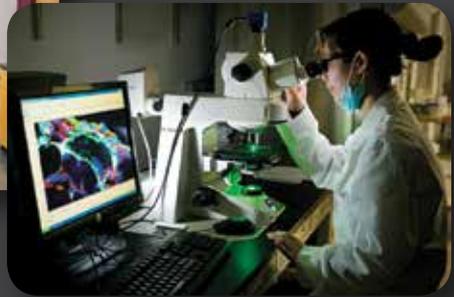


# Research & Creative Activities Profile

Spring 2017



**Southern Illinois University System**

ONE SYSTEM | MANY LOCATIONS | STATEWIDE IMPACT

## From the Desk of System President Randy Dunn

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The ancient Greek philosopher Thales (c. 620 BCE-c. 546 BCE) has been credited as one of the first to explain natural phenomena without references to mythology. He looked up into the sky and down at the earth and described things as they occur empirically. Over 2,500 years later, we are following his search for these basic principles and seeking answers to the things we have not yet come to know.

Across the Southern Illinois University System, our faculty and students are on the cutting edge of scientific discovery. From DNA research and stem cell gene therapy to producing products such as an orally taken drug for noise-induced hearing loss, SIU investigators are creating real solutions for real issues facing people today. In this newsletter, you'll read about those outcomes as well as others, such as combating the scourge of heroin addiction and creating new opportunities for the use of Illinois coal.

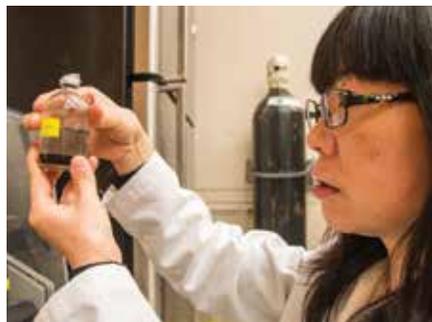
This is the first of our biannual updates about the important research occurring on the campuses of the Southern Illinois University System. By briefly illustrating examples of the great work we're doing, we hope it inspires you, like Thales, to dig deeper and discover more of the real-world solutions we're producing every day.

On behalf of our students, faculty, staff and alumni, thank you for your support of SIU.

Dr. Randy J. Dunn, President

## SIU Carbondale

### Advancing Clean Coal Technology



Bubbling up: Yanna Liang, professor of civil and environmental engineering, examines an experiment on converting coal into methane gas using microbes. (Photo by Steve Buhman)

Two researchers at Southern Illinois University Carbondale are working on ways to convert the innate power of coal into something far more environmentally friendly, and doing so using a technique based on a natural and sustainable process that has gone on for millions of years.

Yanna Liang, professor of civil and environmental engineering, and Satya Harpalani, professor of mining and mineral resources engineering, are using biology to convert coal to methane, which burns much cleaner than coal and produces half the carbon dioxide emissions.

Working with grants from the Illinois Clean Coal Institute and the U.S. Department of Energy, the two engineers are finding ways to fire up the microbes that eat coal and excrete methane. With promising results

already in hand, the method could be applied to the waste coal byproduct left over from coal mining, as well as abandoned coal mines and played-out gas wells across the country.

Possible approaches include injecting microbes into an abandoned, flooded mine, where they could create harvestable methane supplies. Field tests are pending. The researchers ultimately hope the process leads to a cleaner, more environmentally friendly way to use a massive resource here in the United States.

“Instead of treating coal as a waste, as something dirty, we can still use it to get something that is useful,” Liang said.



Breaking it down: Satya Harpalani, professor of mining and mineral resources engineering, examines equipment in his laboratory as he studies how coal samples change as they are consumed by microbes that convert them into cleaner-burning methane gas. (Photo by Steve Buhman)

Learn more at [siu.edu/research](http://siu.edu/research)

## SIU Edwardsville

### Combating Heroin Addiction



Heroin has infiltrated St. Louis’ metropolitan communities and is more prominent than ever. There were 44 confirmed heroin-related deaths in Madison County, Illinois, in 2015, a nearly 50 percent increase from 2014. In a collaboration with the Madison County Probation and Court Services Department and Chestnut Health Systems, Jeremy Jewell, Ph.D., professor of psychology in SIU Edwardsville’s School of Education, Health and Human Behavior, is working to combat this rapidly growing epidemic.

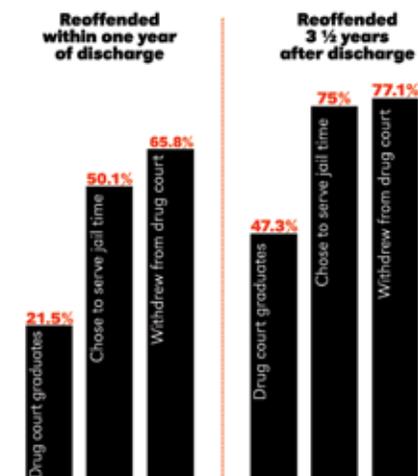
Founded in the 1980s, drug court programs have become an effective imprisonment alternative for convicted drug abusers. The Madison County Superior Court for Drug Treatment (MCSCDT) was the first drug court program in Illinois, and it has provided aid to recovering substance abuse victims in the area since 2005. MCSCDT participants undergo a rigorous, court-

mandated treatment program that generally lasts for 14 months.

Jewell and his colleagues have facilitated diversified treatment opportunities for MCSCDT through two grants from the Substance Abuse and Mental Health Services Administration of the U.S. Department of Health and Human Services: Project Safe Recovery and Project New Direction.

Project Safe Recovery provided treatment for an underserved niche:

#### Long-Term Effectiveness of Drug Court



female drug abusers. The program’s data found that completion of drug court treatment reduces a participant’s risk of recidivism. Jewell has gathered quantitative information that further defends his ongoing research of the long-term effectiveness of drug courts.

Read more at [siue.edu/research](http://siue.edu/research).

Five breakthrough researchers of SIU School of Medicine shared their innovative research at the SIU Technology & Innovation Expo Oct. 13 in Chicago.



**Kathleen Campbell, Ph.D.**, has invented a revolutionary therapeutic drug, D-Methionine, or D-Met, now in Phase 3 clinical trials, which is furthest along in the world for an oral drug to treat noise-induced hearing loss. Her invention shows promise to help the more than 36 million people who suffer from hearing loss.



**William Halford, Ph.D.**, and his biotech firm, Rational Vaccines Inc., have licensed multiple technologies from SIU to treat and/or prevent herpes virus, which infects more than 50 million a year. Halford has found that his live vaccines are 100 times more effective than inactivated vaccines under development. He also is developing a test to more accurately diagnose herpes infections.



A prosthetic designed by **Alberto Colombo, Ph.D.**, could help millions of men suffering from erectile dysfunction. The prosthesis produces a simulated erection without pumps or reservoirs. It uses a nickel-titanium alloy that responds to the temperature similar to the body.



Using stem cell gene therapy, **Andrew Wilber, Ph.D.**, has developed a new approach that potentially can cure severe hemoglobin disorders such as sickle cell disease. The technique inserts new genes into patients' blood cells, helping them "turn on" a gene that had been shut off.

Among their many honors, Campbell, Colombo and Wilber have all named medical innovators by the Sangamon County Medical Society for their projects.

Wilber: [www.youtube.com/watch?v=mEWwHrS0gGc](http://www.youtube.com/watch?v=mEWwHrS0gGc)

Turner: [www.siumed.edu/pubs/aspects/W08/W08s1.pdf](http://www.siumed.edu/pubs/aspects/W08/W08s1.pdf)

Halford: [www.siumed.edu/pubs/aspects/Summer2010/feature4\\_33-3.html](http://www.siumed.edu/pubs/aspects/Summer2010/feature4_33-3.html)

Campbell: [leader.pubs.asha.org/article.aspx?articleid=2478922](http://leader.pubs.asha.org/article.aspx?articleid=2478922)

Colombo: [www.siumed.edu/news/medinnovators.pdf](http://www.siumed.edu/news/medinnovators.pdf)

### SIU Carbondale

1. Ten students at SIU Carbondale will benefit from a grant aimed at helping community college transfer students prepare for careers in the energy sector. The National Science Foundation awarded the \$1 million grant earlier this year. The Southern Illinois Energy Scholarship is, on average, worth about \$7,000 a year for two years.
2. Researchers at SIU Carbondale's Fermentation Science Institute recently found that the relative bitterness of hops in beer can be used to fine-tune flavor in certain types of beers that use wild yeast and bacteria for fermentation by inhibiting the bacteria. Researchers presented the findings – some of the first from the newly created institute – at the World Brewing Congress in Denver in August.
3. Two SIU Carbondale researchers are part of a team that discovered a new species of rain frog in southern Peru. The discovery is described in a recent article published in the open access journal ZooKeys. The lead author is Alex Shepack, a doctoral student working with Alessandro Catenazzi, assistant professor of zoology, who has worked in the area of the Amazon and Andes since 1996. The research team also included members from the University of Michigan and the National University of San Antonio Abad of Cusco in Peru.

### SIU Edwardsville

1. Bill Retzlaff, Ph.D., associate dean in the College of Arts and Sciences and professor of biological sciences, won the Research Award of Excellence from Green Roofs for Healthy Cities for his outstanding contributions to green roof research. Among other things, his efforts have promoted the development of green roofs on six campus buildings at SIU Edwardsville, totaling more than 17,500 square feet of green roof space.
2. Jeff Manuel, Ph.D., and Jason Stacy, Ph.D., associate professors in the Department of Historical Studies, received \$57,127 from the Madison County Regional Office of Education 41 to create and populate an online encyclopedia and digital archive system. They will develop strategic community partners and invite area elementary, middle and high school teachers to join the editorial board.
3. EarthCaching is a new educational activity that combines GPS technology and outdoor activities to allow students to experience Earth's natural wonders. Sharon Locke, Ph.D., associate professor and director of the SIU Edwardsville STEM Center, along with her co-investigators – Thomas Foster, Ph.D., professor in the Department of Physics; Georgia Bracey, research assistant, SIU Edwardsville STEM Center; and Shunfu Hu, Ph.D., professor, Department of Geography – were awarded \$299,547 from the National Science Foundation to develop and study an EarthCaching for Pre-Service Teachers curriculum that includes an Introduction to EarthCaching module and six EarthCaching field-based lessons.

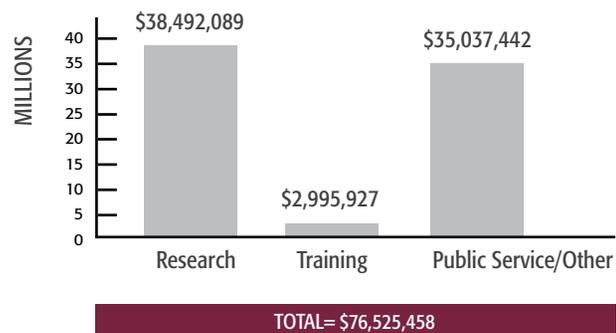
### SIU School of Medicine

1. SIU School of Medicine has joined the White-House led Precision Medicine Initiative (PMI), one of the largest prospective studies of health and illness. PMI will follow 1 million volunteers over time to study lifestyle, environment and genetics of volunteers to help doctors prevent and treat illnesses. Through the Cohort Program, the medical school will begin recruiting volunteers in early 2017. [www.siumed.edu/news/ReleasesFY17/FCM\\_Grant\\_PMI\\_7-18-16.html2](http://www.siumed.edu/news/ReleasesFY17/FCM_Grant_PMI_7-18-16.html2)
2. Hearing loss is primarily caused by the death of sound-sensing hair cells in the ear. Birds, frogs and fish can regenerate these cells. These cells were not thought to regenerate in humans or other mammals until very recently. SIU School of Medicine researcher Dr. Brandon Cox discovered that newborn mice can spontaneously regenerate the hair cells, giving hope to restore these cells – and hearing – in humans. Cox has received a National Institutes of Health grant to study why hearing cells die and how they can be regenerated. [www.siumed.edu/news/ReleasesFY17/Grant\\_NIH\\_Cox\\_7-22-16.html](http://www.siumed.edu/news/ReleasesFY17/Grant_NIH_Cox_7-22-16.html)
3. Stopping breast cancer metastasis is the goal of a new grant awarded to SIU School of Medicine researcher Sophia Ran, Ph.D, from the National Cancer Institute. Her research will study the origins of metastasis and how it can be stopped. Ran's project was initially supported by an SIU Team Science Grant, made possible through Simmons Cancer Institute's Denim & Diamonds Gala. [www.siumed.edu/news/ReleasesFY17/GRANT\\_RanBreastCancer\\_8-29-16.html](http://www.siumed.edu/news/ReleasesFY17/GRANT_RanBreastCancer_8-29-16.html)

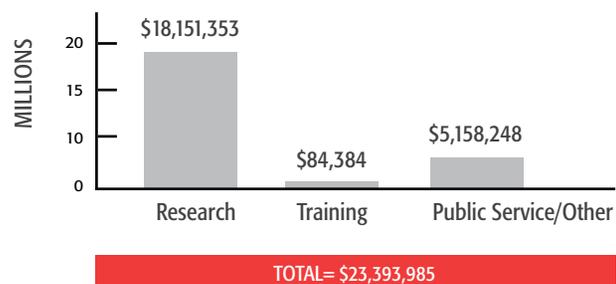
## Fiscal Year Updates

### Grants and Awards Update FY 2016

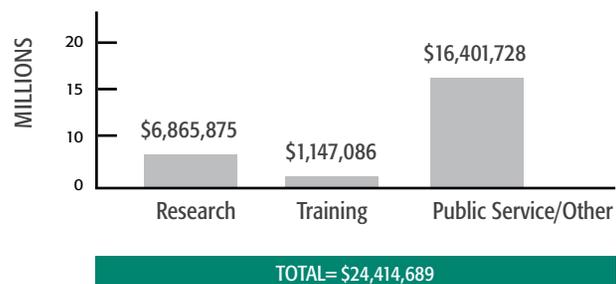
#### SIU Carbondale



#### SIU Edwardsville



#### SIU School of Medicine



## 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.

## Southern Illinois University Carbondale

As a nationally ranked public research university, SIU Carbondale embraces a unique tradition of access and opportunity. In 2015, 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.

*Over the past 10 years, research at SIU resulted in:*

**251** Invention Disclosures

**203** U.S. Patent Applications

**41** U.S. Patents Issued

**59** Licenses & Options Executed

**20+** Startup Companies

## One university, many locations, statewide impact

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 \$897 million, the university employs more than 7,000 faculty, staff and administrators who serve over 30,000 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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