

Research & Creative Activities

Fall 2020



SOUTHERN ILLINOIS UNIVERSITY
EDWARDSVILLE
GRADUATE SCHOOL

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Giving Opportunities

Scholarship and Research Endowment
The SIUE Graduate School provides educational opportunities to nearly 2,500 students annually. Gifts to support student scholarship and research allow students of exceptional acumen with limited means the opportunity to make a difference in life.

Rosemarie Archangel, Ellen Sappington, and Stephen L. and Julia Y. Hansen Innovation and Excellence in Graduate Education Endowment

Faculty scholarship and teaching determine the quality of the education students receive. Gifts to support this endowment will build on SIUE’s culture of scholarship and research by supporting innovative activities and progressive changes in existing and new graduate programs, as well as graduate faculty development related to the strengthening of graduate studies.

Give today: siue.edu/graduate/giving.shtml

On the cover: Searching for a wild pathogen that could be used to control Mormon cricket populations, page 14.



Dean’s Message

“Tear Down This Wall!”



“Mr. Gorbachev, tear down this wall,” President Ronald Reagan uttered in his 1989 speech within the shadow of the Berlin Wall. This line is famously remembered as the beginning of the fall of the Berlin Wall. Reagan threw down the gauntlet to Mikhail Gorbachev, President of the Soviet Union. However, the tearing down of the wall was only about bringing down the physical barrier of the full challenge that Reagan threw to Gorbachev; the full measure of the challenge came a few lines prior: “We welcome change and openness; for we believe that freedom and security go together, that the advance of human liberty can only strengthen the cause of world peace.” The challenge—

embrace inclusion of all people through openness,

invite diversity in all forms and the changes it brings,

advance human liberties.

In a free society, the same challenge is put to us all. Tear down the walls—in our laws, in our policies, in our practices. As a public institution of higher learning, SIUE has a social contract as part of a free and democratic society, to espouse these ideals through its teaching, scholarship, and service.

In part, SIUE strives to fulfill the terms of this contract through public access to research and scholarly works and public engagement in research and creative activities.

This issue of *Research and Creative Activities* includes articles on SIUE scholars advancing knowledge and the public’s access to knowledge. You will learn about advancing knowledge through the USDA funded research in the BugGuts Lab that seeks to eliminate expensive crop damage by an invasive species of crickets; advancing science access and opportunities to minority and underrepresented K-12 students through the STEM Center’s NIH and NSF funded citizen science projects; advancing public access to the historic works of Eugene B. Redmond, Professor Emeritus of English Language and Poet Laureate of East St. Louis through the Lovejoy Library’s NEH funded project; advancing diversity in the STEM workforce through the NSF funded Louis Stokes Alliance for Minority Participation program; and advancing public knowledge about water safety and security to help keep water supplies clean funded by a grant from the EPA. These, as well as the other projects featured in this issue highlight our scholar’s efforts in advancing knowledge while espousing openness and change.

Jerry B. Weinberg

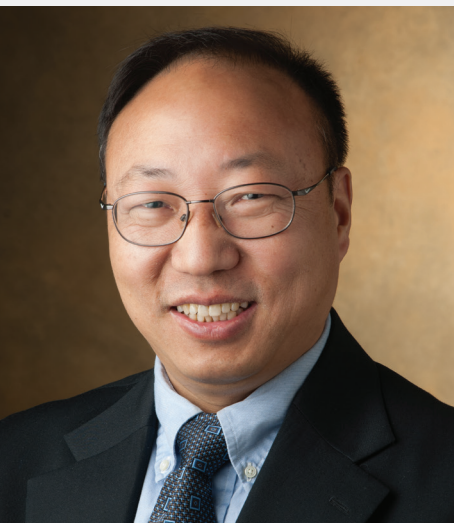
Jerry B. Weinberg, PhD
Associate Provost for Research and Dean of the Graduate School

Research Spotlights and News



Ampadu Named Director of WE CARE Clinic in East St. Louis

Managed by the School of Nursing, the Clinic offers primary patient care to underserved and vulnerable populations in East St. Louis and surrounding communities. Advanced Practice Nurses, a collaborating physician, a licensed clinical social worker, certified health coaches and a doctorly prepared pharmacist provide full services to diverse clients in the Metro East or other local communities. Under Ampadu’s leadership, the Clinic seeks to boost student participation and improve patient access to care, as well as increase connections with potential clientele by offering virtual and telephonic access. In August 2019, she was named as the Clinic’s interim director and was selected February 1 as the director.



Luo Organizes Virtual International Conference on Nonlinear Science and Complexity

The School of Engineering’s Albert Luo, PhD, distinguished research professor in the Department of Mechanical Engineering, has achieved international recognition in his field with his theory of flow barrier vector fields. He has developed analytical solutions of periodic motions to chaos, which have been unsolved for 300 years. Colleagues credit him with developing methods of calculating chaotic motions, as well as pioneering theories of dynamic physical changes that were previously unexplained. Luo has organized a virtual Conference Series on Nonlinear Science and Complexity. Held November 23-25, 2020, the conference series will present the fundamental and frontier theories and techniques for modern science and technology while stimulating more research interest for exploration of nonlinear science and complexity. Five top scientists from Italy, Spain and the United States will deliver plenary speeches. The series will feature 16 invited speakers from the Americas, Europe and Asia, including the United States, Russia, China, Portugal, France, Italy, Lithuania, Egypt, India, Iran and Brazil. Additionally, seven symposiums on Nonlinear Dynamics and Complexity will be included.



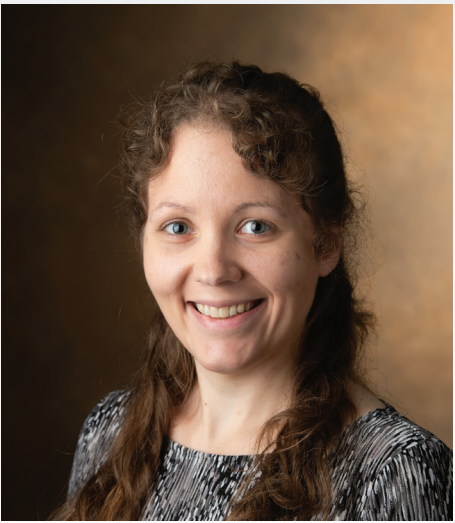
Applied Communications Instructor Featured in The New York Times

In May, The New York Times published Jocelyn Degroot’s, PhD, associate professor in the College of Arts and Sciences’ Department of Applied Communication Studies, op-ed “What Should You Say When Someone You Know is Grieving?” In the article, Degroot shares her research expertise on grief and offers advice on what to say on digital platforms to those experiencing loss during the COVID-19 pandemic. As many people grieving will be alone at home during the pandemic, Degroot suggests sending compassionate messages to acknowledge their grief and offer help, if possible. “Recognize the loss,” she advised in the article. “And let the person have his or her grief.”



Greenwood Receives Early Access to Serge Hovey Archive

Andrew Greenwood, PhD, assistant professor of musicology and graduate program director in the College of Arts and Sciences’ Department of Music, was among the first scholars in the world invited by the University of South Carolina Libraries to access the Serge Hovey Archive. The archive is a collection of Scottish song arrangements within the G. Ross Roy Collection of Scottish Literature, one of the world’s foremost holdings of Scottish songs. Through the W. Ormiston Roy Fellowship, Greenwood received \$5,000 for two research visits in spring 2020. In 2019, Greenwood was named SIUE’s Teacher Excellence Award Winner, the University’s most prestigious teaching award. Additionally, Greenwood was recognized with the SIUE Graduate School’s 2019-20 Vaughnie Lindsay New Investigator Award for his significant research contributions to his field, the College of Arts and Sciences and the University as a whole. Greenwood’s research on The Musical Enlightenment in Eighteenth-Century Scotland involves conducting new archival research with Scottish song collections in the United States and Scotland, and revising his dissertation into a book. It will be the first book-length study of the relationship of Scottish song and musical culture to the Scottish Enlightenment.



Nearly \$500K from USDA will Improve Agricultural Production and Reduce Postharvest Loss

The National Institute of Food and Agriculture of the U.S. Department of Agriculture (USDA) has awarded \$499,113 to SIUE for a collaborative project involving the University of Illinois and agricultural industry partners. SIUE Center for Predictive Analytics Director Carolyn Butts-Wilmsmeyer, PhD, associate professor in the Department of Biological Sciences, is principal investigator of the four-year project, entitled “MEG Models: A Holistic, Systems-Based Modeling Technique for Improved Agricultural Production System Performance and Reduced Postharvest Loss.” The research aims to create a new modeling technique that will improve agricultural production systems and reduce postharvest loss by considering metabolic, environmental and genomic factors. “As a scientist in the public sector, you hope you can give back to society,” Butts-Wilmsmeyer said. “In a time of economic uncertainty and in a nation where agriculture is a major part of the economy, it is an honor to have the chance to remove one of the challenges that is hindering our farmers.”



School of Pharmacy is Bolstering Curriculum to Directly Address Racism

While faculty have traditionally discussed racial disparities in clinical trials and within disease states, they will now delve deeper into the disparities throughout the curriculum. This fall, Lakesha Butler, PhD, began teaching topics of systemic racism and social determinants of health in Pharmacy and Population Health, a newly required third-year course. Butler also teaches the required second-year Health Promotion and Literacy course, which will further explore systemic oppression and racism, toxic stress, and the negative health outcomes associated with chronic trauma. Butler is the director of Diversity, Equity and Inclusion for the School and a clinical professor in the Department of Pharmacy Practice. As president of the National Pharmaceutical Association, she led a joint coalition of 14 national pharmacy organizations in taking a collective stand against racial injustice with a statement release. The united statement is available in full at [NationalPharmaceuticalAssociation.org](https://www.nationalpharmaceuticalassociation.org).



Advancing STEM Education

Bringing STEM to Life for Underrepresented Minority Students

The SIUE STEM Center is a central hub to support innovative science, technology, engineering and mathematics (STEM) research, education and outreach at the University and throughout the region. STEM Center staff are leading multiple research projects to expose more young people to careers in STEM, particularly racial and ethnic minorities, who are widely underrepresented in STEM fields.

Environmental Health Investigators: Building STEM Interest to Promote Careers in the Health Sciences

Racial and ethnic minorities are underrepresented in the field of environmental health sciences, despite the need for diverse perspectives to ensure human health and well-being throughout all communities. To help address this disparity, the National Institute of General Medical Sciences of the National Institutes of Health has awarded SIUE faculty a five-year, \$1,337,855 grant from its Science Education Partnerships Award program.

A team of SIUE faculty researchers, curriculum developers, and graduate students is developing a community-based environmental health program and providing minority students opportunities to learn about and prepare for a career in health sciences. The project is co-led by principal investigators Sharon Locke, PhD, director, STEM Center and professor, Department of Environmental Sciences; Georgia Bracey, PhD, research assistant professor, STEM Center; and Ben Greenfield, PhD, assistant professor, Department of Environmental Sciences.

“Local students will help measure air quality, soil quality and noise levels in the region to determine trouble spots and develop solutions to improve environmental conditions,” Locke said.

“By collecting scientific data, middle school students will have the opportunity to see how science works and how it can help communities,” Bracey said. “Students will also meet college students and professional scientists and get to know them as real people. We want the youth to be able to see themselves as future health scientists.”

Graduate students are teaching the youth how to collect and analyze scientific data. According to Greenfield, “The graduate students, who serve as role models and mentors, are an integral part of our team, helping to design lessons and deliver instruction in an after-school setting.”

When the COVID-19 pandemic required a temporary suspension of the in-person program, the team developed new ways to reach students. Through a partnership with the Goshen Market Foundation, they distributed educational kits about soil quality that allowed students to continue to learn about environmental health at home.

By the end of the project, the team plans to have prepared a successful environmental health curriculum and program model that can be easily replicated in other communities. This summer, the team offered professional development to teachers who were interested in trying the curriculum. Since the teacher workshop was changed to a virtual format, teachers from anywhere in the country could participate. “We had three teachers from the Navajo Nation and others from New Mexico and Texas. It was an exciting experience to connect teachers from southern Illinois with teachers in other parts of the country,” Locke said.

A Youth-Led Citizen Science Network for Community Environmental Assessment (Y-CITYSCI)

A three-year, \$1,033,648 National Science Foundation (NSF) grant is funding the launch of a community project that will engage middle and early high school students in environmental citizen science.

“In order to pursue a STEM career path, students must be able to visualize themselves working in that career,” said principal investigator (PI) Georgia Bracey, PhD, SIUE STEM Center research assistant professor. “Citizen science, or the participation of the general public in scientific research, has the potential to offer meaningful and relevant STEM experiences for youth, developing and strengthening their science identity as they engage in authentic science. A stronger science identity increases the likelihood of pursuing a science career.”

Bracey’s co-PIs include STEM Center Director and Associate Professor in the Department of Environmental Sciences Sharon Locke, PhD; Ben Greenfield, PhD, former assistant professor in the Department of Environmental Sciences; and Adriana Martinez, PhD, assistant professor in the Departments of Environmental Sciences and Geography.

Y-CITYSCI is an after-school program in which middle school students design, carry out and communicate findings from technology-rich and community-focused citizen science projects. Youth interaction with scientists is a critical part of the program. Greenfield and Martinez meet with the students to share their own scientific journeys and to help them plan investigations and interpret data.

Y-CITYSCI is funded by NSF’s Innovative Technologies for Students and Teachers (ITEST) program. The program goal is to help develop the U.S. technological workforce of the future. This past year, Martinez demonstrated drone flights and discussed how drones help scientists study land cover change over time. “Drones are expanding capabilities of scientists to study inaccessible areas, as well as examine an area in detail using three-dimensional modeling,” Martinez said. Having skills as a drone pilot can lead to a variety of interesting careers, and the team hopes that eventually some of the participants will earn FAA drone pilot certification.

The project has a strong emphasis on community involvement. “Under the guidance of faculty and graduate student mentors, participants identify environmental issues within their community that they can investigate using technology,” Greenfield said. After analyzing this data, students are able to share their research findings with the public through Citizen Science Cafés, an innovative community dialogue format. After testing and refinement, the project team will disseminate the Citizen Science Café model through the NSF-funded Teen Science Café Network, extending project impacts to a national audience. According to Locke, SIUE was one of five founding members of the Teen Science Café Network, which now includes 42 U.S. states and Canada.

Integrating Computational Thinking into a Minority Girls Program on Global Challenges

Computational thinking (CT) is a way of formulating problems so that they can be solved by a computer. An example of a CT skill is algorithmic thinking, which is being able to create a step-by-step process to achieve a goal, such as for a person to make a recipe or a computer to make a robot move to a designated place in a room.

“The concepts of CT were developed by computer scientists, but you don’t necessarily need computers to teach CT,” said Georgia Bracey, PhD, research assistant professor, STEM Center. “CT abilities are necessary to becoming a successful citizen within the 21st century global economy. However, many students, especially those in low-income, underserved school districts, do not receive such curriculum.”

The SIUE STEM Center in partnership with Mark McKenney, PhD, associate professor of computer science, are leading the development of a curriculum which integrates CT into an existing research-based STEM program, the iBIO Institute EDUCATE Center’s Stellar Girls. The new STEM + C curriculum is designed for elementary age minority girls to strengthen STEM learning and potentially alter career intentions and preparation. The program has been running at the Christian Activity Center (CAC) in East St. Louis.

The initiative is funded by an \$846,416 National Science Foundation Exploratory Integration Grant. Principal investigators are Bracey; McKenney; Sharon Locke, PhD, director of the STEM Center and associate professor of environmental sciences; and Ann Vogel, EDUCATE Center of the iBIO Institute.

“The girls are taking on the role of future engineers and budding scientists, completing projects that challenge them to find solutions for real global issues, solutions that work toward alleviating hunger, promoting human health, meeting the world’s energy needs and sustaining resources for future generations,” Locke said. “Throughout this program, they will progress through a series of hands-on computing activities during four 10-week sessions over two years. The girls also have several opportunities to interact with women of color who are professional scientists during periodic ‘Meet and Greet’ events held at the CAC.”

In 2021, the last year of the STEM + C project, activities from the new curriculum will be expanded into the Chicago area, where the Stellar Girls curriculum was developed and continues to serve hundreds of girls.



Diversifying the Nation’s STEM Workforce

Funded by the National Science Foundation (NSF), the Louis Stokes Alliance for Minority Participation (LSAMP) program assists universities and colleges in diversifying the nation’s STEM workforce by encouraging and uplifting historically underrepresented populations—African Americans, Hispanic Americans, Native Americans, Alaska Natives, Native Hawaiians, and Native Pacific Islanders—to study STEM disciplines. SIUE has offered the program for more than 20 years.

Myron Jones, PhD, associate professor of chemistry, currently is leading SIUE’s growing LSAMP program and its ongoing efforts to recruit, retain, support and graduate minority students in STEM fields. Jones is joined by co-coordinators Michael Hankins, PhD, assistant professor of chemistry, and Danielle Lee, PhD, assistant professor of biological sciences. Funding was renewed in fall 2019—\$110,000 over five years—by the NSF through the Illinois LSAMP STEM Pathways and Research Alliance (ILSPRA) led by Chicago State University.

“Our goal is to expand our efforts to involve a wider variety of STEM disciplines, particularly engineering,” Jones said. “We plan to enhance the professional development component of our program and provide opportunities for our students to interact and network with successful minorities in STEM.”

Participating students engage in research projects under the direct supervision of their faculty mentor, who also provides advisement and counseling. Regular group meetings and an LSAMP scholars program support and encourage professional and academic development, networking, and multi-disciplinary engagement among STEM students on campus.

“The support and encouragement I’ve felt when working with my research mentor and the mentors of LSAMP is the kind of vitality minority science students need to help them build connections and develop insights and skills,” said Darzanae Crite, senior chemistry major.

“The help and support of our faculty mentors can’t be understated,” Jones said. “We could not be successful with the LSAMP program if it weren’t for the many faculty members serving as mentors for these students.”

Each year, LSAMP takes students to the annual Spring Symposium in STEM in Chicago, hosted by the Illinois LSAMP and the Center for STEM Education and Research at Chicago State University. This year’s event, “Building an Inclusive STEM Future,” had 17 SIUE student attendees who shared their research and participated in discussion sessions in a professional environment.

“I gained experience networking and collaborating with scientists from different STEM disciplines, who inspired me to reach for goals that I didn’t know were possible,” said Dalia Hassan, BS ’20.

ILSAMP 2020 Spring Conference Poster Presentation Award Recipients Jordan Robinson, BS ’20 2nd Place, Molecular Biology

“Not only was it encouraging to see so many of my minority peers be passionate about STEM, but the conference gave me confidence to continue my research and education in a master’s program.”

Jochabay McGeeBey, Senior 2nd Place, Chemistry

“This opportunity has shown me that there is more to life than the horrible oppression people of color, especially those in the Black community, have gone through and continue to go through. It showed me that we can excel...that we are excelling, and that this is just the beginning.”

Advancing Access to SIUE Collections

Digitizing Library History for Future Use

Digital libraries, institutional repositories and open archives are just a few buzzwords for innovative technologies which enable users to access digital information and knowledge resources. SIUE Library and Information Services (LIS) has adopted these advanced technologies to improve their quality of service and increase access to their most delicate materials.

“We consistently strive for new and inventive ways to deliver information to students, faculty and the community,” said Lydia Jackson, director of research commons, instruction and outreach services for LIS.

More than \$48,000 in funding through a Humanities Collections and Reference Resources (HCRR) Foundations grant is supporting the digitization of a portion of the voluminous materials donated by Eugene B. Redmond, PhD, professor emeritus in the Department of English Language and Literature; Poet Laureate of East St. Louis; and prominent African American teacher, poet, editor and mentor. Stephen Kerber, PhD, university archivist and special collections librarian; Marlee Graser, metadata librarian; along with Jackson, are leading the effort.

Throughout his 60-year career, Redmond preserved his correspondence with other well-known African American writers, gathered documents while attending literary readings and conferences, and captured thousands of photographic images of other writers, artists and performers. Redmond’s papers contribute significantly to documenting the evolution of African American poetry during the second half of the twentieth century. His collection is held in the Eugene B. Redmond Collection and Learning Center, housed in Elijah P. Lovejoy Library.

Unique manuscript and rare book collections held by individual academic libraries are important resources that contribute to differentiating one institution from another. Irreplaceable collections and the valuable historical and cultural information they contain need to be cared for and held in trust for future use. Digital tools are increasingly being applied to these traditional library holdings to enhance their use and usefulness.

“This collection is especially useful in that the creator and donor is local,” Jackson said. “This provides opportunities for interactions with the community about the collections and a direct path for student engagement with the materials.”

With remote access to the Redmond Collection, students from anywhere and any academic discipline will be able to use the materials for research assignments and projects. SIUE faculty already are including some previously digitized segments of the collection in their English and poetry curriculum.

While not a method of preservation, the process of digitization supports preservation by substantially reducing the physical handling of fragile, original materials, Kerber explained.

“Digitization is an essential method of delivering information resources in today’s environment,” he said. “By digitizing these unique historical materials, we are providing easy access for any potential user or researcher anywhere in the world on an unmediated basis.”



“Digitization by itself is not important. Rather, the creation of free public access to the information contained in the documents within collections like this through digitization and the application of metadata to make the documents findable is very important.”

*Stephen Kerber, PhD,
University Archivist and
Special Collections Librarian*





Art Across Campus: Inventorying the University Museum Collection

Starting as a collection of public art integrated into the SIUE campus in 1963, the University Museum was incorporated as an independent unit in 1979 to manage and curate its fine art holdings. At that time, the collections numbered less than 4,000 and consisted of fine artworks such as paintings, prints, textiles, photographs and sculptures. Now, the museum is home to over 32,000 artistic, anthropological, architectural and archaeological objects and natural history items.

Over time, budgetary constraints affected staffing levels, resulting in inaccurate records in the museum's collections management system (CMS). Many records have no location information or contain inaccuracies about objects in storage or on display.

Recognizing the need for an accurate full inventory, Erin Vigneau-Dimick, executive curator of the University Museum, applied to the Institute of Museum and Library Services' (IMLS) Museums for America Program and

received a \$129,933 Collections Stewardship grant for the first stage of a multi-year collections inventory project.

This grant funding will allow Vigneau-Dimick to temporarily increase project staff to precisely inventory 10,000 museum objects found in the museum archive and across campus while identifying and recording items that were previously undocumented. The data collected will provide the foundation for subsequent projects leading to greater preservation of the museum artifacts, as well as increased access via digital collections management systems.

Vigneau-Dimick is responsible for the registration, preservation, exhibition and curation of the museum's collections, along with its policies and fiscal matters. Prior to serving as the executive curator, she was an established lecturer in the Department of Art and Design. Previously, she served as a collections conservator at Princeton University Library and the New York Botanical Garden Library, where she designed an inventory project to rehouse 150,000 architectural plans.

"From its inception, SIUE has defined its identity as an artistic and culturally diverse environment that stimulates life-long learning through exposure to stimulating hands-on and visual experiences," Vigneau-Dimick said. "The University Museum plays a major role in creating that environment."

Stage one of the museum's inventory process involves verifying object locations and reconciling records of the objects on public display across campus.

"The museum's collections are displayed in more than 60 buildings spread over the SIUE campuses in Edwardsville, Alton and East St. Louis," Vigneau-Dimick said. "This stage is of primary importance because of the high risk to these objects and the importance of executing a rudimentary condition survey of these materials, many of which have not been observed by museum staff for a decade or more."

The project's second stage will consist of inventorying two of the museum's most utilized collections, the two-dimensional fine arts collection and the Native American collection, which are housed in the museum's 11,000-square-foot, climate-controlled storage archive. Condition information will be gathered for all objects in both collections, and each item inventoried will have a digital photograph added to its record.

Vigneau-Dimick plans to include graduate students majoring in fine arts, history, cultural heritage and resource management, and museum studies in the project. With this guided hands-on experience, they will be able to apply their knowledge and skills to museums and cultural centers wherever they reside after graduation.



"Artifacts of cultural heritage can express diversity, scholarship and history; original student artworks or displays of student object-based research can often go a lot further than words in convincing the public and the campus community of the importance and vitality of the University's values, goals and achievements."

*Erin Vigneau-Dimick, Executive Curator,
University Museum*

From the Ground Up

Increasing Water Security through Public Awareness, Knowledge and Professional Development



Together with a team of SIUE colleagues and students, Kevin Tucker, PhD, is using the lens of environmental education to address critical water issues within local and regional waterways.

A \$100,000 environmental education (EE) grant from the U.S. Environmental Protection Agency (EPA) is supporting the team's efforts to train students on topics including:

- Clean, safe water supplies
- Public awareness and knowledge regarding three critical clean water issues:
 - Regulated pollutants
 - Emerging pollutants
 - Agricultural runoff

Illinois' proximity to major waterways and the rust and corn belts uniquely positions SIUE to tackle these issues. These regions produce significant pollution challenges to be managed by wastewater treatment plants in order to mitigate the effect of a large variety of regulated and emerging pollutants on the environment.

Researchers are specifically targeting emerging pollutants, such as pharmaceuticals and personal care products, and regulated pollutants, such as lead, other heavy metals, and nitrates.

Tucker, an assistant professor in the Department of Chemistry, is the project's principal investigator (PI). Co-PIs include Robert Dixon, PhD, associate professor in the Department of Chemistry; Matthew Maas, director of the Environmental Resource Training Center at SIUE; Educational Outreach Specialist Courtney Breckenridge; and Connie Frey Spurlock, PhD, associate professor of sociology and director of the SIUE Successful Communities Collaborative. Dixon, Tucker and Breckenridge are pictured here.

"This project involves training undergraduate students to collect field water samples and perform chemical testing on them to assess water quality," Tucker said.

Tucker describes the EPA EE trainees as a hardworking, diverse group of undergraduate students. "They are passionate about gaining skills and experiences in sampling and analysis in both the field and laboratory settings. On top of their work ethic, the trainees are eager to be part of a scientific study that focuses on both environmental and humanitarian issues."

The research findings will be used by partners, including the Illinois Rural Water Association and National Great Rivers Research and Education Center, to create interactive displays and conduct training events, a state-wide water collection day in collaboration with high school students, and a student summit. Given the current COVID-19 pandemic, these events will be scheduled when it is safe to do so. According to Tucker, this broader outreach is intended to develop student interest in environmental careers and increase public understanding of clean water.

"We will provide region-specific data to inform decisions made in the greater St. Louis area by industry, agriculture and residents alike," Tucker said. "Considering the mighty Mississippi to the west and Lake Michigan to the north, the 'freshwater' resources available to Illinois could make it a leader in water supply, provided that the pollution of our water is managed."

Community-Based Crime Reduction

Despite widespread declines in violent crime rates in the U.S. over the last two years, high rates of community violence persist in many segregated and marginalized urban communities. This reality is evident in East St. Louis, Illinois, a city with a poverty rate approaching 50% and a homicide rate 20 times higher than the national average (Fenske, 2015; U.S. Census Bureau, 2017). The effects of violence shape many aspects of community life, from residents’ physical and mental health to local business activity.

Armed with this knowledge and relevant expertise, two SIUE faculty members joined a local initiative designed to reduce crime in the greater East St. Louis area. Sandra Weissinger, PhD, assistant professor of sociology, has research expertise in African American communities and institutions, inequality and intragroup marginalization. Roberto Aspholm, PhD, assistant professor of social work, is an expert in community violence and violence prevention and has participated in crime reduction efforts in Chicago’s South Side.

They are collaborating with East Side Aligned, which is a coalition of social service agencies and community groups working to ensure all children and youth in the Greater East St. Louis area are supported and ready for life.

SIUE was awarded nearly \$60,000 from the \$1 million U.S. Department of Justice’s Community Based Crime Reduction grant program. The three-year initiative is specifically designed to address violence in “hot spots,” including places with particularly elevated levels of violence in East St. Louis and neighboring Washington Park. The main goals of the project are to:

- Enhance policing capacity and alignment
- Interrupt and deter crime, particularly retaliatory and repeat offenses
- Empower residents to engage and lead revitalization efforts
- Improve the physical environment of the community

This project was informed by vast survey data compiled over the past few years as East Side Aligned discussed priorities with community residents, who collectively indicated safety was their number one concern. Aspholm and Weissinger have contributed to a variety of aspects of the project, including helping craft the initial grant application, leading a team of community researchers in collecting survey data and completing community mapping, and helping facilitate regular community meetings in which residents have had a hands-on opportunity to shape the direction of the initiative.

“This has been a substantive, meaningful process, not just a way of seeking a rubber stamp for decisions that had already been made by program administrators,” Aspholm said.

“The model of this project is geared toward supporting and bolstering existing community resources, and that has been helpful for organizations native to East St. Louis to continue expanding their important work,” added Aspholm. “It has also provided opportunities for community residents to come together and deliberate on what they think would improve life in their community. Those conversations have actively shaped the intervention.”

The project is a cross-sector partnership involving not only East Side Aligned and SIUE, but also United Way of Greater St. Louis, the St. Clair County Sheriff’s Department and the Metro East Police District Commission. By using a place-based approach and a variety of prevention, community development and human service interventions, involved parties will continue working together to improve safety and foster neighborhood revitalization to ensure all children from East St. Louis can succeed.

Advancing Animal Care

Team Develops Innovative Software for Veterinary Thermographic Image Analysis

In veterinary practices, animals requiring CT or MRI scans may be uncooperative and even aggressive due to increased pain and fear, making it difficult for them to remain still without resorting to sedation. Medical thermography, an imaging process similar to taking a photograph with a standard camera, alleviates time and sedation issues. Thermography captures infrared radiation to produce images in which pixel values are mapped into appropriate colors that represent temperature distribution.

Scott Umbaugh, PhD, distinguished research professor in the School of Engineering’s Department of Electrical and Computer Engineering, leads the SIUE Computer Vision and Image Processing Laboratory. Umbaugh and a team of graduate students are investigating the use of veterinary thermographic images to diagnose and aid in treatment of various diseases and conditions.

Their initial research goal was to determine if the computer vision techniques could be used to successfully differentiate various pathologies in veterinary thermographic images. Early success indicated the method showed merit, and further investigation led them to develop software tools that can be used in the laboratory as an aid in veterinary diagnostics, screening and care.

Thermographic imaging is much more cost effective and timely than other medical imaging methods, and the software tools enable the veterinary specialists to fully utilize and explore the diagnostic power of thermographic imaging.

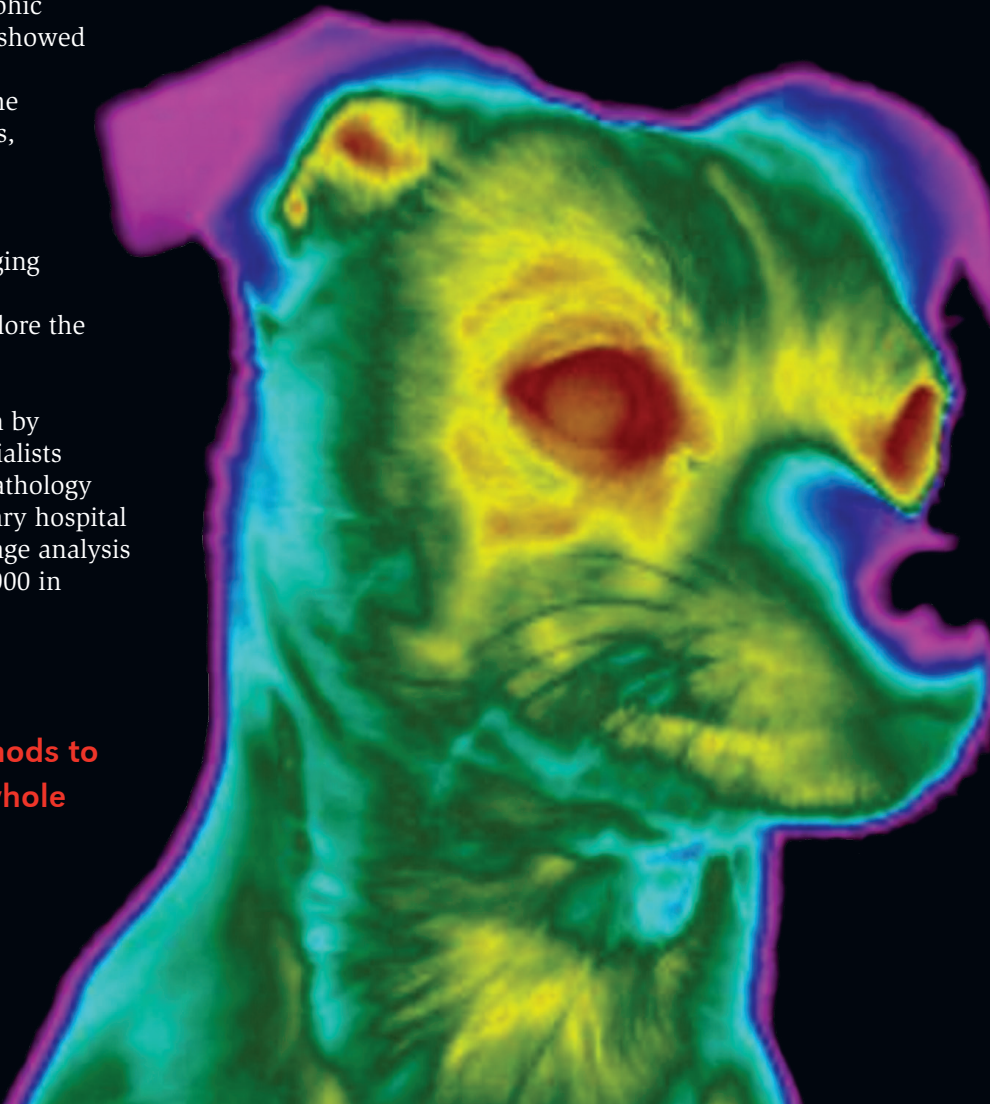
For Umbaugh’s research, animals are chosen by veterinarians at Long Island Veterinary Specialists (LIVS) in New York, based on the specific pathology under investigation. LIVS is the first veterinary hospital in the country to use this thermographic image analysis software and has provided more than \$780,000 in funding since 2006.

“The unique application of image analysis and computer vision methods to these types of problems opens a whole new world of research.”
Scott Umbaugh, PhD, Distinguished Research Professor and Graduate Program Director, Department of Electrical and Computer Engineering

“Dr. Umbaugh and his team have made great strides toward developing effective new pre-screening protocols for detecting animal pathology,” said Dominic Marino, DVM, co-founder and chief of staff of LIVS. “This software has been recognized as one of the most innovative and useful tools in veterinary clinical settings. Dr. Umbaugh’s work has been broadly influential in the fields of engineering and medical image processing.”

Over the past 10 years, the team has investigated cranial cruciate rupture detection in Labrador retrievers, intervertebral disk disease localization in various canine breeds, detection of Chiari-like malformation in Cavalier King Charles Spaniels, assessment of the utility of acupuncture and cryotherapy in cranial cruciate surgery rehabilitation in Labradors, hyperthyroid disease in felines, elbow dysplasia in multiple breeds, and bone cancer in various canine breeds.

“All of our research with animals helps to develop a foundation that can be used in medical practice,” Umbaugh said. “For example, Chiari malformation is a disease that occurs in children as well as in dogs. Our research and development will help lead to a better understanding and treatment of the diseases in people as well as animals.”





“The BugGuts Lab at SIUE is interested in all things insects, microbes and guts. I’m always excited to collaborate with institutions, labs and students with shared interests, like Dr. Woller’s team at USDA-APHIS-PPQ.”

*Brittany Peterson, PhD, Assistant Professor,
Department of Biological Sciences*

Identifying Bacterial Pathogen Causing Mortality in Mormon Cricket Populations

Since the early pioneer days, Mormon crickets have been a notable rangeland pest in the western United States, causing enormous economic damages and periodically threatening food supply during peak outbreak years. Roving bands of these insects gather to cross the landscape en masse, eating countless plants in their path and overrunning human-populated areas to become a general nuisance.

For the past several years, ongoing outbreaks have occurred in Idaho and Oregon as swarms invade crops and homes of citizens. During peak outbreaks, the insects are known to cause car accidents as swarms cross the road and create slippery driving conditions as they are run over.

Left unchecked, native rangelands damaged by Mormon cricket outbreaks can be heavily overwhelmed by invasive plant species. As traditional control methods become less effective and more undesirable, scientists have turned to investigate the feasibility of using biological control agents for pest insect populations.

Brittany F. Peterson, PhD, assistant professor in the Department of Biological Sciences, is teaming up with the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service’s Plant Protection and Quarantine (USDA-APHIS-PPQ) program for a year-long project to search for a wild pathogen that could be used to control Mormon cricket populations.

Peterson’s on-campus lab, candidly referred to as “The BugGuts Lab,” studies insect-microbe interactions, typically in termites and locusts. Through a mutual collaborator, she was contacted by Derek Woller, PhD, team leader at the Phoenix-based Rangeland Grasshopper and Mormon Cricket Management Team. Woller was interested in adding her expertise to the task of developing a cost-efficient, effective and environmentally-sound method of controlling these troubling insects.

“This project synergizes our technical skills with the USDA-APHIS-PPQ’s problem and may result in a new solution that has the potential to impact crop protection,” Peterson said. “The idea that this project could identify a possible biopesticide against this troublesome pest is exciting and quite different from other projects in the lab.”

Marisa Blickhan, who earned a BS in biological sciences in May 2020, worked on the project with Peterson as a participant in SIUE’s Undergraduate Research and Creative Activities (URCA) program. Blickhan was involved in all technical aspects of the project, including developing protocols to dissect, extract DNA from, and screen the crickets for various pathogens.

“Being an URCA assistant has taught me that working in a research environment is a lot of trial and error,” Blickhan said. “Patience and consistency are key in performing good research. We are on a steady track for this experiment, and I am looking forward to presenting the results in the upcoming months.”

Peterson plans to identify target pathogens by utilizing a diagnostic technique to detect the presence of pathogenic DNA within deceased Mormon cricket samples. Once identified, such a pathogen could potentially be developed as a biopesticide and utilized as a green option for large-scale pest control.



Building a Primate Database to Determine Environmental and Familial Effects on Health and Life Expectancy

The rhesus monkey (*Macaca mulatta*) colony at Cayo Santiago, Puerto Rico is one of the world’s most useful primate resources in biomedical and anthropological research. Established in 1938, the colony is the source of a rare skeletal collection containing eight generations of information including individual monkey’s sex, age and pedigree. Luci Kohn, PhD, professor in the Department of Biological Sciences, has joined a team of distinguished researchers to study this colony in order to advance translational research in human diseases.

Kohn is part of a multi-institutional, interdisciplinary team of scholars, led by principal investigator Qian Wang, PhD, Texas A&M, and including Debbie Guatelli-Steinberg, PhD, The Ohio State University, and Qiang Zhao, Mercer University. The group has been awarded \$791,363 from the National Science Foundation (NSF) for a four-year integrated study of the effects of family, environment and age from the colony’s skeletal data.

“Our primary objective is to develop and use this integrated assessment of the effects of environment and family lineage on the development and health within the colony’s rhesus monkeys,” Kohn explained. “Our team brings together expertise in biology, anthropology, biomedical sciences and computer sciences. My research on skeletal morphology, quantitative genetics and evolution contribute to the foundations of this project.”

Details such as bone dimensions, bone density, tooth eruption, body mass and observable disease conditions will be cataloged and added to the previously available details of sex, birth and death dates, parentage, and social rank for each monkey. Once reliable colony history and environmental history are reconstructed, patterns of variation in development and health will be studied in a contextualized manner to reveal environmental and familial influences.

The team will accomplish this task by conducting an original family-based osteo-oral health and pathology study to reconstruct health status within the skeletal collection. After these patterns are revealed, the team hopes to provide a non-human primate model to be used in anthropological and biomedical studies for studying human adaptability and fragility under varied living conditions.

The skeletal collection will serve as a model for the team to study multiple health conditions that have been caused by familial and environmental influences. Among the conditions to be studied are the age-related diseases osteoporosis and osteoarthritis, two of the most devastating conditions of our aging human population.

“Our studies will incorporate undergraduate students interested in careers in medicine, dentistry, veterinary science and biomedical research. Students will be integrated into all phases of these studies, providing unique scientific and cultural experiences as they assist with data collection in Puerto Rico, data analysis at our home institutions, and dissemination of results at professional meetings,” Kohn said.

“This skeletal collection, coupled with the depth and detail of family and demographic data for each individual, provides a unique opportunity to assess skeletal and dental characteristics over time, as well as family and environmental differences in health, longevity and age-related conditions.”

Luci Kohn, PhD, Professor, Department of Biological Sciences



to use and ensure test results can be shared without further treatments. Validation of a newly developed method, therefore, is an important part of the current project to gain international support and acceptance of the method that can be used for hazard identification and risk assessment.”

While Yoon acknowledges this new model will likely not completely replace screening methods using animals, it is a noteworthy step toward reducing usage.

“The animal model is vital in any research field,” Yoon said. “But, without putting effort to reduce the usage, we’ll continuously be depending on this animal model for our medical or biological research. We want to show that certain things can be done in a standardized way, without using the animal model.”

Park notes his research group is working with South Korea’s National Institute of Food and Drug Safety Evaluation (NIFDS). Development of this new method aligns with Dongguk University’s values as a Buddhist-affiliated university.

“My current research to develop a non-animal test method reflects one of the Buddhist teachings: Do no harm to all living creatures,” Park said. “Once developed, our method, accompanied with a detailed Test Guideline, will be used by many governments, industries, and independent laboratories to identify hazards and/or determine the safety of chemicals. This will promote the generation of dependable data for human and animal health, and environmental risk assessments.”

Due to the COVID-19 pandemic, the research team has had to postpone the third and final year of their project. Park and his team’s physical presence on campus over the past two summers has been an important key factor to implementing and performing the validation experiments, and the two professors are currently developing a plan to finish the research.

Following the completion of the validation process, Yoon and Park hope to continue their institutional collaboration. The pair has agreed to continue exploring the negative impacts of exposure to ubiquitous chemicals on model cell lines and organisms, including several mammalian cell lines, insects and rodents.

Reducing Product Testing on Animals

Kyong Sup Yoon, PhD, assistant professor in the Department of Environmental Sciences, and his graduate students are working to validate a newly developed Organization for Economic Co-operation and Development (OECD) official non-animal testing method for the detection of hazardous chemicals, including endocrine disrupting chemicals (EDCs). The project is led by principal investigator Yooheon Park, PhD, of Dongguk University.

Yoon hosted Park and his colleagues from South Korea’s Dongguk University over the course of two summer visits in 2018 and 2019.

“Dr. Park is a food scientist, and I’m a toxicologist, making this collaboration a perfect fit,” Yoon said. “Dr. Park is developing a non-animal screening method using cell cultures that are genetically transformed to detect chemicals by bioluminescence. My team is validating that method.”

“The OECD has a set of strict rules for developing a new standardized method to detect environmental chemicals, including various EDCs,” Park explained. “It is obvious that the method should be suitable for member countries

“According to the OECD guidance, the validation should be done in a Good Laboratory Practice (GLP) or equivalent laboratory. I strongly believe that Dr. Yoon’s research team and his laboratory in the Department of Environmental Sciences are highly qualified and capable of validating our method.”

Yooheon Park, PhD, Dongguk University, South Korea

Research Grant for Doctoral Students: Featured Project

Parents of Prospective First-Generation College-Going High School Students: Perceptions of Accessing College

Previous research has found that parental influence is a critical component to whether or not a student enrolls in college, and that first-generation college students are underrepresented amongst those enrolled. These results suggest that parents who did not go to college lack the knowledge and resources to influence and assist their children to pursue higher education. Christopher W. Brown, EdD educational leadership ’20, addressed these concerns in his research project “Parents of Prospective First-Generation College-Going High School Students: Perceptions of Accessing College.”

Through this qualitative study, Brown set out to gain understanding of the perspectives and experiences parents of first-generation college students have while accessing information about higher education. While conducting semi-structured interviews, he gained insight about parents’ experiences in helping their children apply for college entry and financial aid, and whether or not they are aware of any organizations that help with such tasks.

“Parents are critical influencers of their children, so how can schools be better providers of actionable knowledge about accessing college to these parents?” asks Brown. “With this understanding, high schools can better partner with parents while working toward improving the rate that first-generation students attend college.”

Brown was inspired to conduct this study due to his involvement in the implementation of the Advancement Via Individual Determination (AVID) program. AVID focuses on college preparation by providing valuable learning strategies to potential first-generation students. During this time, Brown realized that he was a first-generation college student who had beat the odds of enrolling in college and completing a degree. Consequently, this realization fueled his interest in the topic and reflecting back on his own experiences inspired him to help other first-generation students.

“What stands out to me about Chris’s work is his interest in learning more about parent perspectives on barriers to college admissions for first-generation college students,” said Allison Reeves, PhD, chair of the Department of Educational Leadership. “While we know that parent support is a key factor in first-generation success, Chris’s study explored the areas where parents need more knowledge to help their child be successful in getting admitted to and completing college.”

By conducting this research study, Brown was able to extend existing literature surrounding the college enrollment disparity between first-generation students and non-first-generation students. He concluded that educational policymakers and practitioners must reexamine their efforts in remedying this disparity and how they perceive parents of first-generation students.



Research Grant for Doctoral Students: Featured Project

Social Indicators to Evaluate and Impact Learning Adaptation in Nutrient Reduction Practices

One of today’s greatest challenges is feeding and fueling a growing world population with minimal adverse environmental impacts. Addressing nutrient runoff while supporting our nation’s agriculture producers is an issue that transcends a single discipline and requires interdisciplinary methods and approaches from areas such as agriculture, communications, biology, environmental science and sociology. Courtney Breckenridge, doctoral candidate in the Department of Environmental Sciences, focuses on this topic in her research “Social Indicators to Evaluate and Impact Learning Adaptation in Nutrient Reduction Practices.”

Nonpoint source pollution (NPS) from agriculture producers’ use of nutrients as fertilizer is considered a significant contributor to global water system and ecological impairments. NPS policy, however, is voluntary and incentive-based, and Midwestern states’ reliance on such approaches is directly related to their success in both the implementation and demonstration of nutrient reduction strategies. Long-term data regarding the successes of incentive-based policies is not widely available, creating difficulty for policymakers and watershed stakeholders to address the efficacy of best management practices.

By conducting interviews while collecting geospatial and biological data, Breckenridge’s research seeks to provide quantitative and qualitative data regarding watershed stakeholders’ environmental behaviors and attitudes. The results of this study will be used to offer landowners and producers information that supports educated, cost-effective nutrient reduction strategies.

“I look forward to working with the diverse researchers across SIUE, as well as stakeholders in our targeted watersheds, to help provide decision makers with data-driven tools to support their best management practices,” said Breckenridge.

“Courtney is involved in a couple of academic investigations and projects as she has both an ambitious and remarkable doctoral research agenda,” said Nic Guehlstorf, department chair and professor in the Department of Environmental Sciences. “This internally funded project is a mixed method study—quantitative and qualitative data—that assesses the unexperienced and expert participation of regional agricultural cost-effective nutrient reduction strategies. Her work will help evaluate current sustainable practices which attempt to have short-term nutrient runoff consequences with insignificant environmental impacts and long-term restoration plans for better watershed maintenance.”

Breckenridge is the first student enrolled in the cooperative environmental resources and policy doctoral program between SIUE and SIU Carbondale and will present this study at a national conference next year.

Research Grant for Doctoral Students: Featured Project

Non-Resonant Piezoelectric Energy Harvesting Using Impact-Based Frequency-Up-Conversion Technique

The desire for building portable electronic devices and wireless sensors that do not rely on batteries draws much research attention on energy harvesting from ambient energy sources. An efficient way to generate power is seen in vibration-to-electricity conversion through piezoelectric energy harvesting. Saeed Onsorynezhad, doctoral candidate in the Department of Mechanical Engineering, is studying how to improve the performance of piezoelectric energy harvesters in his research “Non-Resonant Piezoelectric Energy Harvesting Using Impact-Based Frequency-Up-Conversion Technique.”

“One of the most important issues in the 21st century is the shortage of energy sources and environmental problems accompanied by fossil fuel combustion,” said thesis advisor Fengxia Wang, PhD, associate professor in the Department of Mechanical and Industrial Engineering. “Recent advances in wireless and micro electromechanical systems (MEMS) bring a broad application of energy sources in areas of structural health monitoring, remote sensor networks, and global position tracking. However, as the number of networks increase and the size of MEMS devices decrease, one begins to comprehend the disadvantages of conventional power supply, electrochemical batteries.”

Problems of electrochemical batteries include their finite lifespan, logistical problems posed by replacing millions of batteries in large sensor networks, and the environmental impact of discarding used batteries. To create energy that does not rely on batteries, Onsorynezhad is utilizing piezoelectric materials, which produce an electric current while vibrating when placed under mechanical stress.

The goal of this study is to enhance the performance of piezoelectric energy harvesters and design a small-scale, high-efficiency piezoelectric energy harvester as a power supplier for self-powered wireless sensors and harsh environment wireless data transmission systems.

“The piezoelectric generators have their best performance when the frequency of the ambient vibration is equal to their natural frequency,” said Onsorynezhad. “Throughout my master studies, I obtained the effect of different physical parameters and boundary conditions on the natural frequency of the vibrating piezoelectric plates, such that the resonant frequency can be tuned to match the frequency of ambient vibration. During my PhD, I’ve decided to study a method that can improve the performance of the piezoelectric energy harvester.”

Onsorynezhad plans to take these analytical results and validate them by designing and running experiments with the piezoelectric energy harvester.

“Throughout my project, we noticed that one of the parameters has a noticeable effect on the performance of the piezoelectric energy harvester,” added Onsorynezhad. “To the best of my knowledge, no other researcher has noticed the importance of this parameter while designing a piezoelectric energy harvester.”



Selected Research Grants for Graduate Students

The SIUE Graduate School provides a dynamic environment for master's students to enhance their education and advance knowledge in their fields. The following projects were supported in part by Research Grants for Graduate Students.

Investigating how Kismet Affects Plasticity through BMP Signaling, Cell Adhesion Molecules, and Endocytosis

Rachel Smith, MS Biological Sciences

Autism spectrum disorder and CHARGE syndrome are both neurodevelopmental disorders in which proteins CHD7 (CHARGE) and CHD8 (ASD) are mutated, causing their function in altering gene expression to change. When protein levels aren't altered as intended due to this mutation, neuronal communication changes, causing the two disorders. Working with Faith Liebl, PhD, professor in the Department of Biological Sciences, Rachel Smith investigated synaptic function in relation to autism and CHARGE syndrome for her master's thesis by studying protein localization within fruit flies, which allowed her to see proteins flagged by fluorescent molecules. By studying the *Drosophila melanogaster* (fruit fly) homolog of CHD7, CHD8 and CHD9 called Kismet (Kis), she was able to use the *Drosophila* neuromuscular junction as a model synapse to investigate how Kis could be altering neuronal signaling. She was able to utilize immunohistochemistry to investigate different proteins in these pathways to see if Kis mutants had alterations in protein level or localization.

"This experience taught me a lot about neuroscience and cell signaling, and also showed me how to be self-motivated and productive even after facing obstacles," Smith said.

Detection of Canine Bone Cancer Using Artificial Neural Networks

Naveena Gorre, MS Electrical Engineering

Although bone cancer is a common type of cancer in dogs, imaging methods and biopsies conducted for diagnosis are expensive, inconvenient, and contain large doses of radiation. Naveena Gorre's research investigated the possibility of using thermographic images for diagnosis of bone cancer in dogs and the advantages they include, such as being noninvasive, cheaper, faster, portable, accessible, and free of radiation. Working with Scott Umbaugh, PhD, distinguished research professor in the Department of Electrical and Computer Engineering, Gorre utilized artificial neural networks to employ pattern recognition to classify images of dogs with and without cancer in attempts to improve the efficacy, affordability and convenience of detecting bone cancer at an earlier stage.

Chemometric Characterization of Drinking Water using ICP-AES and Bulk Properties

Olivia Daube, MS Chemistry

Corrosive water has the potential to ruin metal plumbing systems and cause health issues in those who consume it. Olivia Daube, working with Edward Navarre, PhD, associate professor in the Department of Chemistry, created a study to determine the metal concentration, alkalinity, and other properties of drinking water samples from the St. Louis metropolitan area. Results from the three-year study reveal seasonal and short-term changes in drinking water composition. The data collected from this research will contribute to the development of predictive models to understand drinking water quality in the St. Louis area.

The Process of Burkholderia Symbiont Induction and Specification of Mini-microbiome Formation in a Social Amoeba, Dictyostelium Discoideum

Madison Eschbach, MS Biological Sciences

Dictyostelium discoideum is a social amoeba that engulfs bacteria and digests them as a food source. Some bacteria survive this digestion and live inside these amoebas as symbionts. Once food sources are depleted, amoeba aggregate and form a multicellular unit. In her research, Madison Eschbach used *Dictyostelium discoideum* as a eukaryotic model for host-microbe interactions. The goal of her project was to determine how different environmental conditions impact *Burkholderia* infections and host fitness. To explore the interactions between bacteria and their amoeba hosts, she employed a variety of microbiological, molecular and microscopy techniques, including confocal microscopy and flow cytometry. Through her research with Susanne DiSalvo, assistant professor in the Department of Biological Sciences, Eschbach learned which type of food bacteria and *Burkholderia* influence the amount of bacteria that can be carried by *Dictyostelium discoideum*.

"My experience conducting research at SIUE was crucial to my development as a scientist," Eschbach said. "It enabled me to start my project with a question and discover more about it through experimentation. Graduate research has given me the confidence to pursue a career in my field that I did not have as an undergraduate student."

Investigating Bacteria-Bacteriophage Coevolution Dynamics within a Eukaryotic Host System

Paige Bangle, MS Biological Sciences

As antibiotic resistant bacteria are becoming a global health concern, researchers continue searching for alternative treatments to antibiotics for bacterial infections. A promising remedy is seen in phage therapy, a treatment which involves using a virus to infect and kill harmful bacteria. Although antibiotics cannot evolve alongside bacteria, phages can. Working with Susanne DiSalvo, assistant professor in the Department of Biological Sciences, Paige Bangle's study focused on the coevolution between a bacterium and bacteriophage inside of a eukaryotic host. By studying the interactions of the bacterium *Burkholderia* and a bacteriophage, Bangle hoped to learn more about how a bacterium and phage can potentially evolve and affect a human host.

Expansion, synthesis, and biological evaluation of a focused library of N-substituted indolines and -1,2,3,4-tetrahydroquinolines as antimicrobials

Hannah Lupton, MS Pharmaceutical Sciences

Infectious diseases are a major cause of death, disabilities, and social and economic disruption for hundreds of millions of people. While the numbers of death by other diseases have remained unchanged or decreased, deaths from many infectious diseases have increased over the past decade, due largely to the growing number of antibiotic resistant bacteria. Working with Marcelo Nieto, PhD, associate professor of pharmaceutical sciences, Hannah Lupton's research utilized organic synthesis to create various series of N-substituted indoline and tetrahydroquinoline derivatives, which are generally recognized as scaffolds for antimicrobial drug discovery. Each compound was confirmed and characterized with methods like nuclear magnetic resonance and liquid chromatography-mass spectrometry. Bioassays to test for antibiotic activity of the compounds were done against various harmful strains, including *E. coli* and *S. aureus*. Finally, mammalian cytotoxicity assays were done to assess the potential toxicity of each compound.

"Without the grant money, I was able to synthesize only about 10 products, and the RGGS allowed me to buy the necessary reagents needed to expand the library of compounds to around 50. The remainder of the RGGS went toward the cytotoxicity studies, and without the grant this part of the project would not exist," Lupton said. "I have learned so much by being able to synthesize so many compounds via multiple different organic reactions, as well as being able to do more interdisciplinary research and become more well-rounded with the cytotoxicity studies."

Outstanding Thesis and Dissertation Awards

Each year, the Graduate School awards the Outstanding Thesis and Dissertation Awards to recognize a master’s student’s thesis and a doctoral student’s dissertation that have been identified as outstanding among all of the theses and dissertations completed in the previous academic year.



2019 Outstanding Dissertation Award

Mary Pearson, EdD Educational Leadership ’19
“Teacher and Administrator Beliefs and Expectations of School Exclusion in Six Midwestern Alternative Schools”

For her dissertation, Pearson conducted a mixed-methods study to understand why teachers and administrators continue to use exclusionary discipline despite growing evidence of such practices’ ineffectiveness.

“Mary’s study is significant in terms of implications for practice and policy,” said Tianlong Yu, PhD, professor in the Department of Educational Leadership and Pearson’s dissertation advisor. “The rich and informative findings, and her insightful analysis of them provide a much-needed guidebook for both practitioners and policy makers as they think about the persistent ‘problem’ of student discipline, revise current policies, and make fundamental changes that are difficult but needed.”

Pearson currently serves as the principal at Journeys Alternative School. Located in Jerseyville, Ill., Journeys is for children with emotional and behavioral disorders that have become too challenging for their local school districts to educate successfully.

2019 Outstanding Thesis Award

Patrick Ayres, MS History ’19
“Embattled Conservatism: Hamilton Gamble and Conservatism in Civil War Missouri”

Ayres’ research examined the early political career of Hamilton Gamble, Missouri’s Civil War governor from 1861-1864. Throughout his thesis, he argues that a distinct Western identity and conservatism shaped Gamble’s political identity in the 1840s and 1850s.

“Patrick’s thesis is exceptionally researched, including far more original research than is typically expected of a history master’s thesis,” said Erik Alexander, PhD, associate professor in the Department of Historical Studies and Ayers’ thesis committee chair. “His research makes a significant contribution to an emerging historiographical literature on the history of conservatism in the 19th century as a distinct political ideology.”

Ayres’ thesis was also recognized by the Missouri Historical Society as the recipient of the 2019 Lewis E. Atherton Prize. Currently, Ayres is pursuing a PhD in the department’s cooperative historical studies program with SIU Carbondale.



Competitive Graduate Awards

Competitive Graduate Awards support highly qualified new graduate students who are accepted into master’s programs at SIUE.

College of Arts and Sciences

Art Therapy Counseling: Aina Rivas
Chemistry: Samantha Olendorff, Dustin Smith
English: Beatrice Abisola Adesanya
Environmental Sciences: Alexander Kalna
Geography: Douglas O’Donnell
Music: Mu-Chi Hsieh, Anthony Stewart
Social Work: Catherine Atieno Awitta, Cristal Campocasso

School of Business

Business Administration: Chrystopher Terry

School of Education, Health and Human Behavior

Kinesiology: Landon Braun, Pol Porta Nadal
Speech Language-Pathology: Kaleigh Keck

School of Engineering

Electrical Engineering: Hridoy Biswas
Industrial Engineering: Arash Amini, Altug Sonmez
Mechanical Engineering: Jared Cross

Research Grants for Research Doctoral Students

Research Grants for Research Doctoral Students are awarded on a competitive basis to support research and projects initiated and conducted by SIUE doctoral students.

College of Arts and Sciences

Environmental Sciences: Courtney Breckenridge

School of Education, Health and Human Behavior

Educational Leadership: Brian Arteberry, Dustin Bilbruck, Christopher Brown, Barbara Daugherty, Adam Garrett, Ryan Ketchum, Matthew Noyes, Brandon Taylor

School of Engineering

Mechanical Engineering: Saeed Onsorynezhad

Research Grants for Graduate Students

Research Grants for Graduate Students support research and creative activities initiated and conducted by SIUE master’s students to enhance their academic progress. Although faculty advisors oversee the research or creative activity, these grants support the graduate students’ work as it relates to their thesis or final project.

College of Arts and Sciences

Art: Austin Hinderliter, Juan Restrepo
Art Therapy Counseling: Heather Conley, Megan Pieterick, Eva Sedjo, Ariel Swoboda
Biological Sciences: Sophie Bandurski, Paige Bangle, Stephanie Bargiel, Alison Blanton, Blake Collier, Deanna Deterding, Emily Dockter, Jacob Forbes, Dylan Gladson, Matthew Goessling, Rachael Heaton, Kayla Jarman, Eric Parperides, Erica Periandri, Joshua Preston, Sydni Rubio, Brandi Schell, Mallory Wright, Tammy Zanker
Chemistry: Pratichhya Adhikari, Amanda Beach, Abby Cox, Olivia Daube, Evan Hay, Cole Hoffmann, Joshua Jones, Shailendra Koirala, Mohammad Sadegh Laeini, Dustin Pumford, Paria Radmanesh, Swechha Rimal, Tristan Sanford, Drew Scanlan, Dustin Smith, Samantha Olendorff, Andrew Riley
Environmental Sciences: Jannatul Ferdous, Danielle Fischer, Alexander Kalna, Carl Namini, Scott Otto, Krista Russell, Eloho Unufe, Albert Wang, Tatum Wertin
History: Olabode Shadare
Music: Mu Chi Hsieh

Graduate School

Integrative Studies: Chelsea Mettler

School of Education, Health and Human Behavior

College Student Personnel Administration: Deanna Harman, Sara Kirkley
Diversity and Equity in Education: Dylan Brinkmann
Kinesiology: Pol Porta Nadal
Psychology: Gabriel Alfaro, Vyctoria Brooks, Haley Heffernan, Samantha Hinshaw, Natalie Kulpinski, Samantha Lewis, Sam McCullough, Kayla Moody, Savannah Price, Amanda Raymond
Speech-Language Pathology: Kaleigh Keck

School of Engineering

Electrical Engineering: Naveena Gorre, Joseph Olden
Industrial Engineering: Ayperi Dos, Somaiya Islam Khan
Mechanical Engineering: Mahdi Shahikoorabbasloo, Nadia Ebrahimpour Tolouei

School of Pharmacy

Pharmaceutical Sciences: Elizabeth Denn, Austin House, Christopher Reeb, Nathan Scott

Driving Change Through Research

Distinguished Research Professor

The SIUE Distinguished Research Professor rank recognizes faculty members who have made an outstanding contribution to research or creative activities as a result of their continued commitment to scholarship beyond the period of their promotion to professor. This recognition is not given automatically; it is only awarded to nominees demonstrating superior merit.

Zhi-Qing Lin, PhD, Professor

Departments of Biological Sciences and Environmental Sciences

Lin is an environmental ecologist with a research specialization in phytoremediation, a biotechnical process that utilizes plants for the cleanup of trace element contamination. Since joining SIUE in 2002, he has received \$293,912 in external research grant funding for work as a principal investigator, and \$682,284 for projects on which he has served as a co-PI or participant. He has also co-edited seven books, published 30 peer-reviewed book chapters and contributed to 44 research articles in peer-reviewed scientific journals.

Scott Umbaugh, PhD, Professor

Department of Electrical and Computer Engineering

Umbaugh is known worldwide for the development and implementation of application software in medical imaging, satellite imaging, manufacturing, agriculture and robotics. He has been principal investigator of grant funding totaling \$1,092,561, the majority of which has been external funding to support his research and development for computer vision and image processing (CVIP) applications.

Paul Simon Outstanding Teacher-Scholar Award

This award recognizes a faculty member for being an outstanding teacher and researcher and for demonstrating the belief that to be a good teacher, one must also be a good scholar. Winners have shown significant contributions to original research or creative activities and have successfully integrated those contributions into their teaching and mentoring practices.

Therese Poirier, PharmD, Professor and Senior Scholar

Department of Pharmacy Practice

Poirier’s research focuses on advancing interprofessional education, the development of students as educators, the development of health humanities pre-professional coursework, and other innovative teaching and learning. Among Poirier’s national recognitions are the American Association of Colleges of Pharmacy’s 2019 Distinguished Teaching Scholar Award and its 2017 Assessment Award for “A Programmatic Model for Student and Faculty Assessment of Interprofessional Education Simulation Training.”

Emeriti Faculty Association Awards

The SIUE Emeriti Faculty Association provides opportunities for retired faculty to remain active participants of the University community. The group awards grant funding to select faculty projects aimed at strengthening the academic quality of programs and enhancing the University’s reputation. The yearly award competition provides funding for a variety of projects that span across academic disciplines.

Debbie Mann, PhD, Professor, Foreign Language and Literature
“Expansion of Teaching About Diversity: Quebec/Canada Institute”

Jeffrey Manuel, PhD, Associate Professor, Department of History;
Laura Fowler, PhD, Associate Professor, Department of History
“Public History Internship”

Myron Jones, PhD, Associate Professor, Department of Chemistry;
Michael Hankins, PhD, Assistant Professor, Department of Chemistry
“Diversity in STEM: A Colloquium Series”

Gregory Fields, PhD, Distinguished Research Professor, Department of Philosophy
“Indigenous Knowledge and Sustainability: Audio Enhancement System for the Geodesic Dome at SIUE”

Vaughnie Lindsay New Investigator Award

This award is presented to junior faculty members to recognize and support individual programs of research or creative activities that have the promise of making significant contributions to their field of study and to SIUE in general.

Susanne DiSalvo, PhD, Assistant Professor

Department of Biological Sciences

DiSalvo’s research project, “Connecting Unique Outcomes with Dynamic Infection Processes in an Emerging Microbial Symbiosis System,” studies an emerging Burkholderia bacteria-amoebae host system, to investigate the mechanisms and outcomes of bacterial colonization. Award funding will allow DiSalvo to work closely with hired lab students, providing them with proper training and support to independently assist with essential project components while confidently serving as student mentors within the lab.

Jon Klingensmith, PhD, Assistant Professor

Department of Electrical and Computer Engineering

Klingensmith’s research project, “Segmentation and Modeling of Adipose Tissue and Coronary Arteries in Cardiac Magnetic Resonance Images,” focuses on the development of algorithms for identification of fat in cardiac images to provide a non-invasive assessment of heart disease risk not currently available. Currently, he collaborates with a cardiac radiologist at the Washington University School of Medicine, and plans future collaboration with an interventional radiologist for this project.

Concept Commercialization Award

This award promotes interest in and involvement with intellectual property development and commercialization in order to benefit the health, safety and welfare of the community and the economic welfare of the University. The award is primarily intended for patentable inventions or discoveries, but can also support trade secrets and copyrighted materials.

Felix Lee, PhD, Professor Department of Pharmaceutical Sciences
and

Tim McPherson, PhD, Professor Department of Industrial Engineering

Lee and McPherson have designed an automated system for pharmacists to fill capsules with liquid drugs. This will allow pharmacists to produce liquid-filled capsules more accurately and quickly while decreasing the risk of airborne particles that occurs when filling capsules with powdered drugs. The automated system is more economically viable than manual filling and will prevent inaccuracies in dosage and human errors such as double-filling, skipping capsules and spilling doses.

Annette and Henry Baich Award

This award is given annually to the most outstanding Seed Grant for Transitional and Exploratory Projects proposal for basic research conducted within the parameters of the Sigma Xi Society. Disciplines include the physical sciences, life and medical sciences, earth science, engineering, psychology, and mathematics.

Kelley McGuire, PhD, Assistant Professor Primary Care and Health Systems Nursing
and

Angela Andrews, PhD, Assistant Professor Primary Care and Health Systems Nursing

McGuire’s research interests lie at the intersection of stress, performance and sleep. Andrews’ research interests are in theory-based intervention work to support health and behavior change. Their proposal, “Exploration of Sleep Health and Behaviors Among Undergraduate Nursing Students,” was selected from a competitive field of submissions. McGuire and Andrews aim to further explore the sleep health of nursing students to guide a health behavior change intervention.

Visualizing Research Impacts

The SIUE Graduate School’s Visualizing Research Impacts (VRI) competition offers SIUE faculty, staff and students the opportunity to share the results and impact of their research and creative activities through imagery.

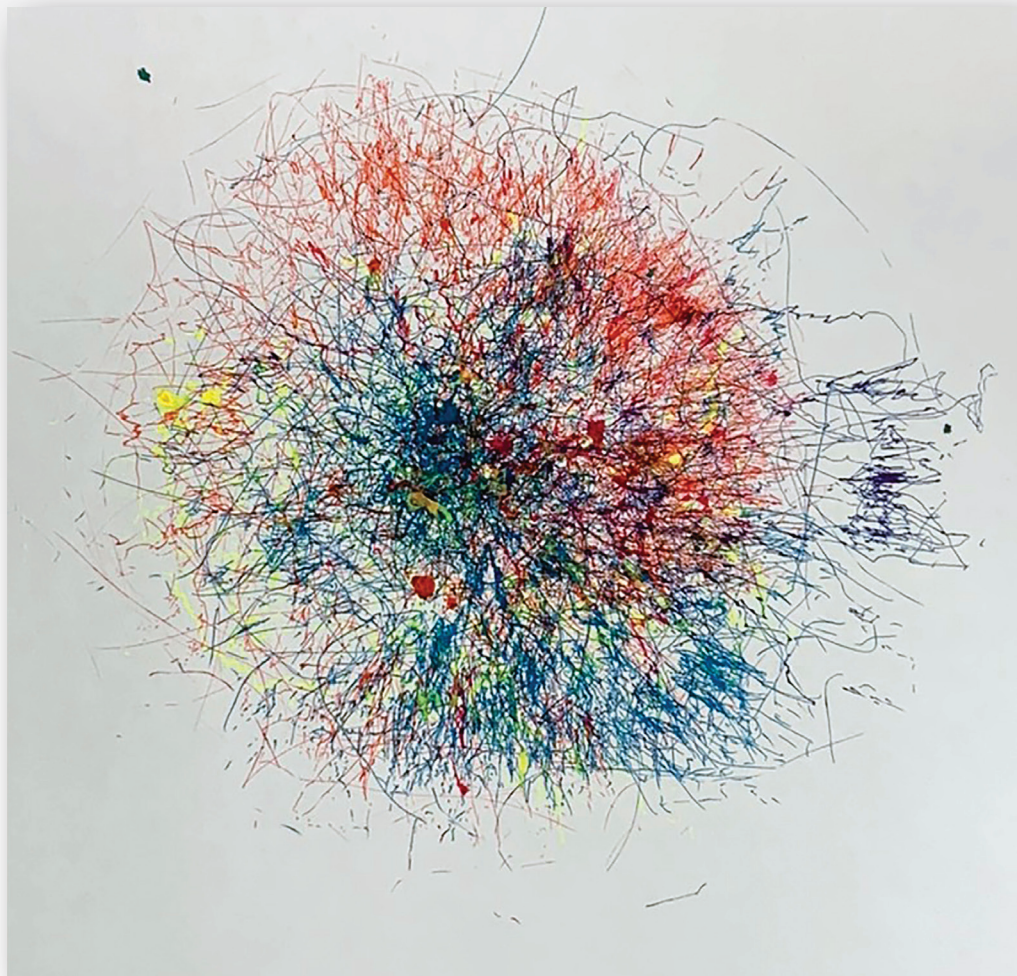
Faculty and students submitted a wide array of entries that depicted a wonderfully rich diversity of creative activities and disciplines from across the institution, including entries from the sciences, arts, humanities and nursing.

Most Creative Representation of Research Impact

“Untitled”
Rodrick Whetstone, Professor, Department of Art and Design

By creating a series of drawings that use a machine built from found parts and junk, Whetstone challenged everything he knew art to be. Inspired by the Dada movement of the early 20th century, known for leaning toward incongruity and irrationality, he created an awkward contraption to make drawings in a distinct and peculiar way. His machine utilized a writing utensil as a pendulum in order to make marks onto a page. Instead of having the autonomy to draw, the utensil was tossed to and fro at the whim of the forces happening upon it.

“Untitled” is the result of Whetstone wearing the machine and recording the natural movement of his body through daily life on paper. Because the machine extended two feet in front of him, he had to raise his awareness and rethink how to navigate through daily spaces while creating this piece.



Best Representation of Research Impact

“The Silver Knife”
Laura Strand, Professor and Head of Textile Arts, Department of Art and Design

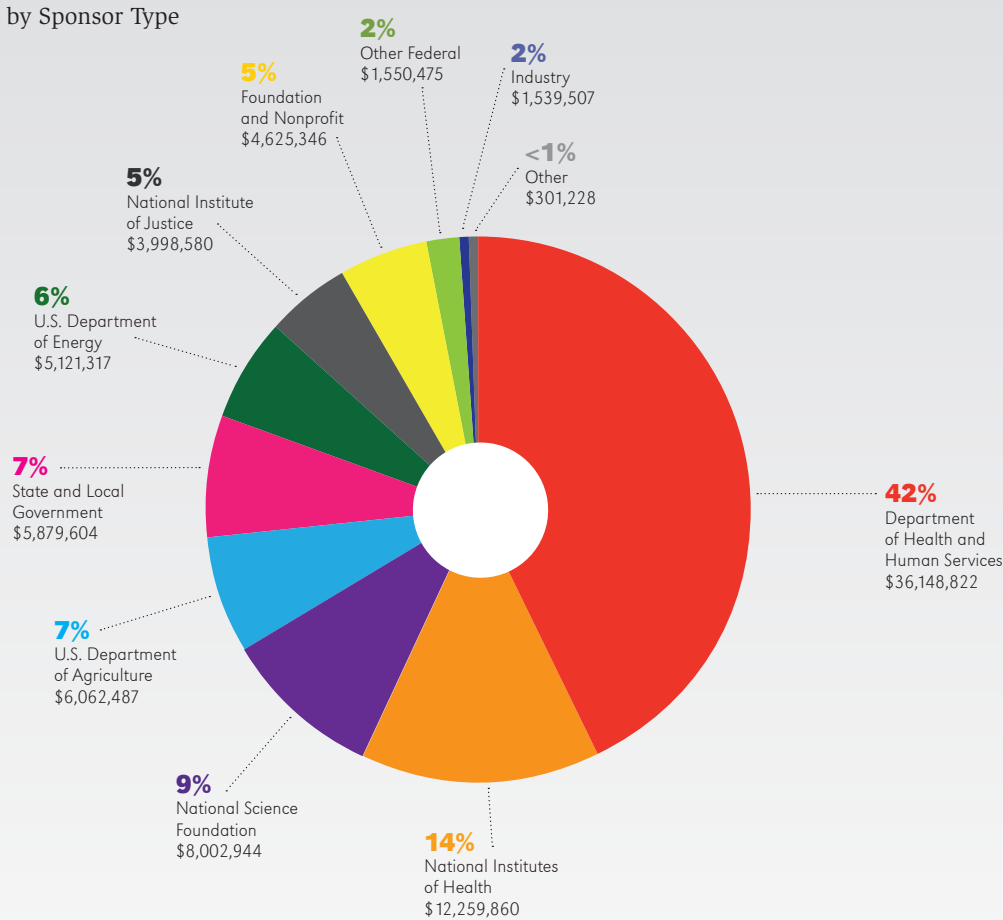
Strand’s work is built upon research into the vulnerability of the Ogallala Reservoir, the vast body of water beneath the central U.S. spanning from North Dakota to Texas. This body was deposited as glaciers retreated thousands of years ago, creating the primary water source throughout the region. While flying west for a conference, Strand was inspired by the compositions of circles that covered the landscape. As she began using those images for her work, she learned that each of the circles were formed by crops watered through a pump irrigation system drilled into the Ogallala.

After discovering that 20 hours of one full rotation of the system uses six million gallons of water, Strand sought to visually represent the startling comparison of regions with and without water crises. The relationship between the needs of western farmers and the plenty known in the St. Louis area where the Missouri and Mississippi rivers converge informed “The Silver Knife.” The woven piece describes the duality of presence and absence that influences the political controversy surrounding water.

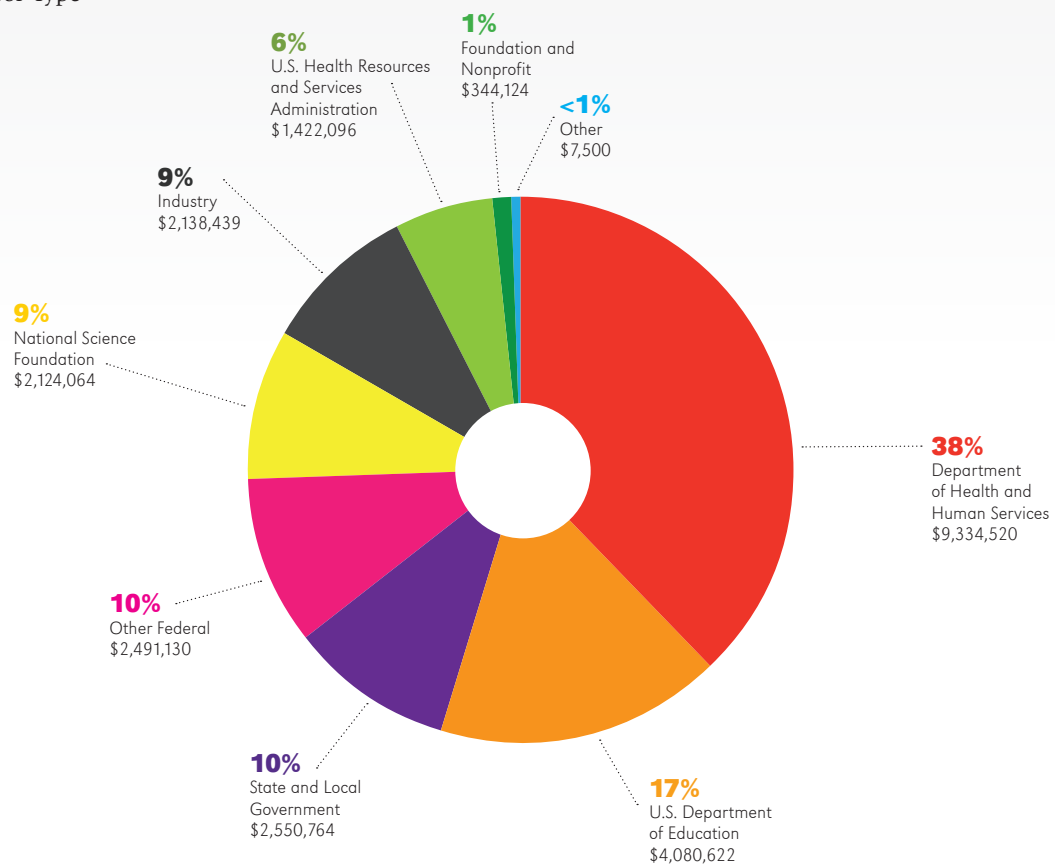


Externally Sponsored Projects

FY20 Proposal Submissions by Sponsor Type



FY20 Awards by Sponsor Type



Selected Books Published

School of Nursing
Boyd, Mary Ann and Luebbert, Rebecca. *Essentials of Psychiatric Nursing.* 2nd ed., Wolters Kluwer, 2019.

College of Arts and Sciences
Aspholm, Roberto. *Views from the Streets: The Transformation of Gangs and Violence on Chicago’s South Side.* Columbia University Press, 2020.

Rambsy, Howard. *Bad Men: Creative Touchstones of Black Writers.* University of Virginia Press, 2020.

O’Brien, Gerald. *Metaphor Analysis in Public Policy and Private Practice: A Social Work Perspective.* NASW Press, 2019.

Stacy, Jason and Matthew Ellington, *Fabric of a Nation: A Brief History with Skills and Sources, for the AP Course.* Bedford St. Martin’s, 2020.

Tamari, Steve, ed. *Grounded Identities: Territory and Belonging in the Medieval and Early Modern Middle East and Mediterranean.* Brill, 2019.

School of Education, Health and Human Behavior
Fuchs, Wendy. *Mindfulness for Students: Curriculum for grades 3-8.* New York: Routledge, 2018.

Hupp, Stephen. *Pseudoscience in Child and Adolescent Psychotherapy: A Skeptical Field Guide.* Cambridge University Press, 2019.

Jewell, Jeremy; Prinstein, Mitchell; Axelrod, Michael; & Hupp, Stephen. *Great Myths of Adolescence.* Wiley, 2019.

Pryor, Caroline R., Alexander, Erik., Johnson, Charlotte, Mitchell, James., & Blankenship, Whitney. (Eds.). (2017-2020). *Teaching Critical Themes in American History,* New York: Peter Lang Publishers, 2017-2020.

Pryor, Caroline., Alexander, Erik., Mitchell, James. Johnson, Charlotte. & Blankenship, Whitney.(in press). Foreword. In M. Karpyn, Ed. *Teaching the Causes of the Civil War,* New York: Peter Lang Publishers, 2019.

Pryor, Caroline., Johnson, Charlotte., Blankenship, Whitney & Wilkinson, Amy. (in press). Resources for Classroom Teachers. In M. Karpyn, Ed. *Teaching the Causes of the Civil War,* New York: Peter Lang Publishers, 2019.

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