

Connecting during quarantine

Before I begin, I want to send my heartfelt words of support to each of you during this time. The COVID-19 pandemic has interrupted our daily lives and demonstrated the important role of fundamental research in our global economy. I hope that you are, and will continue to be, safe.

Connecting students to industry

A 2019 U.S. Congress Joint Economic Committee report shows that highly educated people are moving out of some states faster than they can be replaced. This trend contributes to North Dakota's research-based work-force shortage, which leaders recognize requires a multifaceted response. ND EPSCoR has long been a statewide partner in helping raise the awareness of the importance of STEM graduates to our state's workforce. *[View the full report: ["Losing Our Minds: Brain Drain Across the United States"](#)]*

Our Students in Technology Transfer And Research (STTAR) program connects college and university students with ND-based companies in internships, where they can apply their classroom knowledge to real-world challenges. ND EPSCoR cost-shares the student salary. ND EPSCoR is excited to announce our industry partners for the summer 2020 STTAR program: Airtonomy (Grand Forks); Amity Technology, LLC (Fargo); ComDel Innovation (Wahpeton); CrossFire Technologies (Fargo); Interstate Engineering, Inc. (Jamestown); Pedigree Technologies (Fargo); and WCCO Belting, Inc. (Wahpeton).

While a few companies are currently working through how COVID-19 may impact their summer plans, overall, our industry partners have signaled their flexibility and resiliency as they move forward with plans to participate in the STTAR program.

Airtonomy works to modernize asset management approaches in various industries—energy, agriculture, and public safety. The interns at Airtonomy will work across hardware/software technologies and will see firsthand how the technologies are tightly integrated to form a product offering.

Amity Technology provides agricultural technology. The interns at Amity Technology will work alongside experienced engineers, technicians, and end-users as they help with the design and implementation of sugar beet harvesting equipment.

ComDel Innovation provides contract development and helps solve manufacturing challenges. The interns at ComDel will develop and optimize manufacturing processes of various medical and commercial products.

CrossFire Technologies develops and manufactures complex electronic systems, and their interns will use their skills from electrical and mechanical coursework to help bring electronics to market.

Interstate Engineering is a civil engineering and land surveying company with seven ND locations. The interns will work with project engineers and technicians on various aspects of project management, from report preparation to construction administration.

Pedigree Technologies provides web-based software solutions to help companies manage high-value assets and collaborate with mobile workers. The interns at Pedigree Technologies will work with a team of software developers to improve software functionality.

WCCO Belting, Inc. is a custom rubber belting manufacturer. They provide services to several industries worldwide, including agriculture, light industrial, and packaging and recycling. The intern at WCCO Belting, Inc. will help design and develop a new prototype for an existing customer.

Each of these ND businesses will introduce students to industry and allow them to apply their academic-based skills and knowledge within a real-world business context. Just as important, the students will have the opportunity to network with professionals in their industry. Building these relationships will be a crucial factor as North Dakota works to retain talented students.

Regards,
Kelly A. Rusch, Ph.D., P.E., BCEE
ND EPSCoR Executive Director



Student presentations

Part of ND EPSCoR's mission is to increase North Dakota's STEM capacity and competitiveness and to build a stronger STEM pathway that produces our next generation workforce, educators, and researchers. To help meet these goals, ND EPSCoR occasionally funds travel for students to attend conferences and professional meetings. In this issue, four students reflect on their experiences, which were made possible through travel funding they received under the 2019 ND EPSCoR state-funded STEM initiative.

Agronomy

Jesse Puka-Beals (below) received ND EPSCoR funding to attend the 2019 Agronomy Society of



Jesse Puka-Beals applies a mulch made out of newspaper and water on top of recently planted carrots. After applying the mulch, the white strip of tape is lifted to reveal bare soil for the carrots to emerge. Photo by Kristin Boll, NDSU.

America meeting in San Antonio, Texas, November 9 – 13, 2019. Puka-Beals is a graduate student in the Department of Plant Sciences at NDSU. He attended this conference “to communicate the findings of recent organic research in weed management in Dr. Greta Gramig’s lab at North Dakota State University,” Puka-Beals explained. “This trip was valuable both for my professional development and to communicate North Dakota’s capacity for organic research to fellow agricultural researchers across the country.”

At the conference, Puka-Beals orally presented his master’s project, titled “[Combining Cover Crops, Strip Tillage, and Novel Mulches to Manage Weeds in Carrot.](#)” This presentation reviewed effective weed control strategies that Puka-Beals has investigated, including the use of cover crops to out-compete weeds as well as the use of mulches on top of soil to physically block weeds from growing. One type of mulch was newspaper-based, a potential cost-effective and biodegradable solution for small-scale agriculture in our region. Puka-Beals won first place in the Organic Management Systems student oral presentation competition.



Jesse Puka-Beals uses a seeder to plant carrot seeds on top of a compost blanket, which is made out of cow manure and hemp hurd. Photo by Kristin Boll, NDSU.

Public health

Oliver Frenzel, a Master of Public Health student at NDSU, used ND EPSCoR travel funds to attend the American Public Health Association annual convention in Philadelphia, Pa. on November 5, 2019. Frenzel participated in the pharmacy section of the convention. "A majority of participants were pharmacists, pharmacy educators, and public health advocates that work directly with local pharmacies within their respective public health units," Frenzel said.

His roundtable presentation was titled, "Implementation of ONE Rx: Using the Transtheoretical Model in Detailing Patient Centered Opioid and Naloxone Education in our Community Pharmacies." ONE Rx stands for opioid and naloxone education. Naloxone is a medication used to reverse opioid overdose. Pharmacists use ONE Rx as a screening tool to help identify patients who are at risk of opioid misuse or overdose. "The variety of participants and the abundant discussion about the ONE Rx program was extremely rewarding and great opportunity to discuss this opioid harm reduction strategy that has been incorporated in North Dakota," Frenzel said. "Many of the participants were impressed and voiced appreciation for a strategy that involves pharmacists in the prevention of prescription opioid misuse and overdose." In addition to presenting at the convention, Frenzel learned about career opportunities and other "innovative initiatives that have been incorporated to enhance our nation's health."

Redox biology

Harshit Shah, a graduate student in Pharmaceutical Sciences at NDSU, presented research at the Society for Redox Biology and Medicine conference in Las Vegas, Nev. on November 20 – 23, 2019. Shah presented a poster, "[3WJ-EpCAM-D5D siRNA Nanoparticle Imposes COX-2 Catalyzed DGLA Peroxidation in Breast Cancer Tumors to Produce 8-HOA Resulting in Inhibition of Breast Cancer Growth and Metastasis.](#)" The abstract for this research is also published in the journal *Free Radical Biology and Medicine*.

By attending this conference, Shah learned about research being done by other research groups in cancer therapeutics and the metabolism field. This knowledge will help shape Shah's future research. This conference is a gathering place for the top researchers in the field, and by attending, Shah was able to make connections with the principal investigators working in cancer therapeutics.

Entomology

Brooke Karasch was awarded travel funds to attend the Entomological Society of America's Annual Meeting in St. Louis, Mo., on November 17 – 20, 2019. Karasch, a graduate student in Range Science at NDSU, presented the poster "[Estimates of butterfly density in mixed-grass prairie with restored disturbance regimes.](#)" and she gave a presentation on "[Monarch and regal fritillary behaviors in grasslands with restored disturbance regimes.](#)" The poster presented research about how grazing and burning pastures benefit butterfly species, despite the possible risks of fire to butterflies when they are in the beginning stages of their life cycle and not as mobile. The presentation explained observed behavior of two butterfly species, monarchs and regal fritillaries. Land management decisions are often determined by population or community analyses, but behavior studies like the one Karasch performed can provide a fuller picture of individual species' needs for land management.



A variegated fritillary (Euptoieta claudia), one of the many butterflies Karasch observed. Photo by Brooke Karasch.

At the conference, Karasch appreciated being able to converse with knowledgeable peers about her research. "The perspective of someone who is unfamiliar with the project can offer new questions, point us to different analyses, or just provide a little outside encouragement," she explained. She also was aware of the value of networking at the meeting; her graduation is scheduled for this spring, so she used the meeting as an opportunity to connect with people in many fields. "Science communication, federal agencies, academia, private industry, and nonprofit organizations were all well-represented at this meeting," she said.



A prescribed burn on grassland in North Dakota. Fire helps create variation in wildlife, including butterflies. Photo by Brooke Karasch.

Cancelled events

Annual state conference

The ND EPSCoR Conference, originally scheduled for April 21st, has been canceled due to COVID-19 concerns. While we are disappointed, this decision was made after careful consideration and consultation with numerous individuals who all concurred the safety and health of the participants, speakers, and staff is our highest priority. We look forward to welcoming everyone next spring for the 2021 ND EPSCoR Annual Conference at the FargoDome on April 14, 2021. The ND EPSCoR Conference is an annual event that brings together faculty, students, and the community in a celebration of research endeavors taking place within almost all of the state's higher education institutions.

Posters on the Hill

The Council on Undergraduate Research's (CUR) 24th annual Posters on the Hill (POH) event, originally scheduled for April 20-21, 2020 in Washington, D.C., has cancelled the in-person meeting. Instead, the meeting will take place on Twitter on April 21. Visit the [@CURinAction](#) page and search the hashtags [#POH2020](#) and [#POHgoesVirtual](#). Alexandria Hamm, Minot State University, has been accepted to participate in the event with the project "An improved method of synthesis of a key precursor for multi-target drugs against Alzheimer disease." Hamm is mentored by **Mikhail Bobylev**, Center for Sustainable Materials Science (CSMS) Researcher and Professor, Chemistry. Hamm was one of 60 selected applicants from a pool of 350.

K-12 STEM needs survey

To facilitate bridges between K-12 and higher education, ND EPSCoR is working to produce an in-depth report on K-12 STEM needs. The goal: to better prepare our students for careers in STEM fields.



Shireen Alemadi, ND EPSCoR STEM manager, is looking to K-12 teachers, administrators, and other personnel (e.g., guidance counselors) to provide information, and she is asking everyone to complete an

anonymous survey, either through this QR code (left) or by completing the survey at <http://bit.ly/K12STEMSurvey>.

By gathering this important information, ND EPSCoR will be able to compile a comprehensive report of what ND K-12 is doing in STEM and reviewing how higher education can support these STEM efforts.

For more information, please contact Shireen Alemadi at shireen.alemadi@ndus.edu.

Funding opportunities

Development of NATURE Sunday Academy STEM modules

One of ND EPSCoR's outreach components is the Nurturing American Tribal Undergraduate Research and Education (NATURE) program. To encourage American Indian middle- and high school students to pursue STEM degrees and STEM careers, ND EPSCoR offers half-day long active-learning STEM modules on the tribal college campuses called NATURE Sunday Academies.

ND EPSCoR is currently soliciting NATURE Sunday Academy STEM module proposals of up to 500 words from faculty members for the 2020-21 academic year. Successful faculty from ND University System institutions will be required to travel to each Tribal College/University (TCU) in North Dakota on five Sundays during the academic year (in the months of September, October, November, December, and March) to deliver their STEM module. The STEM modules developed by successful TCU faculty will be presented during the "non-travel" months of January and February as All-Site STEM modules delivered simultaneously by the NATURE coordinator at each TCU.

Deadline: May 4, 2020, 5:00 pm.

For more information, see the [RFP for Development of NATURE Sunday Academy STEM Modules](#).

NSF Track-4 Research Fellows solicitation

The RII Track-4 Fellows program **NSF 20-543** 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: May 12, 2020. There is a limit of three proposals per institution, so please work with your sponsored programs office in advance of this deadline.

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. For more details, please see the program solicitation:

<https://www.nsf.gov/pubs/2020/nsf20543/nsf20543.pdf>

DEPSCoR Regional DoD Day

Congress recently re-established the Defense Established Program to Stimulate Competitive Research (DEPSCoR) Program. The Department of Defense has asked the University of South Dakota to host a regional DEPSCoR DoD Day, where DoD program managers will provide information about the DEPSCoR program as well as general information about working with the DoD. The regional DEPSCoR Day will be **September 10, 2020**, in Vermillion, SD. For more information or to register for the event, please see

<https://www.usd.edu/research/depscor-dod-day>

EPSCoR Workshop Opportunities

EPSCoR is designed to fulfill the mandate of NSF to promote scientific progress nationwide, and we welcome proposals for workshops in **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:

<https://www.nsf.gov/pubs/2019/nsf19588/nsf19588.pdf>

Publications

Water research

“Photodegradation of (E)- and (Z)-Endoxifen in Water by Ultraviolet Light: Efficiency, Kinetics, By-Products, and Toxicity Assessment” by **Andre DeLorme** (Center for Regional Climate Studies [CRCS] researcher and Professor, Science, VCSU) and **John McEvoy** (advisor to a former Graduate Student Research Award [GSRA] recipient and Professor, Microbiological Sciences, NDSU) with Marina Ariño Martin, **Jayaraman Sivaguru** (past CSMS researcher), Prinpida Sonthiphand, and **Eakalak Khan** (past NATURE coordinator) in *Water Research*, 2020, 171. DOI:

[10.1016/j.watres.2019.115451](https://doi.org/10.1016/j.watres.2019.115451)

Economics and the environment

“Putting a price on how land use impacts environment” by **Patrick C. Miller** (CRCS participant) in *UND Today*, March 2020. <http://blogs.und.edu/und-today/2020/03/putting-a-price-on-how-land-use-impacts-environment/>

Miller interviewed **Haochi Zheng**, CRCS researcher and Associate Professor, Earth System Science & Policy, UND. Zheng collaborates with researchers from many disciplines as part of the CRCS team. CRCS researcher specialties include atmospheric science, agriculture, physics, biology, geology, hydrology, computer modeling and simulations. Zheng approaches questions about climate from the viewpoint of an economist.

“What I do is link the natural systems to human society,” Zheng told Miller. “I study how farmers and landowners make decisions. Those decisions will, of course, be affected by the climate – temperature and precipitation – plus market and policy drivers. This affects their decisions about what crops to grow and soil management – tillage or no till? How much fertilizer and how much irrigation will be required?”

Zheng went on to explain how her background in economics has prepared her to study climate. “I felt like all the economic tools I had learned or studied could be perfectly applied to environmental issues,” Zheng said. “While we understand the mechanism for landowners to make decisions from an economic perspective, we also need to know how those decisions relate to an economic evaluation of the environmental consequences.”



Haochi Zheng studies the link between economics and climate. She must consider events like the above in eastern North Dakota, when a wet fall and early winter resulted in corn and other crops going unharvested. Photo by Patrick C. Miller/UND Today.

Student professional development

By *Shireen Alemadi* (right)

Throughout its history, ND EPSCoR has funded countless students and faculty who conduct research in a variety of settings across North Dakota higher education institutions. Students get hands-on, in-depth experiences in different STEM fields related to their major, and faculty can further their research and mentor a new generation. For the students, their education and research experience are only part of the formula for success. Another part of that formula is Professional Development – increasing knowledge and skills for preparedness or advancement in a career or a specific field. This knowledge and the skills learned are not ones usually covered in a Mechanical Engineering course or a Zoology course, such as interview skills, writing a resume, teaching, career development, and more.

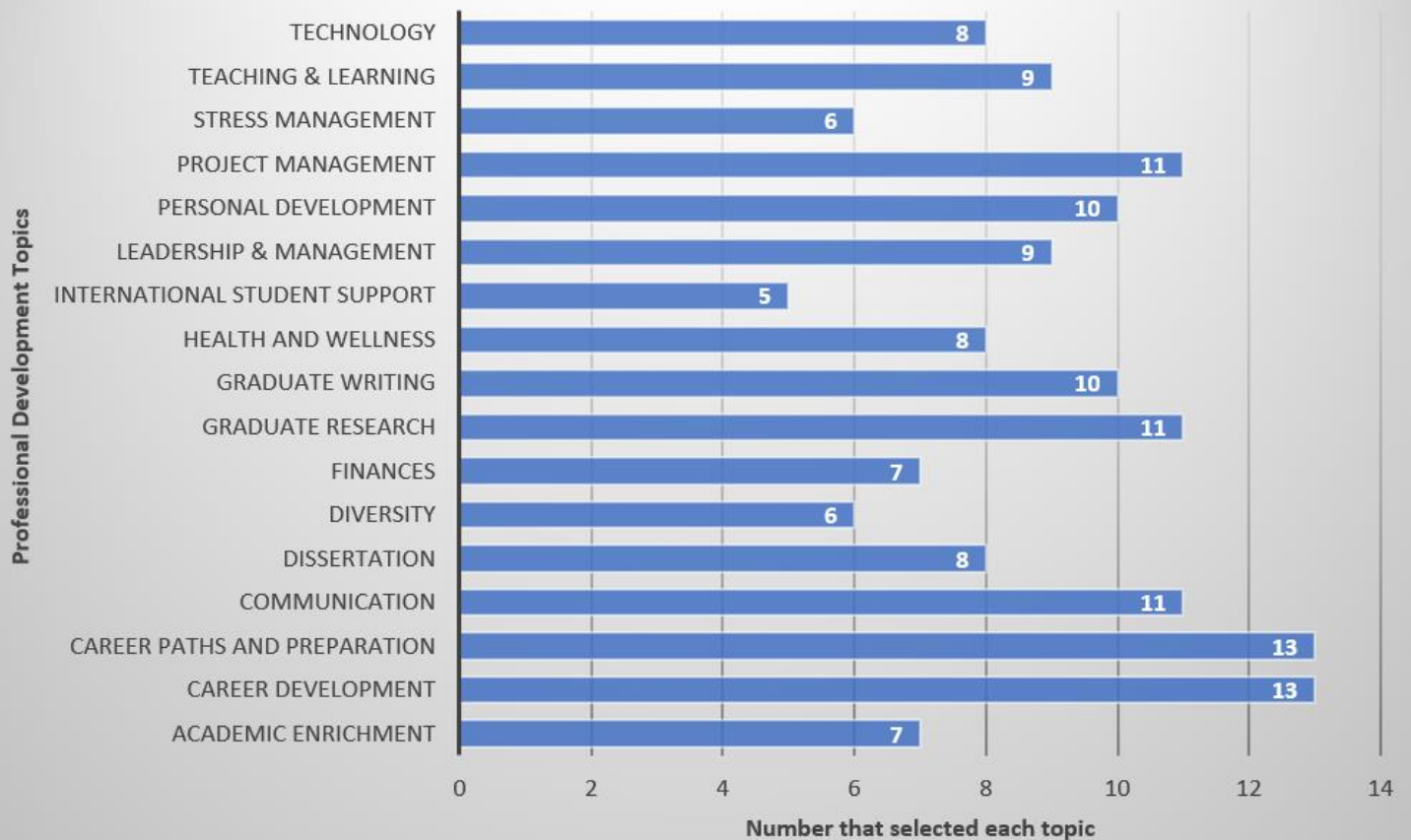
The Professional Development topics students are interested in are always changing. To determine what topics are most important to students who conduct



research with faculty supported by INSPIRE-ND, our current ND EPSCoR NSF RII Track-1, we created a survey for our graduate student participants. We had 31 responses to the survey. The two topics that the most students indicated were important to them were Career Paths & Preparation and Career Development (see figure below). Coming in a close second were Graduate Research, Communication, and Project Management. The information gathered through this survey will help ND EPSCoR to develop a plan for future opportunities.

In many of the higher education institutions across ND, there are also many undergraduates working with faculty on different research topics. These students are also interested in gaining the knowledge and skills provided by professional development. We at ND EPSCoR are very interested in learning more about what topics would interest undergraduate students. Here is a link to the Professional Development survey: <https://bit.ly/39kCe9s>. Please share this link with your students (both undergraduate and graduate). If you have any questions, contact Shireen Alemadi, STEM Manager at shireen.alemadi@ndus.edu.

Professional Development Survey



Uncertain times due to Coronavirus

By *Jean Ostrom-Blonigen* (right)



One month ago, the ND EPSCoR staff was working in our offices, planning our annual state conference, outlining the tasks needed to successfully host our summer Nurturing American Tribal Undergraduate Research

Experience (NATURE) program activities, and finalizing our Students In Technology Transfer and Research (STTAR) internships. Now, we are working from home, we have cancelled our 2020 conference, and we are wondering what impact the COVID-19 pandemic will have on our summer programs.

In the past month, news of the pandemic has dominated our daily lives. This past week, I participated in two webinars about the pandemic, which stressed the need for organizations to determine “mission-critical” processes and to identify possible “single points of failure.” Resiliency was the attribute touted as “most necessary” to successfully move our organizations through this crisis. Resiliency was defined as “continuing to make good decisions in an environment where things are no longer going according to plan.”

As summer decisions at our 11 participating institutions become known, ND EPSCoR will continue to make necessary adjustments and convey them to you via the events page on our website:

<https://www.ndepscor.ndus.edu/news/>.

At print time, the 2020 NATURE Sunday Academy Planning session (June 9-11) for TCU faculty and K-12 teachers has been moved to a virtual format.

We are working with each TCU to determine whether segments of our 2020 NATURE University Summer Camp (June 1 – 12) can be moved to a virtual format.

We are continuing to work with each TCU to determine whether the following activities can be held or moved to a virtual format:

- 2020 NATURE Bridge Camps
- 2020 NATURE Tribal College/University (TCU) Summer Camp Planning Session
- 2020 NATURE TCU Summer Camps

For our National Science Foundation (NSF) RII Track-1 INSPIRE-ND participants, the deadline to submit our Y6 Annual Report to NSF remains May 1, 2020.

Stay safe everyone, and please contact our office if you have any questions.

Stay in touch

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- Submit stories to: <https://bit.ly/epscorsubmitnews>
- To be added to the newsletter mailing list, please email ndepscor@ndus.edu, subject line: newsletter.

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