RESEARCH AND CREATIVE ACTIVITIES PROFILE

2019

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Apollo 11 Astronaut Neil Armstrong, the first human being to set foot on the moon, is best known for his quote that started "That's one small step for man . . ." After that historic walk, he later remarked that "Research is creating new knowledge." For Armstrong, the creation and application of new knowledge through research made moon flight possible. And as the lunar program demonstrates, research is essential to advancement of the human condition.

In this latest Research and Creative Activities Profile, we share how faculty and student researchers across the SIU System are creating new knowledge. Our researchers work in the lab, in libraries and archives, and inside the operating room and on the farm, wherever their scholarship leads them. Their collaborations provide interesting, new lines of research for faculty and students alike.

I hope you'll take time to read about Dr. Michael Neumeister at the SIU School of Medicine, who has been studying tissue engineering for the last twenty years. Also in this edition, we explore how faculty at SIU Carbondale are training students and farmers in the expanding field of cannabis research. And lastly, we highlight the work of Dr. Johanna Schmitz, professor of theater history in SIUE's College of Arts and Sciences, who is creating a digital archive to showcase the 1989 discovery of the Rose Theatre in London.

And as always, we highlight points of pride from each of our campuses where collaboration is leading to new discoveries and knowledge.

Speaking of working together, we're pleased to announce that the Southern Illinois University System and the University of Missouri have joined together to create an "Innovation Interchange" helping businesses and entrepreneurs in our two states better access the expertise of university resources through a new web portal. The effort is funded through a matching grant from the U.S. Economic Development Administration.

As Neil Armstrong reminded us, research creates knowledge, but it also generates opportunity and invention, and establishes new goals for future students and faculty to strive towards. On behalf of everyone across the SIU System, thank you for supporting the research and creative mission of our campuses.

Sincerely,

J. Kevin Dorsey

J. Kevin Dorsey, MD, PhD
Interim President

SIUe

BUILDING THE ROSE THEATRE ARCHIVE (1989-2019)

Photo Credit: Gary Walton

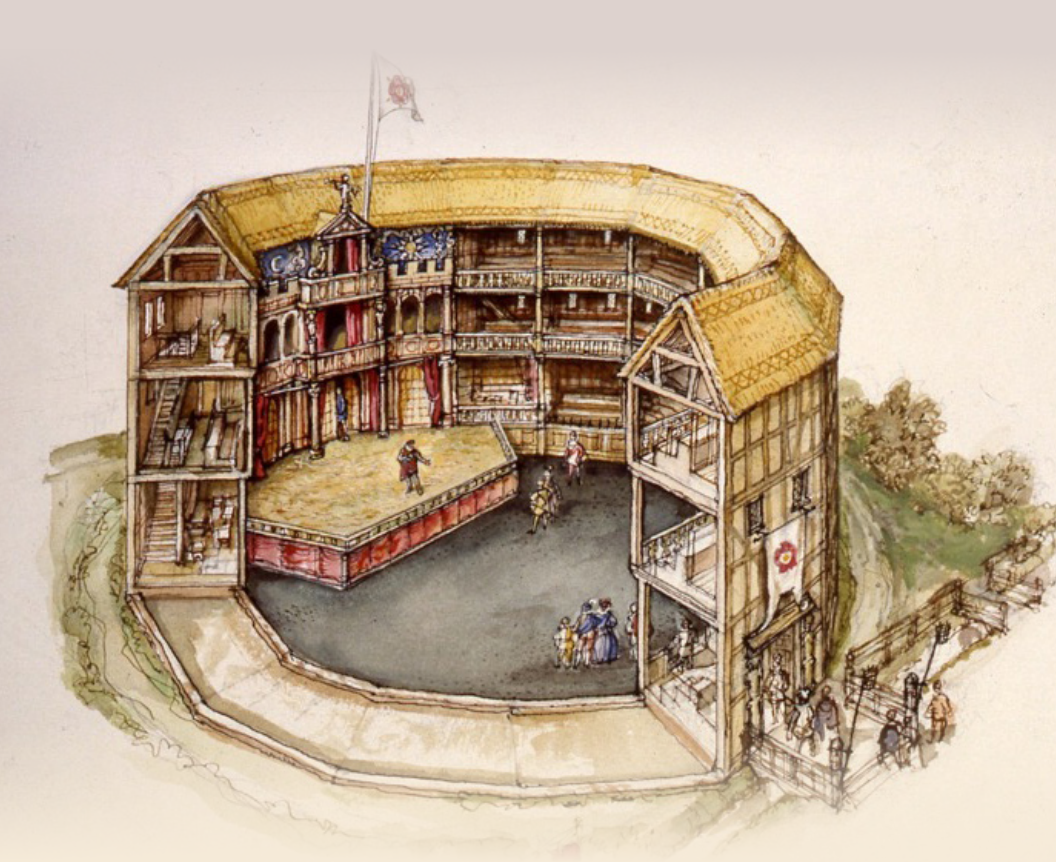
Johanna Schmitz, Ph.D., professor of theater history in SIUE's College of Arts and Sciences, is creating a digital archive to showcase the 1989 discovery of the Rose Theatre in London, which operated from 1587-c.1605 at the height of early modern theater in the Elizabethan and Jacobean eras.

Schmitz's project, "Building the Rose Theatre Archive (1989-2019): Discovery, Protection and Presentation of the Remains of Shakespeare and Marlowe's Theater," will serve diverse research interests in Shakespeare Studies, including theater history, theater architecture, urban planning, performance and cultural monumentalism.

"Dr. Schmitz blends her rich knowledge of Shakespeare's history to this unique archeology find to bring Shakespearean times into our physical world in a way that no other approach to the subject could," said Jerry Weinberg, Ph.D., associate provost for research and dean of the Graduate School. "The preservation through digital archiving creates an opportunity for scholars around the world to study these finds and brings international recognition to the high level of scholarship at SIUE."

"The discovery of the Rose has impacted recent developments in architectural reconstruction, including the design of Shakespeare's Globe Theatre," Schmitz said. "It is not a stretch to say that this archive will preserve 30 years of important developments in our understanding of original practice, historical preservation policies, and even our contemporary sensibilities regarding current performance aesthetics and the construction of memorial spaces."

Located on the south bank of the River Thames in London, the Rose Theatre was a performance venue that featured the plays of William Shakespeare, Christopher Marlowe and their contemporaries. Sometime after 1605, the Rose was demolished and its timber was repurposed.



Rose Theatre conceptual illustration

In 1989, during site preparation for the construction of a new high-rise office building, archaeologists discovered the Rose Theatre's foundation. After months of public protest and construction delays, a new building was redesigned so that the structure would span over the Rose rather than remove it to make space for an underground parking lot. The UK government declared the Rose Theatre foundation an ancient monument in 1992.

Nearly every year since 1990, Schmitz has travelled to London to work and study. In 2001, she became associated with The Rose Theatre Trust, an organization dedicated to preserving the playhouse and began collecting materials for the archive. According to Schmitz, this digital archive will preserve the 30 years including the discovery, protest, preservation and ultimate re-opening of the archeological site as a scheduled ancient monument, museum and newly accessible modern performance space.

Listen to this WISE Radio interview to learn more about Johanna's work with the Rose Theatre: https://streaming.siue.edu/player/JABWdNk1gSvj

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VISUALIZING RESEARCH IMPACTS

The SIUE Graduate School's Visualizing Research Impacts competition offers SIUE faculty, staff and students the opportunity to share the results and impact of their research and creative activities through imagery. Each year, a panel of SIUE alumni selects the award winners, who receive a monetary prize to fund their continued scholarly activities. Here are the winning projects:

1 BEST REPRESENTATION OF RESEARCH IMPACT

Joe Page, Assistant Professor, Department of Art and Design

The vibrant colors, reductive imagery and illustrated movements within Page's "Flow Chart: Vortex" series of wall installations are deceptively simple, a rumination on early video games, pinball machines, mass transit maps and schematic diagrams. A condensed version of Page's larger "Flow Chart" installation body of work, these pieces build upon the visual language of classical labyrinth and mandala motifs, inviting viewers to enter a meditative state of mind. The multimedia artworks incorporate porcelain, paint, vinyl, wire and wood, reflective of the varied historical and contemporary influences within the work. This piece was created for and exhibited during the 2018 National Council on Education in the Ceramic Arts Annual Conference in Pittsburgh.

2 SPOKANE PRIZE FOR SHORT FICTION

If Valerie Vogrin, professor in SIUE's Department of English Language and Literature, had her way, women would be "absolutely intolerant" of corrupt conduct.

"I'm happy to think that maybe women are becoming less tolerant of bad behavior," said Vogrin, winner of the Spokane Prize for Short Fiction, judged by Karen Karbo. Her winning short story collection, *Things We'll Need for the Coming Difficulties*, will be published in late fall by Willow Springs Press. Karbo described Vogrin's manuscript as "original, wickedly funny, satirical at times and heart-bruising."

As Women's History Month came to a close, Vogrin shared her thoughts on the role of writing in her life, and the need for women to write and define their own stories of success. "In her collection's title story, the protagonist is a former academic who finds herself ill-prepared for life in a much-changed, post-disaster world. Now that the

things she thought defined her—her skills in translating poetry and university teaching—are unavailable, she must reinvent herself and find a new source of self-worth," said Vogrin, who joined the faculty of SIUE in 2003. She teaches undergraduate and graduate courses in creative writing, literary editing and literature.

3 THE MUSICAL ENLIGHTENMENT IN EIGHTEENTH-CENTURY SCOTLAND

Andrew Greenwood, Ph.D., assistant professor of musicology in the SIUE College of Arts and Science, has been recognized with the SIUE Graduate School's 2019-20 Vaughnie Lindsay New Investigator Award for his significant research contributions to his field.

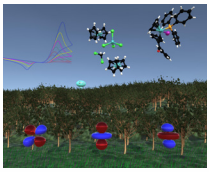
"I am passionate about my research and driven by the question of how music can contribute to the building of new forms of community, understanding and citizenship," Greenwood said.

"In 1707, Scotland lost its sovereignty, and its people turned to their own musical traditions in seeking ways to rebuild sociable connections in the face of social fragmentation," he explained. "The larger stakes of this research raise questions about music's power as a force in strengthening communities not only in the Scottish Enlightenment (c.1720-90), but also in today's world."

Greenwood's intensive research endeavor will involve conducting new archival research with Scottish song collections in the U.S. and Scotland, and revising his dissertation for a book publication.

He notes it would be the "first major book-length study of the relationship of Scottish song and musical culture to the Scottish Enlightenment, and the first major project to conceive the Enlightenment in essentially a musical way."

4 MOST CREATIVE REPRESENTATION OF RESEARCH IMPACT



Mike Shaw, Ph.D., Distinguished Research Professor, Department of Chemistry

The SIUE water tower supervises Shaw's virtual reality (VR) landscape that features d-orbitals lurking in the forest as x-ray crystal structures of compounds gently float by. Electrochemical data are visible in the eastern sky just before sunrise. This image ties together several themes in Shaw's collaborative research. Electron behavior in transition-metal compounds is governed by the physical spaces they occupy around atoms, and those spaces have shapes typified by the orbitals in the forest. The molecules in the sky were generated from x-ray crystallographic data and represent snapshots of these compounds made in Shaw's lab. The electrochemical data are plots of currents versus voltage, and the shapes yield intimate details of the consequences of electron transfer. The particular data here allowed researchers to figure out how to make the compound shown on the top left of the diagram. The entire VR landscape represents efforts to bring research into the classroom through VR technology and virtual worlds.

SIU Southern Illinois University
CARBONDALE

SIU CARBONDALE ROLLING OUT CANNABIS RESEARCH INITIATIVE

Industrial hemp and medical marijuana demand is on the rise. The industries need more trained cultivators and technicians, and farmers want to know more about how they could benefit from these markets.

As laws and society's views on cannabis continue evolving, officials at SIU Carbondale are responding with a new, interdisciplinary initiative to train students and help farmers and growers make better-informed, science-backed choices in their operations. The effort involves areas one might expect, such as agriculture and plant biology, but also chemistry, engineering, business, ecology and other disciplines.

SIU's cannabis science initiative is aimed at creating a program to support agriculture and industry with solid research and top-notch training. The effort is a response to area farmers and students interested in the opportunities presented by the growing markets for cannabis-related products.

Researchers in the College of Science and College of Agricultural Sciences began work securing permits and collecting information a few years ago, with the first actual shovel-and-dirt steps expected this spring in the form of a five-acre hemp research field. Plans call for organizing the program around the dual areas of industrial hemp science and medicinal cannabis science. Along with the hemp field, officials hope to have a program in place this year that would lead to a certificate in medicinal cannabis production.

Karen Midden, interim dean of the College of Agricultural Sciences (now retired) said, "Both of these crops – hemp and medicinal cannabis – show benefits in numerous areas, all the way from health and quality of life to having another natural fiber that can be used in so many ways." "We want a program to support this emerging industry. They need the science we can provide, and we are positioning ourselves to help."

Aldwin Anterola, associate professor of plant biology, sees a lot of potential for research into hemp fiber, as both the market and the science aimed at understanding it is a bit soft, currently.

"We've been engaged and we are trailblazers in this, ahead of the other universities in the state," he said.

SIU MEDICINE

BODY REBUILDING WITH REGENERATIVE MEDICINE

Regenerative medicine is a promising pathway to restore tissue lost to trauma or cancer. Dr. Michael Neumeister, professor and chair of the Department of Surgery at SIU School of Medicine, has been studying tissue engineering for more than 20 years to find ways to use cells from a patient's own body as a reparative resource. His specific interest is in the therapeutic potential of adult-derived human stem cells, which are in all of us and help our bodies to repair wounds and tissue loss. He has isolated the stem cells from adipose (fat) tissue that can be used to create composite tissue such as skin, bone, nerves and muscle.

Current reconstructive efforts use other parts of a patient's body to restore form or function of a missing tissue or organ. Removing skin, muscle or bone from another area of the body to restore tissue removed for cancer resection, or from trauma, results in scarring and distortion at the donor site. Through tissue engineering, it only takes a few cells to develop and grow an entire bone, skin sheet or organ. Neumeister's research team can grow the cells in a medium that allows specialization into different tissue types. The cells can be grown into specific organs and a blood supply applied to them so that they can be transferred as the patients' own tissue to reconstruct parts of the body.

Neumeister is the only person working on regenerative medicine through the basic science of tissue engineering in southern Illinois, as well as the translational work of moving regenerative medicine to the operating room and bedside. New innovations include developing hair-bearing skin with the use of hair follicle stem cells; modifying fat to form nerve cartilage and bone or peripheral nerve reconstruction; ear and trachea reconstruction; and actual bone reconstruction. His lab is also working on the biological scaffolding to help form the structures he is trying to recreate.

Many applications have already been translated into clinical realities where the areas of tissue engineering are being investigated. Most recently, Neumeister found that stem cells can be used to improve the quality of overlying skin in patients who have had radiation as a part of their cancer treatment.

"Our hope is that in the future, patients who suffer from head and neck cancer, breast cancer, lower leg trauma or even birth defects will benefit from tissue engineering and enjoy an improved quality of life," he said.

SIU Southern Illinois University
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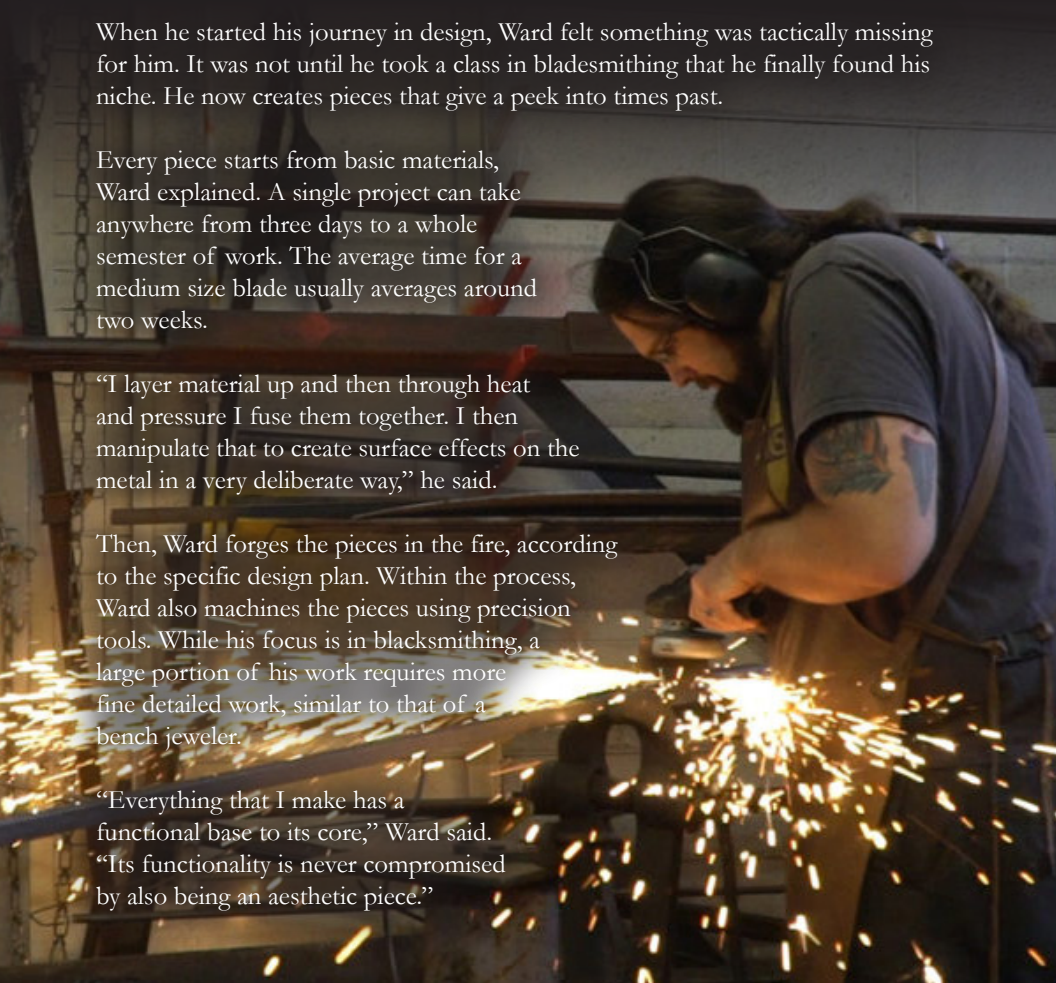
1 BLACKSMITHING STUDENT FINDS HIS NICHE IN ANCIENT WEAPONS

Southern Illinois University Carbondale (SIUC) has the only master's level blacksmithing program in the nation. For most people the word "blacksmith" brings up thoughts of someone in the pioneer days making nails or shoeing a horse. Yet, for Tom Ward, MFA student at SIUC, blacksmithing holds a very different meaning.

With a specialization in ancient weaponry, Ward spends most of his time carefully constructing blades, swords and daggers that resemble prehistoric pieces. From the forging of the metal to the carving of the wood, Ward creates each intricate piece by hand.

When he started his journey in design, Ward felt something was tactically missing for him. It was not until he took a class in bladesmithing that he finally found his niche. He now creates pieces that give a peek into times past.



Every piece starts from basic materials, Ward explained. A single project can take anywhere from three days to a whole semester of work. The average time for a medium size blade usually averages around two weeks.

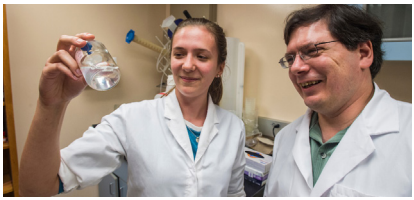
"I layer material up and then through heat and pressure I fuse them together. I then manipulate that to create surface effects on the metal in a very deliberate way," he said.

Then, Ward forges the pieces in the fire, according to the specific design plan. Within the process, Ward also machines the pieces using precision tools. While his focus is in blacksmithing, a large portion of his work requires more fine detailed work, similar to that of a bench jeweler.

"Everything that I make has a functional base to its core," Ward said. "Its functionality is never compromised by also being an aesthetic piece."

2 STUDENT HELPS DISCOVER NOVEL BACTERIUM NAMED 'SIUC-1'

Life: You find it in the darnedest places, and in all its weird glory. Now the challenge for a student in the microbiology program at Southern Illinois University Carbondale is keeping it alive to study where it fits within the tree of life.



Under the Research Enriched Academic Challenge (REACH) Award, Amanda M. Blocker is tending to a bacterium isolated from a 900-meter-deep borehole located on the border between California and Nevada.

Previously known only to exist by DNA sequencing, the bacterium has been cultured for the first time at SIU, and has been given the strain name SIUC-1. One of the weird things about SIUC-1 is that it thrives at a temperature that would kill many other things: 150 degrees Fahrenheit.

Under the guidance of her faculty mentor, Scott Hamilton-Brehm, assistant professor of microbiology, Blocker is in the process of characterizing the microorganism, sequencing its genome, and finding the optimal conditions to culture it. They want to understand where the microorganism fits within the world's ecosystem, and whether it controls critical geochemical processes of the deep subsurface.

Blocker started the project back in spring 2017, initially investigating what subsurface microbes could be enriched using the artificial sweetener xylitol as a carbon and energy source. Once she started turning the temperature up, however, the bacteria sample began to grow, allowing her to run genetic analysis. That's when it became apparent it was something special.

3 RESEARCHER FOCUSES ON TREATMENT PLAN FOR CHILDHOOD BRAIN INJURIES

Traumatic brain injuries (TBI) are the leading cause of death and disability among children and young adults in the United States with an average of 4,100 individuals sustaining a brain injury every day. Management and care for these injuries varies, but a team of researchers at SIU Carbondale are looking at a specific treatment plan that may help to address the complex issue.

Kaylee Stillwell, a pre-med senior with a double major in physiology and psychology, is examining how the combination of a certain chemical, along with an enriched environment, might effectively treat children with brain injuries. Under the guidance of Michael Hylin, assistant professor of brain and cognitive sciences, Stillwell has spent her semester working with lab rats to determine if the addition of this chemical, 7,8-Dihydroxyflavone (DHF), in correlation with an enriched environment affects the rat's social and cognitive functions.

A naturally occurring flavone, DHF is commonly found in fruits and vegetables, but is rarely absorbed just by food digestion. However, the drug itself is special because it not only targets receptors in the brain that are associated with growth, but it also passes the challenging blood/brain barrier.

Additionally, this compound stuck out to the team, as its risk for negative effects is quite low. While the drug is not new in the medical world, this specific use is different from previous studies.

SIU MEDICINE

1 SIU – IDPH COLLABORATION HELPS TRAIN TOMORROW'S LAB LEADERS

Despite the advances of modern medicine, disease outbreaks that affect a large swath of the population have not been relegated to history. In the winter of 2017-18, the flu killed nearly 80,000 people in the United States, according to the Center for Disease Control and Prevention (CDC).

The nation is grappling with a shortfall in skilled lab workers dating back to the new millennium. A smaller workforce is serving a growing population as lab testing procedures rapidly advance. To help meet this demand, the Illinois Department of Public Health (IDPH) and SIU School of Medicine worked together to create the PHLS program in August 2005. This novel master's program was the first of its kind at inception and is currently 1 of only 3 available in the country.

The two-year program combines graduate-level classroom instruction with extensive research experience in a public health laboratory. The objective is to produce scientists who can rigorously apply knowledge because they are cross-trained in a multitude of laboratory disciplines.

Andrew Wilber, Ph.D., associate professor of Medical Microbiology, Immunology and Cell Biology at SIU School of Medicine, remembers the epidemic's peak in January 2018. "Samples were coming in to all the state labs, hundreds every week. It was one of those times of great need when everyone has to step up. It was unprecedented, and our Public Health Laboratory Science (PHLS) master's students were right there in the thick of it."

2 CLINICAL TRIALS – KEY TO BETTER CARE

SIU School of Medicine was founded in 1970 with the goal of providing medical education and care "from bench to bedside." Clinical trials play a crucial role in the development of this translational science, aiding advances in biomedical knowledge to develop new and better strategies for detecting, treating and preventing disease.

SIU Medicine regularly conducts clinical trials to explore new treatments for major illnesses like hypertension, diabetes, Alzheimer's disease and cancer. Currently, 82 clinical trials are underway in SIU facilities.

Trial participants make the decision to enroll in a medical study for a variety of reasons. They can be attracted to the nobility of helping future generations, but there can be more immediate benefits. In many instances, participants gain personal advantages, such as improved disease outcomes or better health. Regardless of the motivation, we are grateful for our friends, neighbors and loved ones who actively choose to move medicine forward.

3 GREEN TEA MAY YIELD KEY TO HEARING PROTECTION

If you could take a drug that would help cure your cancer, but it would make you go deaf, would you still take the drug?

Cisplatin is a widely used anticancer drug that unfortunately carries some major side effects, including hearing loss and damage to the nerves and kidneys. Its high toxicity often requires dose reductions or the use of less effective alternate drugs.

Cisplatin-induced hearing loss can range from 50-75 percent in adults. When the drug is used to treat neuroblastomas in pediatric patients, extreme care must be taken because hearing loss can hamper speech, cognition and social development of the child.

Vickram Ramkumar, Ph.D., professor of pharmacology at SIU School of Medicine, has received a $2.3 million

NIH grant to explore the properties of a green tea extract, epigallocatechin gallate (EGCG), which offers protection against cisplatin-induced hearing loss. It builds upon his lab's ototoxicity research with Debashree Mukherjea, Ph.D., assistant research professor, and Leonard Rybak, MD, professor emeritus, both in the Division of Otolaryngology, Department of Surgery.

"Chemotherapy can be daunting, so anything you can do to end a side effect and ease the patient's recovery is a win," said Dr. Ramkumar.

SIU & UM COLLABORATING ON ECONOMIC DEVELOPMENT PORTAL

by Tim Crosby

Southern Illinois University and the University of Missouri have partnered to create an "Innovation Interchange" to help businesses and entrepreneurs in Missouri and central and southern Illinois better access the expertise of its faculty, students and academic resources. The new web portal will facilitate communication between business and the universities.

The effort is funded with a matching grant from the U.S. Economic Development Administration, which will contribute about $700,000 equal to the time and cash the SIU and UM systems have invested in securing the $1.4 million effort.

The portal not only will help businesses and entrepreneurs access expertise, but also will help graduate students find important internships and employment opportunities, said Robert Patino, director of the Office of Technology Transfer at SIU. The project also will make research and development collaborations among SIU faculty easier.

SIU and the UM together employ more than 4,000 R&D-focused faculty, and perform more than $400 million in externally funded work in those areas each year. The Innovation Interchange program will help bridge the traditional gap between industry, academic institutions and regional resources that radiate around St. Louis' vibrant business community, which includes many bioscience, technology and advanced manufacturing companies.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10%
30%
45%
15%
40%

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MEET THE SIU SYSTEM

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. Recently, SIU Carbondale was ranked the 27th most entrepreneurial research university in the US by *Forbes* magazine and was designated as an Innovation and Economic Prosperity University by the Association of Public and Land-Grant Universities.

SOUTHERN ILLINOIS UNIVERSITY 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 in Carbondale and Springfield.

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.

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The Research and Creative Activities Profile is a joint project between the SIU System campuses and the SIU System Offices of the Vice President of Academic Affairs and the Office of Government and Public Affairs.

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