Ken Witt~

ENDOMETRIOSIS: FOR ONE SIU RESEARCHER, IT'S NOT JUST WORK, IT'S PERSONAL



When Andrea Braundmeier-Fleming, PhD, was 17 years old, she had already suffered from endometriosis for several years. Endometriosis occurs when the uterus' lining grows outside the uterus, resulting in painful lesions on other organs and possible infertility.

After years of intense pain and numerous surgeries, doctors were urging the teenager to have a hysterectomy to relieve her pain. Knowing she would eventually want to have children, Andrea resisted a hysterectomy, and today she is not only the mother of three, but as a researcher at SIU Medicine, she may have found a way to help women who suffer from endometriosis.

Dr. Braundmeier-Fleming, assistant professor in the Department of Medical Microbiology, Immunology, and Cell Biology, and her colleagues say if they can better understand how endometriosis affects the body's microorganisms, doctors will be able to better diagnose and treat the disease.

Currently, minimally-invasive surgery is how doctors diagnose endometriosis. Recent results from a collaborative research project found that women diagnosed with moderate endometriosis had significantly different bacteria in the uterus and cervix and greater inflammation throughout the body. As a result, Dr. Braundmeier-Fleming says, physicians may be able to diagnosis endometriosis by

analyzing bacteria through swabs or urine samples.

Being an endometriosis patient has simply augmented Dr. Braundmeier-Fleming's passion as a biomedical researcher: "That is why I do the research that I do: to move this field forward."

If successful, her research will help women be diagnosed earlier without surgery. "Hopefully, routine screening and earlier detection will help patients get treated earlier and with more targeted treatments to reduce pain and inflammation." The Endometriosis Foundation of America is funding her research.

Dr. Braundmeier-Fleming's research is just one of the endometriosis

studies under way at SIU Medicine.

Associate Professor Kanako Hayashi, PhD, Department of Physiology, in collaboration with Dr. J. Ricardo Loret de Mola, professor and chair of the Department of OB-GYN, is conducting research that could also lead to improved treatments for endometriosis. Dr. Hayashi's research will determine whether an FDA-approved drug (niclosamide) can affect STAT3 gene signaling within cells isolated from the endometrium to reduce inflammation and curb the unwanted growth of nerves and blood vessels, a condition common in endometriosis. An NIH grant of \$405,625 will help fund their collaborative, translational studies.



FERMENTATION SCIENCE ADDS MALTING FACILITY

The age-old question remains: whether craftsmen in the past made beer because of their ability to grow barley, or if they grew barley so they could make beer.

In any case, in 2018 Southern Illinois University Carbondale (SIUC) is capitalizing on this ancient grain, by augmenting its Fermentation Science Institute (FSI) with the addition of new malting equipment in its state of the art laboratory located at the McLafferty Annex.

With help from a \$120,000 grant from the U.S. Department of Agriculture, the FSI is purchasing a pilot malting facility, which will serve as a training and demonstration site aimed at sparking a new industry in Southern Illinois that will benefit brewers and farmers in the state.

The malting process, which creates sugars, is critical to making alcohol drinks such as beer and whiskey. SIU's automated facility will be able create 500 pounds of malt per batch. The single-vessel system will conduct steeping, germination and kilning all in one tank, with mechanical augurs inside to perform the functions of rakes and shovels.

The FSI also is experimenting with growing barley in 2018, as well.

Officials hope the FSI's custom-designed system will be the lynchpin connecting willing local barley farmers with brewers who want locally grown grains, potentially creating a new industry in the state.

SIUE

1 Chris Herndon, PharmD, CPE, professor in the SIUE School of Pharmacy's Department of Pharmacy Practice, received the 2018 Distinguished Service Award from the American Pain Society (APS). Herndon has dedicated his career to easing the afflictions of others and is the principal investigator for the National Institutes of Health Center of Excellence in Pain Education at SIUE. He led the effort to revise the APS' book, Principles of Analgesic Use, and serves on the Board of Directors for the Midwest Pain Society, the Clinical Practice Guidelines Committee



for the American Pain Society, and the Section Advisory Group on Pain and Palliative Care for the American Society of Health-System Pharmacists, among others.

The National Science Foundation has awarded \$846,416 to SIUE to launch programming that will integrate computational thinking in after-school, student-centered learning in science, technology, engineering and mathematics (STEM) to strengthen minority girls' learning and potentially alter career intentions and preparation. The NSF Exploratory Integration grant supports Exploring Global Challenges: A STEM+C Curriculum for Minority Girls. Principal investigator (PI) is Jesse Dixon, executive director of the SIUE East St. Louis Center. Co-PIs include Sharon Locke, PhD, director of the SIUE STEM Center; Mark McKenney, PhD, associate professor of computer science in the SIUE School of Engineering; and Ann Vogel with the iBIO Institute EDUCATE Center.

3 Suicide is the second-leading cause of death among young adults. More than 1,000 college students die by suicide annually. In an effort to prevent suicides, SIUE has strengthened its commitment to student safety and support through a project funded by a Campus Suicide Prevention Grant. The Substance Abuse and Mental Health Services Administration awarded the nearly \$300,000 grant to the SIUE Schools of Pharmacy and Nursing and SIUE Counseling Services to fund an initiative to Create Awareness, Recognition and Education (iCARE) about suicide and prevention.



ANTIDEPRESSANT STUDY

Depression is a lingering feeling of sadness that interferes with daily life and can last for weeks or months at a time. The National Institutes of Mental Health estimates that 16 million adults – nearly 7 percent of the US population – has at least one major depressive episode annually.

Most people, even those with the most severe forms of depression, can get better with treatment. Department

of Physiology's Assistant Professor Xiang Cai, PhD, is studying the fast-acting antidepressant ketamine to better understand how its cellular mechanisms function in the brain. He has received a \$682,900 grant from the National Institutes of Health for his research. "Our hope is these laboratory studies can aid the design of a new generation of antidepressants," said Dr. Cai.

CLINICAL STUDY TO TEST NEW HIGH BLOOD PRESSURE TREATMENT

2 Researchers at SIU Medicine are conducting a clinical trial to test the effectiveness of a new medication to treat high blood pressure, or hypertension. The NEW HOPE study is led by John M. Flack, MD, MPH, professor and chair of SIU's Department of Internal Medicine. "The impact of high blood pressure on our health is immense," Flack said. "It is the most common reason that patients visit out-patient clinics for treatment. Being part of a clinical research trial gives patients an opportunity to help discover new, safe and more effective treatments for this common but hard-to-manage health concern."

Based on the new hypertension guidelines, 103 million adults in the U.S. have high blood pressure, with 82 million qualifying for drug therapy to lower their blood pressure to less than 130/80. According to the Centers for Disease Control, only about half (54%) of them have their condition under control.

SIU Medicine research teams participate in over a hundred individual clinical trials investigating new diagnostic, treatment, and/or prevention options for patients. These clinical studies span diverse medical conditions including cardiovascular related diseases, cancer, mental illness, Alzheimer's, prematurity, orthopedics, infectious diseases, diabetes, renal diseases, respiratory function, and women's and men's urogenital health, among others.

"LITTLE LEAPS" PROGRAM

Between birth and age 3, a child's brain develops at a rapid pace. The brain is the fastest growing part of the body in the early years, with the brain doubling in volume in the first year. This period of a child's life is significant for brain development—and it has inspired a new project from SIU Medicine's Office of Population Science and Policy. The Little Leaps program provides parents with bags based on developmental milestones. The bags are designed for interactive play and include toys, everyday objects, and activities targeted at cognitive development. Rich interaction between caregiver and child improves memory, speech, and

executive functioning. The program longitudinally tracks a group of 75 children at Hillsboro Area Hospital's day care center over the next two to three years. Being integrated within a center helps ensure if developmental delays are identified, children from birth to 5-1/2 have access to needed support services. Jeanne Koehler, PhD, OPSP's social innovation director and assistant professor of medical education, says, "Our brains develop so quickly in these early years, so it is important to foster strong neural networks through interactive play. In addition, our hope is to strengthen the bond between child and caregiver which supports emotional development as well."



The Southern Illinois University Carbondale 'Security Dawgs' cyber defense team finished second Feb. 17 in the Illinois Collegiate Cyber Defense Competition. Team members, from left, Brianna Yagon, Thomas Birch, Steven Osborn, Christian Scott, Mark Blume, Trenton Taylor, Ben Fairbanks, and Vincent Davis.

1 SECURITY DAWGS MAKE REGIONAL CYBER SECURITY TOURNEY

The Southern Illinois University (SIUC) "Security Dawgs" team capped off its season this spring by earning a coveted spot in the Midwest Regional Collegiate Cyber Defense Competition for the eighth time in 11 years.

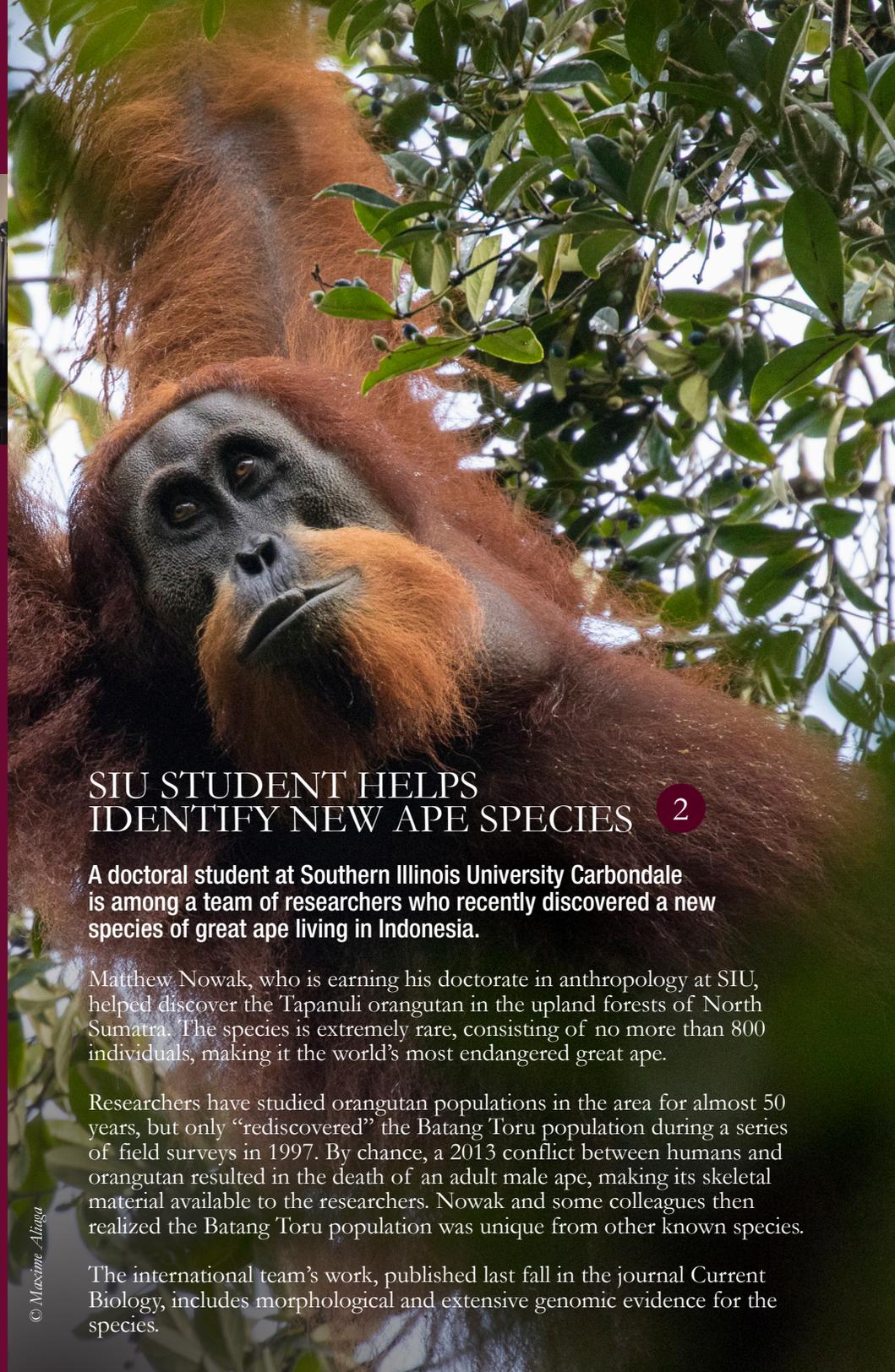
To earn its berth, the team finished second behind Baldwin Wallace University in a wildcard competition March 10. Earlier, the Security Dawgs finished second behind DePaul University in the 11-team Illinois Collegiate Cyber Defense Competition on Feb. 17. The regional tourney was held March 23-24 Moraine Valley Community College.

During competitions, teams work to keep their site secure from hackers and unwanted cyberattacks and are responsible for system maintenance, upgrades, and completing other

requests, such as installing or upgrading a website in the simulated competition. Teams earn points based upon how successful they are at accomplishing the business tasks, in addition to writing incident reports and identifying and stopping hacker attacks.

The Security Dawgs have a strong reputation in collegiate cybersecurity competitions. The team has won three state competitions, most recently in 2014, and finished second in 2015, 2016, and 2017.

"A big part of our plan for success is our camaraderie as a team," Belle Woodward, an associate professor in the School of Information Systems and Applied Technologies, and faculty adviser for the registered student organization, said. "We've gotten really close as a team over the last year."



SIU STUDENT HELPS IDENTIFY NEW APE SPECIES 2

A doctoral student at Southern Illinois University Carbondale is among a team of researchers who recently discovered a new species of great ape living in Indonesia.

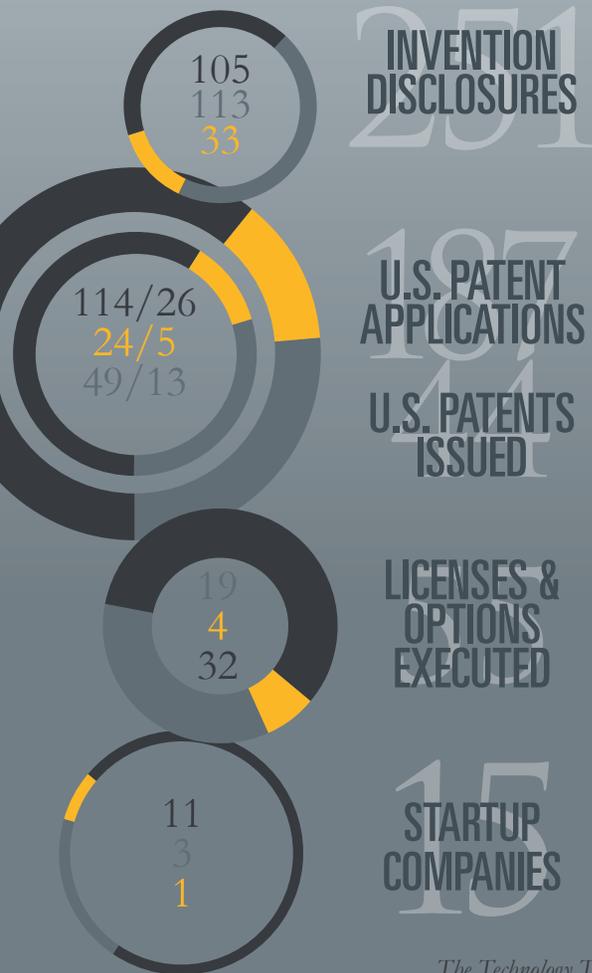
Matthew Nowak, who is earning his doctorate in anthropology at SIU, helped discover the Tapanuli orangutan in the upland forests of North Sumatra. The species is extremely rare, consisting of no more than 800 individuals, making it the world's most endangered great ape.

Researchers have studied orangutan populations in the area for almost 50 years, but only "rediscovered" the Batang Toru population during a series of field surveys in 1997. By chance, a 2013 conflict between humans and orangutan resulted in the death of an adult male ape, making its skeletal material available to the researchers. Nowak and some colleagues then realized the Batang Toru population was unique from other known species.

The international team's work, published last fall in the journal *Current Biology*, includes morphological and extensive genomic evidence for the species.

TECHNOLOGY TRANSFER

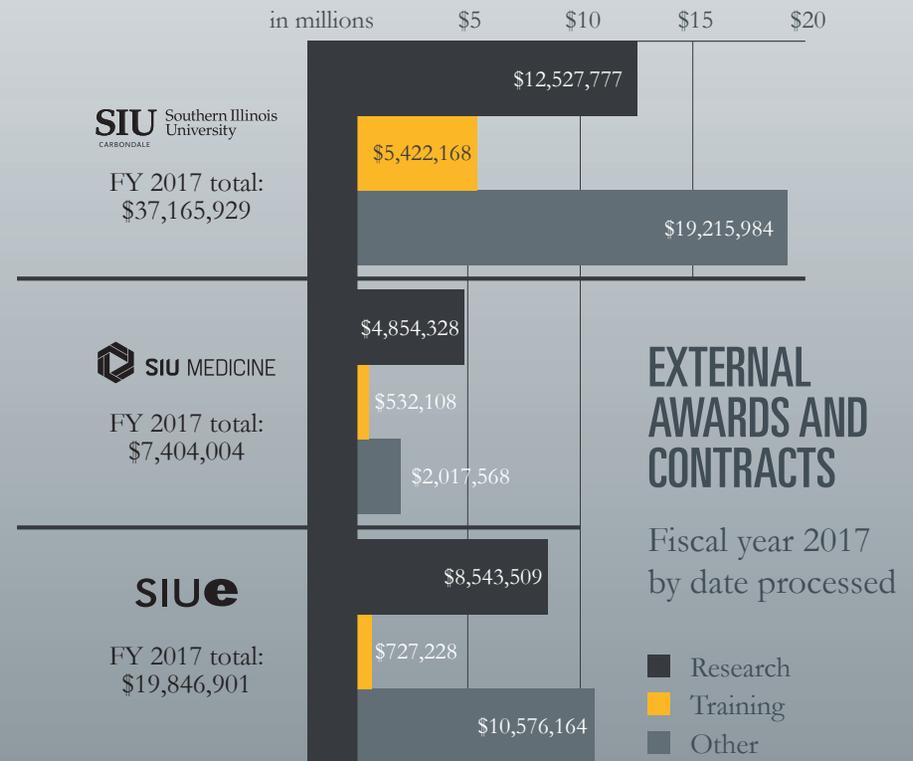
Southern Illinois University (SIU) is among some elite universities when it comes to technology transfer. According to a report titled, “Concept to Commercialization: The Best Universities for Technology Transfer,” (Ross DeVol, Joe Lee, and Minoli Ratnatunga; April 2017), out of 225 universities, SIU is ranked 76 when comparing patents issued, licensees issued, licensing income, and start-up companies—outranking prestigious universities such as Michigan State University, University of Kansas, Auburn University, and University of Notre Dame.



Across the SIU System, there are top-ranked research faculty that spend countless hours exploring while graduate and undergraduate students collaborate with them – learning about the art of invention.

SIU Carbondale
School of Medicine
SIU Edwardsville

The Technology Transfer data reflects a 10-year time period.



TECHNOLOGY HIGHLIGHT

Dr. Boyd Goodson, PhD, professor and acting associate dean of the College of Science, at Southern Illinois University Carbondale, has been involved with the Office of Technology Transfer (OTT) for many years, but much of his current activity revolves around an extensive patent portfolio on MRI enhancement. In April 2014, a single disclosure started the process when Dr. Goodson’s longstanding collaboration with a medicinal chemist from Vanderbilt University resulted in a new discovery. Their work had been heavily funded by NIH over the years, and that initial disclosure served as the spark that developed into a portfolio. Four short years later, the portfolio includes two issued U.S. Patents, two pending U.S. Patent Applications, and another related disclosure currently under evaluation. Some of the newer filings include inventors from Duke University, and the OTT currently works with both universities to protect and market the technologies in hopes of finding a company to license and develop them for the clinics. The hope is to use the compounds in this portfolio to enhance MRI signals, which will potentially improve patient care by increasing image accuracy.



MEET SIU

With more than 1,000 faculty researchers spread across three main campuses, Southern Illinois University is an innovation and economic engine for the southern half of the state.

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SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

As a nationally ranked public research university, SIU Carbondale embraces a unique tradition of access and opportunity. Recently, SIU Carbondale was ranked the 27th most entrepreneurial research university in the US by Forbes magazine and was designated an Innovation and Economic Prosperity University by the Association of Public and Land-grant Universities.

SOUTHERN ILLINOIS UNIVERSITY – EDWARDSVILLE

SIU Edwardsville is a nationally recognized university that provides students with a high-quality, affordable education. Built on the foundation of a broad-based liberal education and enhanced by hands-on research and real-world experiences, SIU Edwardsville equips students to thrive in the global marketplace and make Illinois communities better places to live.

SIU SCHOOL OF MEDICINE

The Springfield-based SIU School of Medicine is a publicly-assisted medical school focused on the health care needs of downstate Illinois. As an academic medical center, SIU School of Medicine trains caring and competent physicians, works closely with the School's SIU HealthCare clinical practice, and engages in innovative scientific research and community service projects.



HIGH PERFORMING

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IMPACT



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ALIGN

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The Southern Illinois University System – where learning comes first, where students are valued and encouraged to explore new ideas, and where progress is complemented by tradition.

The two institutions that constitute Southern Illinois University today – SIU Carbondale, with a School of Medicine in Springfield and partnership in the University Center of Lake County, and Southern Illinois University Edwardsville, with its School of Dental Medicine in Alton and its East St. Louis Center – reach not only from the Shawnee National Forest to the bluffs of the Mississippi River, but also through the flatlands of central Illinois to the shores of Lake Michigan.

With a total budget of about \$867 million, the university employs more than 7,000 faculty, staff and administrators who serve over 28,000 students. As a modern and comprehensive post-secondary educational system, SIU offers a broad range of academic programs that lead to associate, baccalaureate, master's, specialist's, and doctoral and professional practice degrees in 32 fields, including law, medicine, pharmacy and dental medicine.



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