

**Better equipment builds opportunity**

In a recent grant round, Dickinson State University (DSU) received a ND EPSCoR equipment award that allowed our department to purchase a specialized piece of equipment. As a soil scientist, my ND EPSCoR-sponsored research has been to look at how soil properties change with changes in soil management. Our research compares the soil properties of land in the Conservation Reserve Program (CRP) with land that has been taken out of CRP and put into no-till production or no-till production that is also used as winter forage for cattle. Up until now, we've taken the soil samples twice a year by hand: from the surface to one meter deep at 30 sites, totaling 300 samples per year. That's a lot of digging!

Being awarded the equipment grant now allows us to get a hydraulic sampling system that can be easily transported to various field sites. The hydraulic Giddings model (left) has a gas motor and comes with various attachments such as an auger, direct push tubes, and a bucket auger. Now instead of being limited to hand digging, we can go up to 25 feet deep if needed.



So why is one piece of equipment so important?

Equipment like this plays a key role in helping to equip our students for their careers. Many of our students get their bachelor's degree and go into the workforce. With the oil boom, companies and consultants want our students who have majored in environmental studies, soils, natural resources or range management to help them with environmental projects or reclamation. This new equipment is similar to other equipment they may need to operate in their new jobs, so it's another way DSU prepares students and plays a key role in workforce development.

Another benefit to students is the ability to conduct research as an undergraduate. Studies show that when undergraduates get involved in research, their retention is better, graduation rates are higher, and students are

better prepared for their next career step, whether it's in graduate school or industry. Equipment like this creates opportunity for students to explore and build their resume. Employers or other researchers want to know about experience, and this infrastructure is important in that effort.

As you might expect, equipment like this is also a huge benefit to our research. Rather than spending time digging hundreds of holes, we can now focus on studying the soil samples and analysis. The equipment reduces time, increases the number of samples we can collect, which makes our research even stronger. It also gives us additional collaborative abilities with other researchers across the state who may want to work with us on a project because we have the needed equipment to accomplish the research goals.

As a smaller university, our principal investigators are teaching three to four classes each semester. At larger universities, professors will have graduate students to help with research, grading classwork or helping in labs. We don't have that option at DSU which significantly limits the time we have available to write new grants or to do research. So the simplified ND EPSCoR application was a definite bonus.

Finally, a piece of equipment like this opens up other funding opportunities. Now we have the equipment, it allows us to apply for other types of grants or funding. Funding sources often ask what equipment is already available, and this award helps build our infrastructure so we can be more competitive with the equipment we can bring to the table.

From training students to research to new funding opportunities, one piece of equipment can be a key factor. We appreciate the support of ND EPSCoR.



Regards,

Eric Brevik Ph.D.  
Professor of Geology & Soils, DSU  
(Guest editor, Center for Regional  
Climate Studies [CRCS] Researcher)

## EPSCoR support for ND K-12 instructors

We are excited to announce that the STEAM Energy Teacher Professional Development Module, an enroll-anytime self-paced online course is now open:

<https://register.und.edu/learning/jsp/session.jsp?sessionId=PDE.20.0522&courseId=TL.ONL.SE&categoryId=10062>

Once enrolled, participants have 60 days to complete the modules. These modules were developed with funding from North Dakota's current National Science Foundation (NSF) EPSCoR RII Track-1 cooperative agreement (INSPIRE-ND).

This three-module course will explore aspects of STEAM (science, technology, engineering, arts, and mathematics) instruction through an integrated investigation of sustainable cities. Participants will imagine, research, design, and build their own sustainable city while considering how this integrated curriculum may be effectively taught in their own classrooms. Each module has a specific content focus that participants will engage with through both a learner and teacher lens, allowing them to develop a deeper understanding of energy sources and consumption, city design, geography, climate, and population.

As a part of the INSPIRE-ND financial support, the first 25 Science teachers in ND who successfully complete this course will be reimbursed for the total cost of the course (and receive information to promote STEM instruction in their classroom). Please contact the instructor, **Ryan Summers**, EWD researcher and assistant professor of Science Education at UND, at [ryan.summers@und.edu](mailto:ryan.summers@und.edu) or call 701-777-3144 for more information.

## Organic answer to oil spills

Oil spills have been in recent headlines, along with concerns over how to clean up the affected sites. Prevention of spills is one aspect of the problem; another is developing a better way to clean a contaminated area so the soil can once again be a productive site.

Recent research directed by **Brent Voels**, former CRCS and now Center for Sustainable Materials Science (CSMS) researcher and Science instructor at Cankdeska Cikana Community College (CCCC), developed a proof of concept treatment using a certain type of mushroom as a useful, organic way to clean up an oil spill. "A typical oil spill not only contains the oil but many kinds of heavy metal particles as well. Traditional methods of

remediating or cleaning up a site involve burning the oil out of the soil, but that often leaves behind toxic heavy metals."

The research project used mushrooms, which are a type of fungus. The mushroom root system includes mycelia and hyphae that reside under the ground and feed on various nutrients. As Voels explained, it is that amazing root structure that seeks out the microscopic chemicals of the oil and absorbs or "eats" them. "What you get as a result is organic waste," Voels (below) said.



The experiments involved mixing used oil from the Bakken into dirt samples, he explained. "The next step was adding mushroom spawn to the oily dirt," he said. "What we found was that the spawn slowly "eat" the oil over the course of several months and use it for their nutrition. When the 'fruit bodies' or mushroom (what people would normally eat) is produced, it contains the heavy metals from the soil, removing it from the soil." The mushrooms can then be destroyed.

Now that he has shown the potential of using mushrooms as a treatment strategy, Voels said the next step would be to isolate the enzymes to develop a spray that could be used in the oilfields. "Our biggest problem is getting the research to the next level," he said. "We have proven the concept works, but the mushroom process takes more time than current treatment methods. These early results need more research and development."

Voels' project is a classic example of helping students learn while developing new concepts that can make a difference. By tying the research to the tribal concerns over clean water, air, and soil, Voels has found a way to bring added interest to STEM disciplines and potential careers.

## The values used in decisions

Family farming is a common model in North Dakota, but recent Center for Regional Climate Studies (CRCS) research focused on a more in-depth look at the values that drive farmers' and ranchers' decisions about land usage. **Tamba-Kuii Bailey**, assistant professor in Education, Health & Behavior at UND, finished his Track-1 sponsored research last summer, and he and his team are preparing to publish their results.

"We had assumed that farmers would place economic factors as the primary decision factor," Bailey said. "Instead we found strong familial and emotional connections to the land. Many of the people we talked with were part of a multi-generational family enterprise, so they were very concerned about stewardship, about keeping the farm legacy for the next generation."

As a former urban dweller, Bailey noted a rural/urban disconnect. "One rancher told us you work 365 days a year," he explained. "With his cattle, when it snows, he still has 300 mouths to feed, so it means he plows a path to the barns to get hay to the cattle. Things don't stop when it snows when you're on a ranch." Bailey continued, "It's not a job. It's a way of life with stewardship and responsibility at a whole different level."

The people interviewed in the study were aware and concerned about farm policy, climate fluctuations, conservation practices, labor shortages, and new technologies as well as economics, Bailey said. "It can be very complicated, and it has become even more difficult because they want and need information that is science based and not driven by a political source," he explained. "They see value in technology that can help them: such as using drones to monitor crops and fence lines or having automated equipment. But their goal continues to be stewardship of the land so it can be successful now and be in good shape to hand down to future generations."

Students involved in helping gather the research data also learned a great deal. "Both urban and rural students were involved in the project," Bailey said. "We all gained a greater appreciation for the experience of farming and ranching in ND, and the students were able to learn about attitudes and values that can impact behavior."

One of the outcomes from the research may be in how entities, such as federal agencies, interact with farmers and ranchers. "We often see farm programs from an economic standpoint, and some programs try to get buy-in with only economic incentives. The

question is then asked about why more don't take part," he said. "Farmers and ranchers told us they think beyond the financial gain to the bigger picture of their family and legacy."

"Perhaps the best example of the emotional connection to the land came from one farmer," relayed Bailey. "I have photos of my kids in my wallet that I'm proud to show people. The farmer had pictures of his farm that he proudly displayed. There is a different connection with the land."

For more information about this research, please contact [tambakuii.bailey@und.edu](mailto:tambakuii.bailey@und.edu)

## Research information from the road

Located at the crossroads of two interstate highways in the heart of massive agricultural production means ND is a major transportation hub. Vehicles of all sizes and shapes use the state's highway system to transport goods to and from markets. Monitoring that traffic to develop more "intelligent transportation systems" is the goal of **Mu'ath Al-Tarawneh**, a recent Doctoral Dissertation Assistantship (DDA) awardee, and of **Ying Huang** (below), associate professor in Civil and Environmental Engineering at NDSU and Advance Focus on Resources for Women's Advancement, Recruitment/Retention, and Development (FORWARD) Leap Award recipient.



"We have used various sensors to make our roads and cities smarter," Huang said. "We're looking for new ways to use technology to enhance safety and make our models more responsive to actual traffic patterns."

Because the weight and frequency of a vehicle on a road can impact the length of time before a road must be maintained or replaced, gathering more information about vehicle traffic is critical. In addition, engineers



want to know where, how, and when vehicles are traveling in order to create traffic systems that help keep drivers safe.

The vehicle classification system developed by the national Federal Highway Administration (FHWA) divides vehicle type into 13 categories depending on the number of axles and the wheelbase. Current systems that monitor traffic handle singular measurements such as weight, number of vehicles, length of a vehicle, or speed, but the individual results may not be integrated with the other reporting systems.

According to Al-Tarawneh and Huang, classifying vehicles becomes difficult because vehicle patterns overlap. To distinguish between different vehicle categories, they developed specialized machine learning algorithms to classify vehicles based on traffic data collected from embedded three-dimension sensors that combine multiple tracking devices into one system.

“Our newly developed technology is a game-changer,” Huang said. “We have created a proof of concept tracking system that has been piloted with the Minnesota Department of Transportation on a test section of I-94,” she said. “This integrated system is designed to last as long as that section of pavement, doesn’t require a technician on-site, and has a reasonable cost.”

Huang’s future research will continue to refine this evolving technology. As for Al-Tarawneh, the DDA funds helped him finish his dissertation, Huang said. “The research funds from the Track-1 were very helpful for both of us,” she said. “For Al-Tarawneh, it helped him gain confidence and strengthened his resume. He had three job offers when he graduated!”

## Solving materials problems

When there’s a product that works, why would someone want to change it?

The question is at the heart of much of **Catherine Sutton’s** research for CSMS at NDSU. A doctoral student in Chemistry under the mentorship of **Mukund Sibi**, CSMS researcher and distinguished professor in Chemistry, Sutton has spent the last several years gaining a better understanding of everyday chemicals and how ND crops could be a better answer.

“We’re looking for greener answers,” she said, “because many of the chemicals use toxic materials in their production or as a part of the finished product. We’re investigating biobased materials that work as well as other products.”

Beyond finding renewable sources for the materials comes an added advantage. “With the biobased

materials we’re able to develop interesting compounds that are not found in petrochemically based materials,” she explained. “It’s opened up new avenues for making innovative monomers (building blocks) that can be used in other chemistries.”



Sutton (above) began her chemistry education journey thinking she would go into medicine. “I liked my AP chemistry class in high school, but I didn’t know any chemists so I assumed I would go into medicine,” she said. “It was an undergraduate professor of mine that knew about the NDSU program and suggested I take a look. My interest in green chemistry was piqued as an undergraduate, and when I met with Dr. Sibi and heard about his green chemistry research, I knew what I wanted to do.”

Since starting her program, she has helped develop new monomers and new processes. “Other graduate programs are more rigid and established with a focus on pharmacological chemistry,” she said. “Here at NDSU, it’s more innovative and I’m able to do things to help the agricultural community in this amazing state. In addition to the inedible part of plants like corn stover or grasses, we have sunflower and soybean oil that we can use in research that will help the state’s farmers if we can scale the products into production.”

In explaining her research, Sutton said, “The biomass base is the core of the compound, and now we’ve been able to build a library of compounds from this foundational research. These compounds are useful in a variety of materials and are efficient in reactions.”

In fact, the research has yielded results that have given Sutton another first: her name is included as one of the inventors on a recent provisional patent application. “I’m very honored,” said this Illinois-born student. “I never expected this to happen at this stage in my career. To be able to work with other students, publish papers, collaborate with researchers in Coatings and Polymeric Materials (CPM) to polymerize some of the molecules to see if they are useful—it’s been a great place for exploration. For me, it’s been the right size school in the right place for research.”

## Updated fertilizer recommendations

Research continues to provide the ND agricultural community with new information. In recent years, **David Franzen**, CRCS researcher and professor/Extension specialist in NDSU's Soil Science and School of Natural Resource Sciences, took an in-depth look at the fertilizer recommendations for North Dakota.

"Our recommendations used to focus on yield predictions, but we've found that it's not an effective way to determine fertilizer requirements," Franzen said. After extensive research and review of the fertilizer impacts during various weather conditions, soil conditions, and crop types, he said the recent recommendations were all crop nutrient response and economics-based.

"The real key is how nutrients in the soil are taken up during different conditions," he explained. "During 'ideal' conditions, the nitrogen release is unbelievable, and the microorganisms are working at capacity. The amount of nitrogen made available to crops from the soil is phenomenal—sometimes as much as 100 to 150 pounds per acre."

What happens during less than ideal conditions? "When it's dry, the roots are not growing to their full extent and the microbe activity is low. Nitrogen is a major crop nutrient," Franzen (below) said, "and it is



affected by soil water availability. Nitrogen moves to roots through a process called 'mass flow', where the nitrates are dissolved in water and move to the root systems which then take up the nitrogen needed for healthy plant growth. If there is too little water, there is little flow and the efficiency of nitrogen uptake is greatly reduced. The net result is that there needs to be more nitrogen added per unit of yield to achieve the greatest yield/profit."

"During wet years, the crop root systems often are very shallow. When the soil is saturated, the oxygen

needed by the microbes is not available because they don't swim," he said, "so the crop needs more nitrogen per unit yield in order to help the crops produce to their economic maximum." The net result is that a similar rate of fertilizer is required to produce a profitable crop whether the year supports higher or lower yields, and 'yield goal' is not important.

"Initially we thought the fertilizer rates would be climate-controlled, but they are really climate neutral," Franzen said. "In poor years (wet or dry) you need to add more nitrogen to a field per unit of eventual yield because the conditions inhibit uptake by the roots. In good years, a farmer doesn't need to add more nitrogen or other nutrients than in any other year, because the efficiency of nutrient release in the soil is higher and the ability of the plant to take up nutrients is much improved."

One additional research-based insight may impact the type of cultivation used by farmers. "There are symbiotic nitrogen fixers in the soil," Franzen said. "These are microbes that aren't attached to any plant but they are important for crop health. They increase the soil nitrogen supply when they're not disturbed, so you'll see much greater microbial activity in a long-term no-till field than you will where conventional tilling is done. In the no-till field, there is more food available for them and stable 'housing.' Farmers can use less nitrogen with long-term no-till because the soil has better microbial activity."

The new nitrogen calculators for wheat, corn, and sunflowers help the farmer by accounting for various types of soil, types of land management, the prices for various crops, and the cost of the fertilizer. To find out more or to access the nitrogen calculator, please see [https://www.ndsu.edu/soils/personnel/faculty/dr\\_david\\_franzen/](https://www.ndsu.edu/soils/personnel/faculty/dr_david_franzen/)

## From research to industry

For many researchers, their goal is to develop an idea, product, or service that can be useful for individuals or industry. A research center that has been funded in part by ND EPSCoR for the past several years is now in the process of making the transition to a formal university/industry collaboration. The Center for Sustainable Materials Science (CSMS) will continue its efforts in concert with industry partners, thanks to an NSF Industry & University Cooperative Research Centers (IUCRC) program.

"NSF is looking to build more industry and academic collaborations and the IUCRC is a way to build those



interactions,” noted **Dean Webster**, (below) CSMS lead and chair of NDSU’s Coatings and Polymeric Materials (CPM). Housed at NDSU under the direction of David Grewell, chair of Industrial & Manufacturing Engineering, is the Center for Bioplastics and Biocomposites (CB<sup>2</sup>) which brings together industry partners and university researchers. NDSU became a CB<sup>2</sup> university partner in May 2019. Their mutual goal is finding useful biobased plastics, polymers, and composites that have industry applications.



“CSMS has given us a toolkit of chemicals and materials, and the IUCRC is able to move this work closer to industry,” said Webster, who is also the CB<sup>2</sup> PI on NDSU’s award. “NSF encourages and helps fund the operational side of the project while industry partners help fund the research projects.” The hoped-for result will be a product that an industry member can then begin to take to a commercial market.

The difference between a typical academic research approach and the IUCRC is that the research is driven by the needs of industry, Webster said. Each year, industry partners in the IUCRC present their top priorities, and researchers propose projects that will provide answers. He added, “CB<sup>2</sup> can now use those chemicals and materials from CSMS to advance the technology to mature commercially viable products.”

One of the CB<sup>2</sup> co-PIs at NDSU (along with Grewell and Alan Kallmeyer) is **Chad Ulven** (below), CSMS



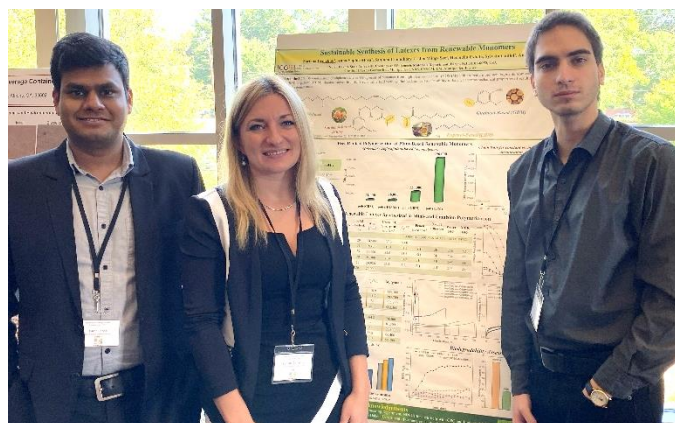
researcher and professor in Mechanical Engineering. “The timelines are aggressive—only one to two years,” he said, “but there’s a real excitement by the students and faculty in solving a real-world issue for a company. It’s very rewarding and an opportunity for those that can adapt to the faster pace.”

Many of the existing CSMS researchers at NDSU are involved with the NDSU CB<sup>2</sup> partner award. Other university partners include Iowa State University, Washington State University, and the University of Georgia. “We’re excited to partner with other academic researchers as well as key industries,” Ulven said. “The industries also appreciate that every dollar they spend is going to fund research for their current challenges. It’s a good relationship.”

Both Ulven and Webster note that students will also benefit from the CB<sup>2</sup> partnership. “It helps students begin to think in applied ways,” Ulven explained. “It also provides an internship-like experience for the students and exposes them to potential job opportunities with these companies. It benefits everyone.”

With years of research invested in CSMS, ND has benefited in a variety of ways from the efforts to use agricultural byproducts as the replacement for petrochemical materials to increased awareness of the possibilities in these innovative answers. With partnerships such as CB<sup>2</sup>, consumers may also see the benefits—and have access to products like golf tees, helmets, paddleboards or new coatings—using biobased materials developed in North Dakota.

## Activities of note



**Karan Bansal, Zoriana Demchuk, and Yehor Polunin** (above left to right) CSMS researchers and graduate students in Coatings and Polymeric Materials at NDSU, gave poster presentations at the 2019 Fourth International Symposium on Materials from Renewables (ISMR) held at the University of Georgia in Athens, Georgia.

*Novel Monomers from Biomass* was the topic presented by **Mukund Sibi**, CSMS co-lead and NDSU distinguished professor in Chemistry and Biochemistry. *Copolymer Latexes from Renewable Monomer Mixtures* was presented by **Andriy Voronov**, CSMS researcher and professor in CPM at NDSU.

The ISMR is a series of conferences, organized by NDSU and the University of Georgia, designed to bring together professionals from academia, national laboratories, and industry specialists. The meetings are focused on basic and applied aspects of monomers, polymers, and polymer composites from renewable sources.

ND EPSCoR's NATURE program was recently featured in the *Diversity in Action* magazine with an article titled ***Moving the Needle***. Information on the ND EPSCoR NATURE program was provided by **Kelly Rusch**, ND EPSCoR executive director, and **Scott Hanson**, ND EPSCoR tribal colleges liaison manager. The article features NATURE as one of the programs that encourage underrepresented Native American youth in the U.S. to pursue STEM careers. Read more at: [https://www.bluetoad.com/publication/?i=625422&pre=1#{%22issue\\_id%22:625422,%22page%22:38}](https://www.bluetoad.com/publication/?i=625422&pre=1#{%22issue_id%22:625422,%22page%22:38})

*Bridging the Gaps Towards Valorizing Forages and Fiber Crops in North Dakota* was the winning team topic in a recent NDSU Co-Search event. The goal of the interdisciplinary process is to help researchers develop new ways of tackling research questions. This team's project will determine how unused forage materials in the state (up to 30% of the total annually) could be used to create new products at local bio-refineries. The team included several CSMS researchers: **Chad Ulven**, professor of Mechanical Engineering, **Marisol Berti**, professor of Plant Sciences, **Ghasideh Pourhashem**, assistant professor in CPM, Venkataramana Chapara, extension research assistant professor of Plant Pathology, Wenjie Xia, assistant professor of Structural Engineering, and James Caton, assistant professor of Agribusiness and Applied Economics.

**Dean Webster**, CSMS researcher and chair of NDSU's CPM, was awarded \$41,500 for *Polymers and Adhesives for Stone Conservation* by the National Park Service.

**Marisol Berti**, CSMS researcher and professor of NDSU Plant Sciences, was awarded \$196,500 for *Alfalfa Management Practices and Their Effect on Arbuscular Mycorrhizal Populations - Towards Improving Health,*

*Productivity, and Sustainability of Alfalfa Production* from the National Institute of Food & Agriculture.

Alan Kallmeyer, along with Co-PI **Chad Ulven**, CSMS researcher and professor in Mechanical Engineering, was awarded \$150,000 for *Design and Development of Durable Adhesive Joints* by the Department of Defense and PPG Industries.

**Chad Ulven** along with Co-PIs Bashir Khoda (former CSMS researcher now in Maine), **Mukund Sibi** (CSMS researcher and distinguished professor in Chemistry), and **Dean Webster** were awarded \$1,000,000 for *High Performance Bio-based Polymers for Coatings and Additive Manufacturing* from the Department of Defense.

**Timothy Greives**, Doctoral Dissertation Assistantship (DDA) advisor and recipient of a New Faculty Start-up Award and associate professor in NDSU's Biological Sciences, was awarded \$15,295 for *Methods Development to Reduce Blackbird Damage to Sunflowers* by the Animal and Plant Health Inspection Service.

**Andriy Voronov**, CSMS researcher and professor in CPM, was awarded \$34,365 for *Collaborative Research: Engineering of Recoverable Cellulosomes for Bioconversion* by the National Science Foundation.

**Feng (Frank) Xiao**, Emerging Seed Areas award recipient and assistant professor in Engineering, along with Co-PIs **Xiaodong Zhang** (former CRCS researcher), Julia Xiaojun Zhao, Naima Kaabouch, Deborah Worley, and Andrew Leonard (all UND) were awarded \$649,791 for *Support for Academically Talented STEM Scholars at the University of North Dakota* by NSF.

## **Thanks to PUI and TCU hosts**

ND EPSCoR thanks our Primarily Undergraduate Institution (PUI) and Tribal College/University (TCU) hosts during this past month for showing us the impact of the Track-1 at their campuses and in their communities and for taking time to talk with us about the unique STEM needs across the state: Association of Tribal College Presidents (10/18), Cankdeska Cikana Community College (10/21), Dickinson State University (10/22), Nueta Hidatsa Sahnish College (10/24), and Turtle Mountain Community College (11/6). We look forward to our upcoming visits with United Tribes Technical College (11/15), Mayville State University (TBD), and Valley City State University (TBD).

## Funding opportunities

### NSF Track-2 funding deadlines:

EPSCoR Research Infrastructure Improvement Program: Track-2 Focused EPSCoR Collaborations (RII Track-2 FEC) **NSF 20-504**.

**Letter of Intent Due Date** (required): by 5 p.m. submitter's local time on **December 20, 2019**

**Full Proposal Deadline:** by 5 p.m. submitter's local time, **January 24, 2020**

- There is a limit of a single proposal from each submitting organization.
- Each proposal must have at least one collaborator from an academic institution or organization in a different RII-eligible EPSCoR jurisdiction as a co-Principal Investigator (co-PI).

For more information, please see the ND EPSCoR website or:

<https://www.nsf.gov/pubs/2020/nsf20504/nsf20504.pdf>

### NSF Track-4: EPSCoR Research Fellows:

The RII Track-4 Fellows program **NSF 18-526** provides an opportunity for non-tenured faculty to spend extended time at premier research facilities. The fellowship period may be used to initiate new or expand existing collaborative relationships, or to make use of unique equipment not available at the PI's home institution. Any research topic eligible for consideration under NSF's policies will be considered for support. The fellowship host site may be an academic, governmental, commercial or non-profit research facility within the United States or territories. **Deadline: March 10, 2020.**

Eligible PIs employed by degree-granting institutions of higher education must hold a non-tenured faculty appointment. RII Track-4 awards will be made as standard grants. The award amount will not exceed \$300,000 and the project duration will not exceed 24 months. Only single-PI proposals will be considered, with a limit of three proposals per institution (work with your sponsored programs). For more details, please see the program solicitation:

<https://www.nsf.gov/pubs/2018/nsf18526/nsf18526.htm>

### EPSCoR Workshop Opportunities Program

EPSCoR is designed to fulfill the mandate of NSF to promote scientific progress nationwide. EPSCoR welcomes proposals for workshops in **Program Solicitation NSF 19-588**. These workshops focus on multi-jurisdictional efforts of regional to national

importance related to EPSCoR's goals and NSF's mission. For more information, please see the RFP at <https://www.nsf.gov/pubs/2019/nsf19588/nsf19588.pdf>

## NATURE Sunday Academy sessions

Sunday Academy (SA) is a program offered through NATURE, helping Native American students in grades 7-12 to develop an interest in STEM disciplines. SA sessions rotate to the tribal college campuses. For more information, contact **Scott Hanson**, NATURE coordinator at [scott.martin.hanson@ndus.edu](mailto:scott.martin.hanson@ndus.edu). The remaining 2019-2020 sessions will be:

*Water is Life* led by **Ali Alshami** (UND-ND EPSCoR Emerging Areas and Translational Seed Awardee)  
December 8, 2019 (TMCC)  
March 1, 2020 (SBC)

*What Lives in Wetlands?* led by **Jon Sweetman** (NDSU)  
December 8, 2019 (UTTC)  
March 1, 2020 (TMCC)

*Winter Weather* led by **Aaron Kennedy** (UND-CRCS co-lead/researcher)  
December 8, 2019 (NHSC)  
March 1, 2020 (UTTC)

*Oxygen Sensing in Water* led by **Julia Zhao** and **Xu (Steve) Wu** (both UND)  
December 8, 2019 (SBC)  
March 1, 2020 (CCCC)

*Synthesis of Gold Nanoparticles* led by **Alex Parent** (NDSU-CSMS researcher)  
December 8, 2019 (CCCC)  
March 1, 2020 (NHSC)

*Senses and Perception in Nature* developed by **Mafany Ndiva Mongoh** (SBC-CSMS researcher and NATURE site coordinator)  
January 12, 2020 Topic for all sites

*Native Achievements in STEM* developed and led by **Charles Okigbo** and team (NDSU)  
February 9, 2020 Topic for all sites

## Upcoming events

- **ND EPSCoR Annual State Conference:** April 21, 2020, at the Alerus Center, Grand Forks, ND; Registration opens January 13, 2020.



## Updates from ND EPSCoR State Office

### Connecting Native American youth with STEM

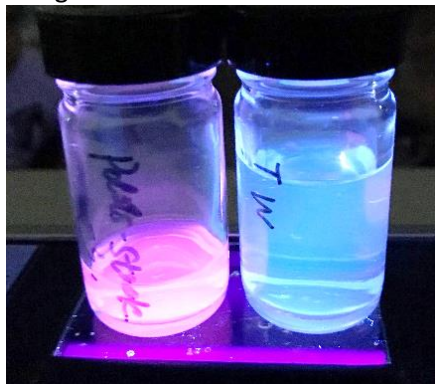


*By Scott Hanson (left) ND EPSCoR tribal colleges liaison manager*

Water is an essential component in our world, and **Julia Zhao**, professor, and **Xu Wu**, assistant professor, (both in UND Chemistry), have developed a NATURE Sunday Academy module this year that features a new way to measure the oxygen content of water. Although Zhao has presented at SA before, this was Wu's first experience with the students. I had the opportunity to observe the first run of this module during the September SA at Nueta Hidatsa Sahnish College (NHSC).

The activities began with Tanya Driver, adjunct instructor at NHSC, leading a discussion of how the culture of the Mandan, Hidatsa, and Arikara considers water sacred and recognizes that it is essential to all living things. The 15 student participants were divided into three groups, each led by a UND graduate student, to give each participant the maximum opportunity to engage in the experimental procedures.

Before starting the experiments, the graduate students gave each participant a chance to try out operating the hand-held pipettors that they would need to use to measure out precise, small volumes of liquids during the experiments. The experiment was based on using fluorescent nanomaterials called Pdots, which



cause a fluorescent reaction in the presence of oxygen. The higher the oxygen concentration, the brighter the fluorescence of the treated water. The participants

seemed very engaged in the activities and enjoyed looking at the fluorescent "light show" they created (above).

### Funds dispersed across ND

*By Janelle Smith (right) ND EPSCoR business manager*



ND EPSCoR recently released a Request for Proposals to fund STEM Research and Education opportunities that closed September 20, 2019. This solicitation included categories for equipment, student travel, undergraduate research, preliminary data collection for federal proposals, external review of federal proposals, and K-12 outreach activities.

The RFP call was met with an overwhelming response. A total of 128 proposals from 10 campuses across the state requesting \$1.6M in funding was received by the deadline at ND EPSCoR. The requests were across disciplines, filled with exciting opportunities to both explore new horizons and build on current successes. The major categories funded were for additional equipment and for preliminary seed data which is designed to help researchers collect information for a future funding proposal.

Without a doubt, North Dakota has reason to be excited about the ideas coming from researchers across the state!

Of these requests, 54 proposals totaling \$691,265 were awarded across 10 campuses. UND and NDSU each received approximately one-third of the funding, while the remaining third was awarded to master's college/university (MCU), primarily undergraduate institutions (PUI), and tribal college/universities (TCU). The broad dissemination aligns with ND EPSCoR's goal of having a lasting, state-wide impact with these funds, building infrastructure and enhancing researcher capabilities for additional funding from federal and industry sources.

All award recipients will be required to provide a final report to the EPSCoR office. We are looking forward to reading about the results of the activities and research enabled by these funds.

Future newsletter articles will undoubtedly highlight some of these results.

## Stay in touch

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