

SD EPSCoR UPDATE

SOUTH DAKOTA ESTABLISHED PROGRAM TO STIMULATE COMPETITIVE RESEARCH

**QUARTERLY NEWSLETTER
FALL 2018**

New NSF Research
Traineeship Award in
South Dakota

Sinte Gleska Students
Experience Research at SDSU

Undergrad Researchers Present
Summer Work

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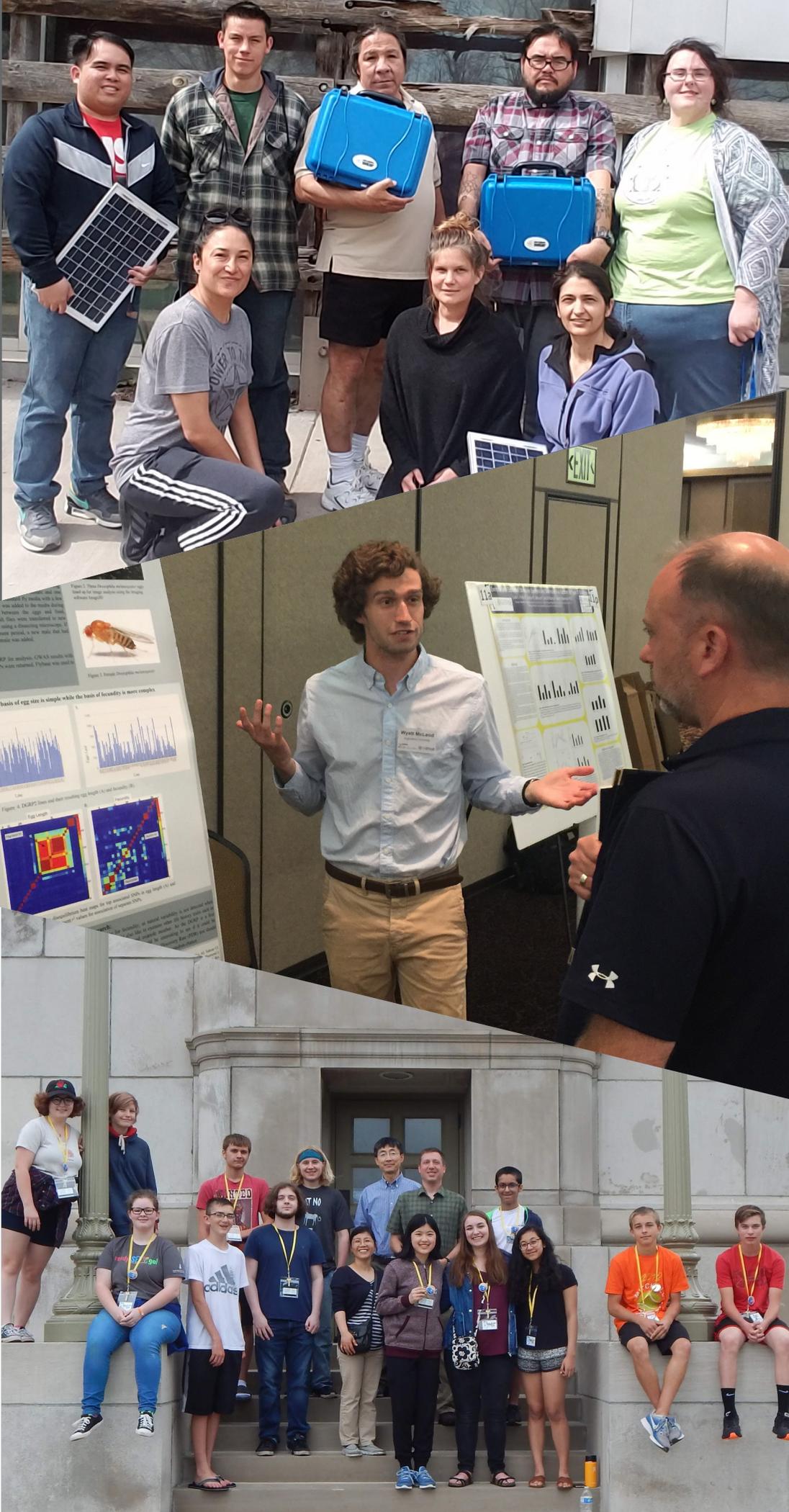
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SD EPSCoR

Current Focus Areas:

Research

- EPSCoR recognizes that universities are valuable resources. Their science and engineering programs, as well as faculty and students, are major assets to the state. Currently, SD EPSCoR supports facilities, faculty, students, and equipment at South Dakota Universities.
- EPSCoR universities, their faculty, and students are leading the way in the 21st century. These researchers are needed for the nation to meet its most pressing priorities in health, cyberinfrastructure, and homeland security. A broad science and technology base is especially important in an era when different regions have unique issues involving resources, health, security, and the environment.
- Scientific and technological research cannot be limited to a few states if the nation is to maintain world leadership and reach its full potential. Along with stimulating competitive research and promoting excellence in education, EPSCoR improves access to that high-quality education and cutting-edge research, expands economic opportunity, creates jobs, and improves the quality of life across the nation.



Education

- SD EPSCoR promotes and supports educators, research faculty, and programs in the areas of science, technology, engineering, and mathematics (STEM).
- Advances in science and engineering are essential for ensuring America's economic growth and national security. During the next decade, U.S. demand for scientists and engineers is expected to increase at four times the rate for all other occupations. Today's high school students overall are not performing well in math and science, and fewer of them are pursuing degrees in technical fields.
- Outreach and informal science education activities engage more than 35,000 SD residents per year.



Diversity

- The SD EPSCoR diversity plan represents bold, catalytic, strategic and systemic approaches to recruiting and supporting citizens of all races, ethnicity, nationality, gender, age, economic status, and sexual orientation within STEM. With a small population, South Dakota must take advantage of all its human resources if it is to advance. SD EPSCoR seeks to develop a mechanism for sharing successful diversity initiatives and discussing policies, progress and barriers statewide.
- A key to the diversity plan is developing meaningful partnerships between state government, K-12, higher education and the private sector to strengthen STEM education for diverse audiences and to diversify STEM-related workforce. The plan calls for utilizing statewide initiatives to improve instruction for underrepresented groups and those in remote regions to help diversify SD's STEM workforce.



Economic Development

- To nurture economic development in South Dakota, SD EPSCoR partners with the SD Governor's Office of Economic Development, the SD Office of Commercialization, and the SD Board of Regents. Through these collaborations business/technology education programs are created.
- Global competition demands a highly skilled workforce, and the country's economic future depends on scientific and technological advances everywhere, not just in a few places. Through EPSCoR, participating states and territories are building a high-quality, university-based research infrastructure, a backbone to their scientific and technological enterprises, and a strong and stable economic base into the next century.



New NSF Research Traineeship Award Aims to Transform Approaches to STEM Graduate Education in South Dakota

The National Science Foundation (NSF) Research Traineeship (NRT) program recently awarded 17 projects, totaling \$51 million, to develop and implement graduate education traineeship models in science, technology, engineering and mathematics (STEM) fields. One project in South Dakota will help train the next generation of scientific leaders to develop the skills necessary to tackle complex societal problems.

The awarded proposal, Cyber-Physical-Social System for Understanding and Thwarting the Illicit Economy, is a collaboration from faculty members spread across South Dakota. Researchers leading the project include Dr. Jon Kellar, South Dakota School of Mines and Technology (SD Mines), Dr. Brian Logue, South Dakota State University (SDSU), Dr. Stanley May, University of South Dakota (USD), and Dr. Ashley Podhradsky, Dakota State University (DSU).

All of the researchers collaborate with the Center for Security Printing and Anti-Counterfeiting Technology (SPACT) that was established in December 2014 and includes DSU, SD Mines, SDSU, and USD. SPACT is using an interdisciplinary, and multi-institutional approach to create the next generation of security-end products to thwart counterfeiting.

The project includes a comprehensive approach that combines three collaborative research areas. One part of the project deals in the physical world, including the effort to identify counterfeit items, such as pharmaceuticals, and work on anti-counterfeiting efforts such as the use of nanoparticle-based inks in unique markings to identify authentic goods. A second branch of study focuses on the cyber world and it includes internet-based investigations such as digital forensics and an effort to better understand the cyber/physical interface. The third part of the project is the

social world and in building a cultural understanding of the counterfeiting and illicit economy this includes, understanding crime trends and the human factor in the design of anti-counterfeiting systems.

“This traineeship program is the first of its kind in the country aimed at producing the next-generation of science-based leaders in the fight against counterfeiting and disrupting the illicit economy,” says Kellar.

NSF’s NRT program aligns with their 10 Big Ideas for Future NSF Investments: 10, bold process ideas that identify areas for future NSF investment at the frontiers of science and engineering. This year’s awardee’s from NSF focus on Harnessing the Data Revolution, and the Future of Work at the Human-Technology Frontier.

“Innovative approaches are vital to transforming STEM graduate education,” said Jim Lewis, acting assistant director for NSF’s Education and Human Resources Directorate. “By supporting approaches that utilize evidence-based learning practices, immersing students in interdisciplinary research and providing students with opportunities to develop career-aligned skillsets, NRT projects are helping change the landscape of graduate education and better prepare future STEM scientists for diverse careers.”



Jon Kellar



Ashley Podhradskey



Stanley May



Brian Logue

Sinte Gleska Students Experience Research at South Dakota State

“Come try it out—this is what we do.”

These words from South Dakota State University researchers are helping students from [Sinte Gleska University](#) in Mission see what’s possible through their research. And that’s exactly what the Sinte Gleska students’ adviser, Dana Gehring, had hoped would happen during their two-day BioSystems Networks and Translational Research ([BioSNTR](#)) center-sponsored research experience.

All five Sinte Gleska students who visited South Dakota State are working on funded research projects, explained Gehring, who heads the SGU computer and environmental sciences department. BioSNTR Program Manager BreeAnn Brandhagen and BioSNTR Senior Secretary Courtney Jones worked with Gehring to tailor the visit to her students’ interests.

Brandhagen said, “The ultimate goal is to give the students an opportunity to learn about research, equipment and capabilities beyond those available at their schools.” This is the first time BioSNTR has sponsored this event to bring students from the tribal colleges to campus, but Brandhagen and Jones are already making plans for future visits based on the students’ positive experience. BioSNTR hopes to create more opportunities like this for students at not only tribal colleges, but also smaller primary undergraduate



Darian Running Horse, left, and Joseph Hacker of Sinte Gleska University in Mission examine cells that Assistant Biology and Microbiology Professor Natalie Thiex is using to figure out which genes control “how cells drink.” Five SGU undergraduates and their adviser visited SDState through a two-day BioSystems Networks and Translational Research (BioSNTR) center-sponsored research experience.

institutions, who may not have access to some equipment or techniques.

Joseph Hacker, who is finishing an associate degree in nursing, said, “The nursing field is practical, but I’ve always loved biology and environmental sciences.” He is doing water quality research on the Little White River, Spring Creek and a natural spring in Todd County. “I’m looking at chlorophyll, E. coli, pH, ammonia and turbidity in these water bodies before bison are introduced,” he explained.

Junior environmental science major Darian Running Horse is analyzing the soil and Lester Kills The Enemy is doing an animal survey, while another SGU student is doing an arthropod survey. The baseline data that these four undergraduate researchers are gathering will be part of a 10-year study assessing the impact of bison on the ecosystem, according to Gehring. Her goal is to get other universities involved in the project.

Brandhagen said, “Successful collaborations are mutually beneficial to both parties. We hope that this is a way to get conversations started, meet people, talk about research and get some new ideas that SGU and SDSU can build on.”

Hacker added a visit with SDSU Water and Environmental Engineering Research Center (WEERC) Director Chris Schmit. “He gave me some pointers on other things to test for,” said Hacker, who plans to send water samples to SDSU for further analysis. He also got some ideas on soil analyses to share with Running Horse.

“It is helpful to see the atmosphere at a larger university. The staff and faculty are very courteous and let us participate in their labs and operate some of the equipment,” Running Horse said.

Hacker agreed: “It was an awesome experience, being in a lab and seeing what they are doing.” When Assistant Professor Natalie Thiex explained her research to determine which genes control how cells drink, the students were able to manipulate the microscope to see the white blood cells the researchers are studying.



Maliesha Bear Heels, left, and Pauline “Stormie” Jackson of SGU examine immune cells with Gitanjali Kafle and Adam Hoppe.

In Associate Professor Adam Hoppe’s lab, the students examined fluorescent images that help the researchers examine how immune cells target viruses. Assistant Professor Qin Ma’s work mapping gene expression intrigued computer science major Pauline “Stormie” Jackson. “A lot of people are using scripting languages to analyze their data—that intrigues me. I can use my degree in more than just one area. It was refreshing.”

“It is helpful to see the atmosphere at a larger university. The staff and faculty are very courteous and let us participate in their labs and operate some of the equipment.”

Jackson, who completed an associate degree in human services and is working on a bachelor’s in computer science, visited SDSU several

-Darian Running Horse, SGU Student Researcher

times exploring undergraduate studies, but now she’s focused on the graduate school. Jackson and SGU biology major Maliesha Bear Heels have been collecting mosquitoes to monitor West Nile virus in the Mission area as part of the South Dakota Department of Health surveillance program.

“Through this experience, the students can see how the pieces fit together,” Jones said. Next year Brandhagen and Jones hope to draw up to 12 students from all three tribal colleges. When it comes to involving university researchers, Brandhagen said, “Our goal is to continue to expand the program and grow participation to represent even more of the research at SDSU.”

-CHRISTIE DELFANIAN

Undergrad Researchers Present Summer Work

Over 150 undergraduates presented their research at the annual Summer Undergraduate Research Symposium and Faculty Meetings this past Summer in Pierre. The symposium, now in its fifth year, marks the continued growth of South Dakota's fellowship for undergraduates interested in scientific research.

A collaboration between SD EPSCoR and SD BRIN (Biomedical Research Infrastructure Network), the event provides students the experience of participating in a real scientific meeting that includes a poster session competition and numerous opportunities for networking. The symposium also promotes South Dakota's graduate programs and STEM employment opportunities.

Poster presentations were reviewed and evaluated on technical content, poster appearance and oral presentation by a panel of judges consisting of faculty mentors from each of the universities represented. Cash prizes were awarded for both morning and afternoon poster sessions.

"Undergraduate research is the culminating experience in an undergraduate STEM major's education," said Dr. Mel Ustad, project director for the SD EPSCoR program. "It's where they learn to apply what they know from their studies to solve a real-world problem. These problem-solving experiences are also important because they help prepare the students for entering the STEM workforce. The demonstrated ability to apply what a student knows to solving a problem and then communicating that solution is a highly sought-after ability by STEM employers."

Morning Poster Session:

1st – Andre Schaum – SPACT REU

2nd – Joseph Brett – BIOSNTR

3rd – Sarah Westerman and Tania Rodezno – BRIN Augustana

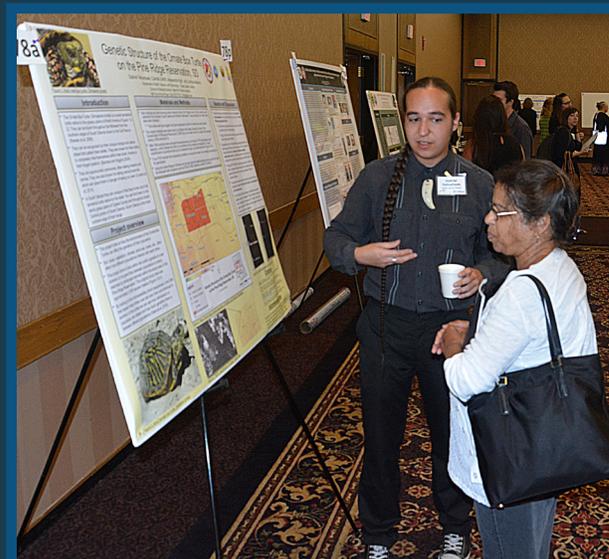
Afternoon Poster Session:

1st – Sydney Kreutzmann – BRIN Augsutana

2nd – James Norwood – Sanford Underground BHSU REU

3rd – Nora Madrigal – SPACT REU





...NSF NRT Award

CONTINUED FROM PAGE 5

All of the projects funded through NSF cover areas of national importance. Seven funded projects focus on Innovations at the Nexus of Food, Energy and Water Systems. Notably, broadening participation strategies for six of the awardees utilize links with NSF INCLUDES projects.

Additionally, the awards promote convergent research by addressing complex challenges facing society that require expertise and perspectives from multiple disciplines and stakeholders. NRT projects train students to work in these convergent spaces. Examples of specific areas of research include: integrating technology and computational approaches at the nexus of food, energy and water systems; building stakeholder-engaged natural resources management approaches; increasing the resiliency of rural areas and agricultural systems; designing user-centered, smart engineering solutions; and fostering discovery and innovation in cyber-physical systems.

Diversity/Science Fair Grants

A key component of the EPSCoR project is to increase the number individuals from underrepresented groups in STEM activities. The SD EPSCoR diversity plan represents bold, catalytic, strategic and systemic approaches to recruiting and supporting citizens of all races, ethnicity, nationality, gender, age, economic status, and sexual orientation within STEM. With a small population, South Dakota must take advantage of all its human resources if it is to advance.

Eligibility:

Applications may be submitted by school districts, post-secondary institutions, educational service providers, non-profit organizations and other entities supporting STEM education and outreach activities in South Dakota. Click [here](#) for full details.

Grant awards will be made based on alignment with the following priorities:

1. Student participation: Demonstrates a capacity for a large number of students in grades 7-12 to participate in the project.
2. STEM Awareness: Increases student awareness, knowledge and skills through participation in science fairs and other activities exposing participants to a range of STEM careers available in South Dakota.
3. Diversity: Supports a diverse audiences and targets underrepresented groups of students and those located in rural areas of the state. Preference will be given to applications focused on females, underrepresented minorities, students with disabilities, and students in rural communities.

Use of Funds:

Funds may be used to support a variety of activities including but not limited to:

- Science fair participation and events
- Travel to participate in science fair activities
- Travel to promote science fair and other STEM outreach activities
- STEM outreach events
- STEM education workshops
- STEM exposure events
- STEM career exploration

Grant Amounts:

The maximum amount per application is \$5,000. Total funds available for STEM Diversity awards is \$44,000. All funds will need to be expended and reimbursement requested by June 30, 2019.

Deadline:

Proposals must be submitted electronically to Elizabeth.martinson@sdstate.edu by October 26, 2018.
Award Notification date: November 16, 2018

[Visit our website for full details.](#)

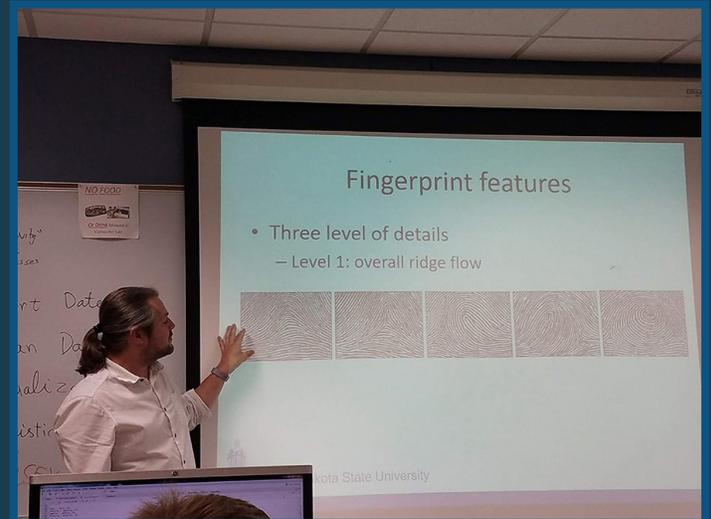
Students Learn Programming, App Development at Camp

This summer, SD EPSCoR partnered with BioSNTR and the SDSU Department of Mathematics and Statistics to hold a Data Analytics Camp for high school students. This free camp taught students different computer programming languages, how to develop applications, create webpages and analyze datasets.

“I was blown away by some of the student projects,” said Xijin Ge, an associate professor at SDSU and the camp’s director. “They started from zero on Monday, and after five hours of training, by Thursday they were able to write code to analyze datasets and develop useful apps.”

When not coding, the students heard from working professionals. Kelly Crevier, business intelligence manager at First Bank and Trust, talked about how analytics help make her employer be more efficient and detect frauds. Valerie Bares, senior biostatistician at Sanford Research, discussed how she used mathematics and statistics to help find cures and treatments for various diseases.

In addition, SDSU faculty talked about the career of data scientists, how mathematics help solve crimes by analyzing fingerprints and how spatial data are gathered and took the students on a walk



Cedric Neumann, an associate professor in the SDSU Department of Mathematics and Statistics, talks about how the use of mathematics and analytics can help solve crimes by analyzing fingerprints.

across the campus using GPS coordinates. The students also went on tours of the Jerome J. Lohr College of Engineering’s facilities, including its collection of 3D printers. Between classes, the campers relaxed at the SDSU Dairy Bar and the SDSU Wellness Center. Stay tuned to the [camp’s facebook page](#) for details on next year’s camp.

NSF EPSCoR Releases Track-2 Solicitation

The National Science Foundation EPSCoR program has released a [solicitation](#) for proposals for “Track-2” collaborative research projects. Proposals must include Co-PIs from at least two of the 26 EPSCoR states and territories and must be on the topic of “*Harnessing Big Data to solve problems of national importance.*”

Proposals are for up to four years and up to a total of \$1 million a year for awards shared between two EPSCoR jurisdictions, and up to \$1.5 million a year for awards shared between three or more jurisdictions.

Letters of intent are due November 26 and full

proposals are due January 25, 2019. Researchers interested in applying should contact the SD EPSCoR office or your institution’s office of sponsored research.



Researchers are also encouraged to serve as Co-PI’s on projects at other jurisdictions. If you’re looking for collaborators, our friends at South Carolina EPSCoR have created an [online searchable spreadsheet tool](#) that enables EPSCoR researchers to find potential collaborators by location, topic, research keywords and more.

SD Mines Researcher Receives \$2.2 Million DOE Grant to Turn Biorefinery Waste Into Valuable Products

Rajesh Shende, Ph.D., associate professor in the chemical and biological engineering department at the South Dakota School of Mines & Technology has received a \$2.16 million grant from the Department of Energy's Bioenergy Technologies Office to research and demonstrate cost-effective ways to turn waste from biorefineries, such as ethanol plants, into valuable products.

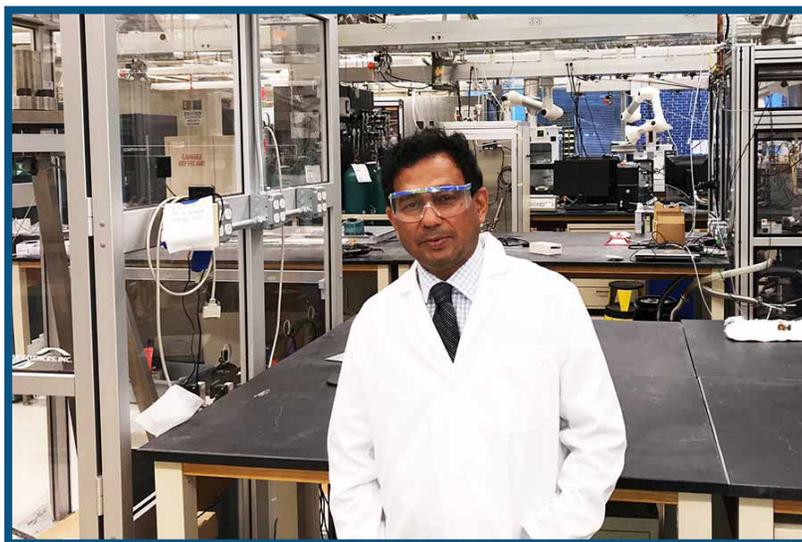
“The Integrated Biorefinery Optimization effort is a prime example of how the Department of Energy can leverage its resources to help solve real-world issues facing biorefineries,” said U.S. Secretary of Energy Rick Perry.

Shende's research will focus on finding efficient ways to turn waste generated by ethanol plants and other biorefineries into useful products. Commodities such as biocarbon, carbon nanofibers, lactic acid, and phenol can be made from waste generated by facilities that process corn and other plant material. This waste is normally thrown-away—but finding cost effective means of turning it into new products will generate extra revenue for ethanol plants and other biorefineries and help lower fuel costs from these facilities.

Shende's research will focus on three objectives: to demonstrate how the process of converting waste into value added products could integrate into current facilities, estimate the final product yields and revenue that could be generated based on current market value, examine the environmental and economic impact of the processes.

Partnering institutions on this project include: Old Dominion University (ODU), Virginia Commonwealth University (VCU), Idaho National Laboratory (INL) and Southwest Research Institute (SwRI). This research also includes co-principal investigators: Hao Fong (SD Mines), Sandeep Kumar (ODU), Ram Gupta (VCU), and Tyler Westover (INL).

For more information about the DOE's Bioenergy Technologies Office click [here](#). To learn more about DOE's programs under the Office of Energy Efficiency and Renewable Energy click [here](#).



Rajesh Shende, Ph.D., shown here at a Massachusetts Institute of Technology lab while doing research on sabbatical, is an associate professor in the chemical and biological engineering department at SD Mines and the principal investigator on a project that aims to turn biorefinery waste into value added projects.



**U.S. DEPARTMENT OF
ENERGY**

New USD Patent Enables Improved Environmental Monitoring, Biomedical Devices and Precision Agriculture

A new patent issued to University of South Dakota researchers led by Rick Wang creates a breakthrough technology by which molecules can be manipulated, designed and synthesized to act on and capture other molecules, enabling enhanced analysis of those molecules.

This new technology will aid in identifying previously undefinable matter or molecules, and will support scientists and research efforts seeking to better understand material properties at the molecular level.

It is anticipated this technology will have significant functions and contributions for precision agriculture, environmental monitoring, biomedical devices and other uses.

The patent explains how molecular supercontainers of varying conformations can be designed and assembled in a modular fashion, increasing the commercial applications for this technology.



Rick Wang

Zhenqiang (Rick) Wang, Ph.D, is an associate professor of chemistry at the University of South Dakota. He has been at USD since 2010. Co-inventor was Feng-Rong Dai, Ph.D., a former postdoctoral researcher in the Wang laboratory at USD.

ENTER NOW!

**THE NSF 2026
IDEA MACHINE**



Finding “Big Ideas 2.0”: Identifying new directions for research.

The [NSF 2026 Idea Machine](#) is a competition to help set the U.S. agenda for fundamental research in science and engineering. Participants can earn prizes and receive public recognition by suggesting the pressing research questions that need to be answered in the coming decade, the next set of “Big Ideas” for future investment by the NSF. It’s an opportunity for researchers, the public and other interested stakeholders to contribute to NSF’s mission to support basic research and enable new discoveries that drive the U.S. economy, enhance national security and advance knowledge to sustain the country’s global leadership in science and engineering.

Enter your “Big Idea” between August 31, 2018 and October 26, 2018!
Follow on twitter: [#NSFIdeaMachine](#)

Biotech Breakthrough Summit to Highlight Human, Animal Health

Learn about biotech breakthroughs, get up to speed on industry issues and connect with others in the biotech community at South Dakota Biotech's annual Breakthrough Summit. Held Oct. 4 from 7:30 a.m. to 4:30 p.m. at the Washington Pavilion in Sioux Falls, the annual summit brings together biotech industry business leaders, educators and the professionals who support them. [More](#)

USD Receives Information Technology Infrastructure Grants

The University of South Dakota received two grants to improve research networking capability on campus and throughout the state. The Western South Dakota Research and Education Network award from the National Science Foundation Campus Cyberinfrastructure Program is a federally funded, \$700,000 grant that supports a two-year project to build more advanced campus networks for Black Hills State University and South Dakota School of Mines & Technology. [More](#)

Save the Date: Women in Science Conference 2019

Save the date for next year's Women in Science Conference: Tuesday, April 30, 2019 at the Ramkota in Pierre. The conference is open for all girls in middle school and high school. Don't miss this free and fun day of hands-on activities led by women in STEM careers. The girls will have the chance to explore STEM opportunities beyond high school, mingle with like-minded girls and meet professional women in science. [More](#)

Annual Innovation Expo

SD EPSCoR is a sponsor for the Innovation Expo, a conference held in Rapid City and Sioux Falls that focuses on connecting entrepreneurs, innovators, angel investors, venture capitalists and the many others who are involved in developing startup companies. This year's event(s) will be held Oct. 9 in Rapid City and Oct. 11 in Sioux Falls. The conference includes a Student Idea Competition that is open to all higher education students in South Dakota. Selected finalists will present their business idea on stage at the Innovation Expo. Cash awards will be given to the top ideas and all student contestants will receive a free ticket to the Innovation Expo. [More](#)

Engebretson Talks Biomedical Engineering on Podcast

Dan Engebretson, Ph.D., chair of the biomedical engineering program at the University of South Dakota and the director of the Graduate Education and Applied Research (GEAR) Center in Sioux Falls, spoke with the University of South Dakota Credit Hour Podcast about the history and future of biomedical engineering and the emerging options USD students have in this growing field. [More](#)

SD Mines Researchers Chat About NSF Research Experiences for Undergraduates on SDPB Radio

South Dakota School of Mines & Technology faculty members Dr. Grant Crawford and Dr. Jon Kellar were recently on South Dakota Public Broadcasting to talk about the Center for Security Printing and Anti-Counterfeiting Technology (SPACT) and their cultural heritage science approach to combat the sale of counterfeit Lakota arts and crafts. This particular research is done by students taking part in SPACT's National Science Foundation Research Experience for Undergraduate's (REU) site that provides students with the opportunity to conduct cutting-edge research focused on security printing and anti-counterfeiting technology. [More](#)

