ND EPSCoR
Established Program to Stimulate Competitive Research

News & Notes

March 2019

Renew, anticipate, celebrate

Spring is often a time of renewal and anticipation, and that is also true for ND EPSCoR. While winter snows were blanketing the state, research and outreach continued, and the results are cause for celebration.

The Center for Sustainable Materials Science (CSMS) hosted a ***Translational Summit*** the end of February, at which representatives from several major industries, as well as experienced faculty, shared insights and information about the pathway from lab bench to commercialized products. Industry interactions with students and faculty included a poster session and networking opportunities that, according to one student, helped her reframe her research focus.

Another celebration of research and outreach will occur at the ***ND EPSCoR Annual Conference***, March 27. This year's event will feature both student and faculty presentations to the entire audience, rather than smaller, center-based breakouts. The goal this year is to celebrate the past five years of research within the Center for Regional Climate Studies (CRCS) and CSMS, to communicate the impact of this NSF cooperative agreement research as well as the extensive outreach efforts, and to highlight the importance of this statewide collaborative effort on the state's economy and STEM workforce development.

The CRCS conference (***Northern Plains Weather/Climate Product, Service, and User Engagement Workshop***) that is planned for March 28 will bring together the CRCS research team, industry partners, and other stakeholders who are looking for reliable information about predicted climate shifts in the region and the potential impact on North Dakota agriculture.

National perspective

Recently, ND EPSCoR administration attended the national EPSCoR/Institutional Development Award (IDeA) Coalition meeting, which offers an opportunity for all EPSCoR states to collaborate on ways to enhance science and engineering research and technology within their states. During this meeting, we were reminded of EPSCoR's impact. The FY 2018 budgets assigned to the five EPSCoR-affiliated agencies (Department of Energy, Department of Defense, National Aeronautics and Space Administration, US Department of Agriculture and National Science Foundation), were at a record high $652.8 million. ND is honored to be a part of that important research effort as we provide resources for students and faculty, expanding the STEM pathway that will grow our state's economy.

Each EPSCoR state has a designated NSF program officer who works very closely with the jurisdiction on all aspects of the cooperative agreement. We have just been informed that our program officer, **Tim VanReken**, has now been assigned to another jurisdiction. We have appreciated his support and insights throughout the past five years, and ND EPSCoR gratefully acknowledges his valuable assistance during this award.

We also want to welcome our new NSF program officer to the ND EPSCoR team: **Jose Colom-Ustariz**. He is planning to attend the ND EPSCoR Annual Meeting, and will provide a NSF update. A warm welcome!

We are looking forward to wonderful celebrations during the ND EPSCoR Annual Conference and at the CRCS workshop. Hope to see you there!

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

Translational Summit Highlights: From bench to industry

How do you translate your research from the lab bench to something that industry will find interesting? The February 25 - 26 Translational Summit hosted by CSMS, was an opportunity to ask questions of several industry representatives and to share insights with colleagues across the state.

The Summit provided insights about the CSMS research efforts of the Track-1 cooperative agreement, otherwise known as INSPIRE-ND or **In**novative and **S**trategic **P**rogram **I**nitiatives for **R**esearch and **E**ducation-**N**orth **D**akota.

Dean Webster (left), CSMS lead and researcher, and chair of the Coatings and Polymeric Materials Department (CPM) at North Dakota State University (NDSU), opened the Summit with a brief overview of the "transformative" and sustainable research efforts that utilize ND agricultural feedstocks to create new compounds and materials.

Webster provided a host of examples of biobased materials being used instead of petrochemical sources to create new composites, enhance biodegradability, develop novel latex polymers, and produce biobased resins - all while using advanced computational models to predict reactions. From soybean oil to flax, bran to sucrose (sugar), lignin to other biomass products, all have been utilized in CSMS research. The result has been over 25 invention disclosures, and the discovery of hundreds of new monomers, polymers, compounds, and resins that may find a useful future in industry.

"When we look at the materials, we know that the biobased materials must perform at a level of their petrochemical competition, whether it's hardness, flexibility, durability, strength, or other characteristic needed by industry," Webster said. The CSMS research shows that biobased materials have the potential, in many cases, to reduce or eliminate the petrochemical sources, while maintaining the desired characteristics.

Commerce weighs in

James Leiman, senior manager of Strategy & Research with the ND Department of Commerce, discussed the impact to the state of the cyclical commodities. "North Dakota is the most export-dependent state in the country," he said, "with about 22-24% of our products being exported."

Leiman (left) stressed the need to continue building the interface between industry and academia, stating their office is looking for ways to engage more corporate partnerships in the state and for opportunities to assist in the technology transfer. He noted that North Dakota is the only state without a venture capital fund over $50 million, which can help move new technology or research beyond the lab and into production.

Getting technical

Two presentations by 3M and PPG representatives highlighted the challenges faced by industry in trying to incorporate sustainable or biobased materials into their product line. **Kevin Lewandowski**, lead research scientist at 3M, echoed quality concerns, saying, "we can't sacrifice performance of a product."

When designing a product, Lewandowski said, the biobased material or product needs to show a performance advantage and be cost effective for the consumer. He acknowledged that since about 95% of products have some petrochemical base, it's not easy to ask manufacturers to change their model.

Inanllely Gonzalez, research chemist from PPG, said PPG has the goal of deriving 40% of their sales from sustainable products and processes by 2025. She acknowledged that it was an aggressive goal for the organization. To answer the question of whether customers will pay for the biobased products, she said that one key will be if the products can demonstrate enhanced performance.

Gonzalez, left, and Lewandowski, right, at the Translational Summit.

Gonzalez noted that, for researchers, raw materials pose different challenges than produced materials. "Bio-derived materials can differ significantly in composition," she said. "When

developing a product using a bio sourced feedstock, there may be a large variation in the material's organic components, depending on where it's grown."

She also noted that the CSMS effort to develop new coatings from agricultural sources has a long history that includes Henry Ford, who once advertised painting cars with soybean oil. He wanted the users of his automobile to also benefit and, as a result, did research on developing paint from agricultural products.

Adding opportunity for research

As the luncheon keynote speaker, **Michael Kessler** (right), dean of NDSU's College of Engineering, offered insights from his previous research experience, noting the most successful projects had partnerships linking federal, state, and industry with the academic research. He indicated that a soon to be completed new collaboration between NDSU, Iowa State, Washington State, and the Center for Bioplastics and Biocomposites, a NSF Industry–University Cooperative Research Center, will help build a more sustainable collaborative effort.

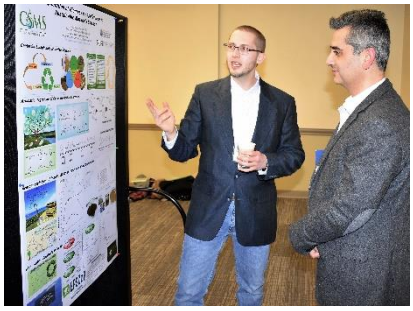
With his research background in polymer matrix composites and nanocomposites, Kessler was encouraged by CSMS' use of plant oils in research, noting they were readily available in ND, relatively inexpensive to obtain, had high purity and molecular weight, and were natural and renewable sources. He added that there will be additional interest in biobased materials as researchers become more adept at tailoring their properties to meet industry needs. He reminded the attendees that the Morrill Act of 1862 stands as a precedent for university research that benefits society.

New materials preview

Considering the life cycle when designing research, ensuring that the products can be scalable, adding performance or regulatory benefits, and considering how a product could be manufactured were nuggets of advice shared by industry members in the Monday afternoon panel. **Victoria Gelling** (left), fellow with Sherwin Williams, said that industry interest increases when there is added value in a new product. She termed the added characteristics "delighters" and said they may help an industry choose one new product over another.

Dan Sawyer (left), business development leader at NatureWorks, LLC indicated that his company has had significant success with poly (lactic acid) (PLA), which they now ship to markets around the globe. He noted that new materials should address regulatory concerns for manufacturing as a part of their life cycle analysis.

During the afternoon, students had an opportunity to present posters.



*Eric **Serum** (left), CSMS researcher and graduate student in Chemistry and Biochemistry, explains his research to **Soydan Ozcan** (right), senior scientist from Oak Ridge National Laboratory (ORNL).*

An industry panel on uses of biobased materials discussed various applications for potential products and shared examples from their organizations. **John Schneider**, chief executive officer at 3D Fuel, said his customers were "pushing" them to consider more environmental conservation efforts. At ORNL, Ozcan said they use biobased products whenever possible; indicating they have even used biobased PLA to make unique art structures and to "print" a car. **Autumn Zakula**, staff engineer at John Deere, said their organization is incorporating biobased materials in a variety of products, from sprayer booms to tractor seats, replacing other petrochemical materials. She said they want to support partners who have "maximum productivity with minimum environmental impact."

Two of the Industrial representatives: John Schneider (left), 3D Fuel; and Autumn Zakula (right), John Deere.

Drowning in plastic

The evening session featured **David Grewell**, chair of Industrial and Manufacturing Engineering at NDSU, who led a discussion on the prevalence of micro-plastics in the environment. He noted the three primary sources include what is released from our washers and dryers, tire tread particles, and dust and paints.

To become more environmentally aware, Grewell (left) urged taking steps to reduce, reuse, recycle, but also to compost or properly incinerate (not in the backyard) before placing an item into a landfill. With oils, sugars, starches, and lignin as readily available feedstocks for products, he suggested that researchers consider the huge market potential in replacing many petrochemical plastics with biobased products.

Entrepreneurship encouraged

Scott Meyer (right), executive director of Entrepreneurship Initiatives in the NDSU College of Business, encouraged faculty and staff to take the risk, to build and transfer knowledge into opportunity. He shared his three beliefs regarding entrepreneurship: it is essential, can be taught, and can be shared.

Current research in engineering provides an example of using sustainability in entrepreneurship, according to **Chad Ulven** (left), CSMS researcher, NDSU professor in Mechanical Engineering, and chief technical officer at c2renew, a startup company. In the NDSU lab, his team has been able to use soy-based resins that are incorporated into flax fibers to create materials that can compete with traditional materials in strength, shear, and flexibility, but with less density. One of his students decided to test the durability, and built a bicycle, which has just over 500 road miles. In his entrepreneurial venture at c2renew, Ulven has developed custom compounds and biocomposites for client needs.

The remainder of the conference focused on consumer products, featuring experienced entrepreneurs discussing the journey from good idea to commercial product. Bogobrush co-founder **Heather McDougall**; EarthKind, LLC founder and CEO **Kari Warberg Block**; Sana Packaging co-founder and CEO **Ron Basak-Smith**; and Patagonia materials innovation engineer **Michelle Legatt**, shared their passion for sustainability and positive environmental impact, while also relaying some of the challenges of engaging in an entrepreneurial venture.

Consumer representatives (left to right) Heather McDougall, Bogobrush; Ron Basak-Smith, Sana Packaging; Kari Warberg Block, EarthKind; and Michelle Legatt, Patagonia, share insights at the Summit.

"We are in the business to save our home planet," quoted Legatt from Patagonia's mission. The panel members advised researchers to ask what the customer needs, build trust through reliable products, be aware of how your product compares to the competition, and communicate with regulatory channels to build understanding. Most importantly, however, these innovators stressed the value of remaining passionate about the mission of making a difference.

*Summit organizers (left to right) Chad Ulven; **Mukund Sibi**, CSMS co-lead and Distinguished Professor in Chemistry and Biochemistry; and Dean Webster.*

Academic research is vital for foundational discoveries, but it can also lead to collaborations with companies that need research information. The CSMS Translational Summit provided a valuable education for students and faculty who seek to develop products or processes that are useful to industry.

CRCS stakeholder conference

CRCS is hosting the **Northern Plains Weather/ Climate Product, Service, and User Engagement Workshop** on March 28, 2019, at the NDSU Memorial Union, from 8 a.m. to 4:30 p.m.

The workshop will bring together regional partners that disseminate weather and climate information; researchers from the fields of agriculture, hydrology, and atmospheric science; and end users who depend on weather/climate data, including the National Weather Service, ND State Climate Office, Weather Data on your Phone, ND Atmospheric Resource Board, High Plains Regional Climate Center, CRCS, USDA Climate Hub, and CRCS Stakeholders.

According to conference organizers, **Adnan Akyüz**, CRCS researcher and state climatologist at NDSU, and **Aaron Kennedy**, CRCS co-lead and assistant professor in Atmospheric Sciences at the University of North Dakota (UND), activities of the workshop will include educational talks, interaction with researchers discussing current research, and interactive discussions to understand end user needs.

There will be opportunities for students to present poster information during the session. Attendance is limited. Please register at https://apps.ndus.edu/northern-plains-climate-workshop

Exploring novel territory

"It's pretty gratifying to create something useful for industry," said Dean Webster. Over the past five years of the current Track-1 award, the researchers and students involved in CSMS have been able to develop new biobased polymers and resins, some of which are now being tested by industry.

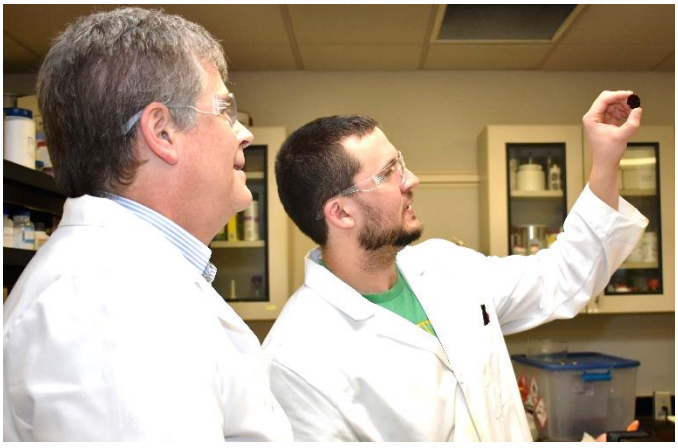
"It's tough to come close and then be disappointed with how a material performs," he admitted, "but we have found several agricultural products, including soybean, sugar, and citric acid, that have created materials that meet or exceed the qualities of their petrochemical competition." Some of those materials are currently being tested.

Using available biobased materials, CSMS researchers use chemistry principles to explore and rearrange the properties to create new composites. For example, Webster cited a new sucrose polyester that involves a combination of soybean oil and sugar. "It was a big 'a-ha' moment when we combined the two and found it had superior characteristics," he said.

After years of exploration and discovery, leading to 25 invention disclosures and three patents for the CSMS team, what's the next step?

Webster said there are key areas of focus for CSMS' future:

- Creating biobased composites, including the research done by **Chad Ulven**'s group, which has been using biobased resins with flax and glass fibers with very positive results, Webster said.
- Developing biobased coatings to replace petrochemical coatings, especially for large-scale factory applications, such as furniture or steel siding. "One of the interesting aspects of our research has been creating coatings that do things that current products don't do," he explained. "Now we need to find out if those characteristics are important or useful to the end user."
- Expanding industry awareness of these new products. A recent publication regarding the replacement of isocyanates in polyurethane with a CSMS-derived novel resin, illustrates the need for these materials. According to *Green Chemistry*, "Concerns on the use of isocyanates as starting materials for polyurethanes (PUs) have risen due to their effects on human health after exposure and also because their synthesis involves the use of phosgene (a poisonous gas)." *Green Chemistry* notes that "Initial studies have shown promise in systems where CSS (carbonated sucrose soyate) is crosslinked with multifunctional amines generating coatings with good solvent resistance. This work focused on … formulations of biobased non-isocyanate polyurethane coatings." (More information about this development can be found in *Journal of Coatings Technology and Research* January 2019, Volume 16, Issue 1, pp 41–57.)



*Webster, left, talks with CSMS researcher and graduate student **Eric Krall**, right, about a sample.*

- Continuing to train students. "There is a huge demand," Webster said, "since there are very few programs that train in coatings technology. In fact, there is no other 'stand-alone' university department in the United States with a focus on paints and coatings." With a history that extends back to 1905 when Edwin Ladd first evaluated paint samples for the state of North Dakota, NDSU has been analyzing paints and coatings, and training students who now are in research and industry around the world.
- Incorporating life cycle analysis into all projects. With the addition of **Ghasideh Pourhashem**, CSMS researcher and assistant professor in CPM, NDSU, the faculty and students have gained insight into incorporating life cycle evaluations into their development processes; thereby ensuring the sustainability of developed products.

From analyzing tiny lab samples to developing robust chemistries that can be taken to industry, the CSMS researchers' work will continue to make an impact. "We're opening doors to more collaboration with industry, and trying to bridge the gap between a novel technology and a finished product," Webster said. For North Dakota, it reinforces their leadership role in creating innovative answers and materials, using agricultural products to benefit the rest of the world.

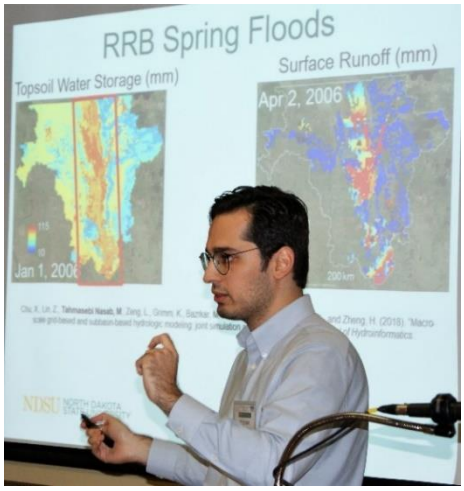
Predicting water supplies

Water supply research predictions are essential for agricultural, recreational, and environmental tasks in North Dakota. The information collected from macro-hydrological models helps identify dependable water supplies in the state and other similar geographical regions.

Mohsen Tahmasebi Nasab, CRCS researcher and graduate student in NDSU's Civil and Environmental Engineering, is studying topographic maps and macro-scale hydrologic models based on the North Dakota climate. The state's unique climate is important for water security research conducted using snowmelt fluctuations in freezing temperatures.

"Hydrologic models are simplifications of the real-world water cycle systems and are being increasingly used to simulate different water-related processes or hydrologic processes such as snowmelt, surface runoff, and infiltration," said Tahmasebi Nasab. "Historically, water security or a reliable supply of water for agriculture, communities, and ecosystems has been one of the top priorities of humans."

Hydrologic models are particularly important for predicting future changes in water resources. These predictions are specifically important for flooding events that often occur in the Red River Valley, which significantly affects agriculture production. "Hydrologic simulations and predictions can provide valuable information on different hydrologic processes for decision-makers, farmers, and researchers," Tahmasebi Nasab said. "For example, hydrologic modeling results can tell us how much surface runoff a rainfall event can generate, how much snow is melted on a given day, or how much water is stored in the soil profile."



The hydrologic model that Tahmasebi Nasab (right), uses inputs data from different sources that include precipitation, temperature, topography, and land use. These data sets are all necessary for projecting certain geographic water resources, but one specifically important figure is the topographic map.

"North Dakota has unique hydro-topographical characteristics such as cold and long winters and a depression-dominated topography," Tahmasebi Nasab explained. "These unique characteristics give rise to special conditions such as frozen soil that directly affects the modeling of different hydrologic processes." The information collected contains topical data such as temperature and precipitation variations that are important for addressing long-term regional water resource issues.

"Climate and hydrologic models can be linked to predict the future of water resources under different scenarios," said Tahmasebi Nasab. "In one of our recent studies, we evaluated the impacts of temperature variations on macro-scale snowmelt simulations in the Missouri River Basin. We found that even sub-daily temperature fluctuations around the freezing temperature can significantly affect the generation of snowmelt."

These studies have proven to be beneficial for developing more accurate models to identify reliable water supplies for end users, including agriculture and recreation. Now, the next step is to further develop the

hydrological model and test the ability of the model in other regions with river basins.

(Article written by Ashley Rone, a Health Sciences, French, and Honors major, at UND.)

Wetland loss may impact flood risks

Wetlands are a crucial part of the natural environment that provides habitat to animals and plants, improves water quality, and reduces flood potential. The loss of wetlands changes stream and river chemistry and can alter the way ecosystems function. For example, a decrease in wetland water can lead to increased pollutants that are not filtered out, reducing the water quality. Another example shows that by reducing the surface area of water (by reducing wetland areas), it leaves the land prone to flooding under heavy precipitation and snow build-up.

Research done on the loss of wetlands in North Dakota can provide valuable information about flooding potential and provide insight in how to restore needed wetlands**. Xiaodong Zhang**, CRCS researcher and former associate professor in Earth System Science and Policy at UND, has focused on the Devils Lake water basin. "North Dakota is part of the pothole area in the U.S., and used to be covered with stretches of wetland," said Zhang. "Draining wetland has certainly increased flooding potential in the region."

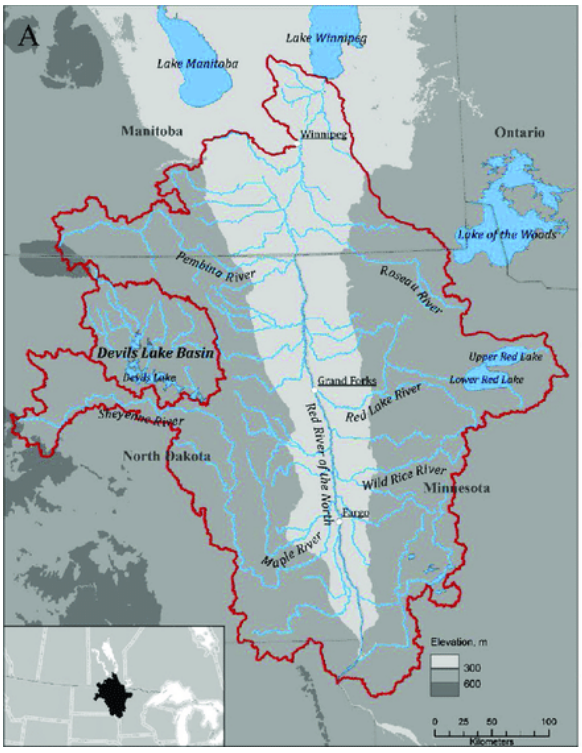
He and his team of fellow scientists used the Soil and Water Assessment Tool (SWAT) hydrological model to identify water movement in the Devils Lake watershed area. Combined with data from the historical and Coupled Model Intercomparison Project Phase 5 (CMIP-5) (part of a worldwide climate change model) they were able to estimate flood risks.

"Currently, 11% of the Devils Lake basin is covered by wetland. An increase of 5% in added wetland coverage would reduce the Devils Lake water level by approximately 0.5 m," Zhang explained. "This is mainly because the presence of wetland reduces the peak stream flow into the lake."

Based on predicted flood risks, the researchers examined potential solutions that would benefit the Devils Lake area in the future. "Operating the two outlets that have been built is more effective in controlling rising water of Devils Lake than restoring wetland," said Zhang. "On the other hand, diverting water from Devils Lake to the Sheyenne River would increase the flooding potential of the river and degrade its water quality. So, there is no perfect solution."

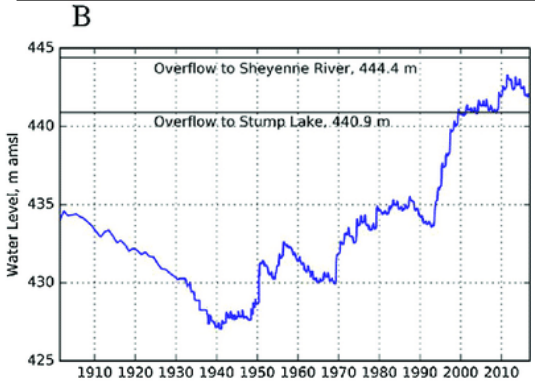
Research like this is useful for the state of North Dakota to provide more accurate data for use in risk management and building river diversions that can help prevent flooding, a useful tool for entities across the state.

(Article written by Ashley Rone, a Health Sciences, French, and Honors major, at UND.)



A figure taken from *Wetland loss impact on long term flood risks in a closed watershed,* a research article by Sergey Gulbin, Andrei P.Kirilenko, Gehendra Kharel, and Xiaodong Zhang in Environmental Science & Policy 94:112-122. doi: 10.1016/j.envsci.2018.12.032

Image A shows a map of the Devils Lake Basin and the Red River North basin boundaries. Image B shows the water level change of Devils Lake from 1910 to 2010.



STARR companies awarded

The Students in Technology Transfer And Research (STTAR) program provides upper-division students (juniors through graduate students) in science, technology, engineering, and mathematics (STEM) with an opportunity to use their academic training and experience to address challenging science and technology-based problems faced by North Dakota companies. The primary emphasis of STTAR is on research and development, and ND EPSCoR cost-shares the students' salary.

To date, the following companies have applied and been accepted to participate in the program: **Border States Electric**, **John T. Jones Construction**, **Mayo Construction Company**, **Myriad Mobile**, **PS Industries**, and **WCCO Belting, Inc**. ND EPSCoR welcomes these partnerships to help provide valuable work experience for students. If other organizations would like to participate, please contact **Paula Comeau**, ND EPSCoR STEM Manager at paula.comeau@ndus.edu.

STEM's hidden resources: K-12

The ND EPSCoR State Office works to facilitate STEM activities at all levels of education across the state. To better understand STEM education needs at the K-12 level, we are actively seeking information from our K-12 educators and administrators.

ND EPSCoR seeks to facilitate the integration of STEM strategies into already existing curriculum of our K-12 schools; however, before we can assist in the development and augmentation of STEM we need to know what our educators are already doing and what their priorities are for future development. Our goal is not to replace already established curriculum, but rather support current, and integrate new, complementary strategies.

To better support K-12, ND EPSCoR would like to facilitate a stronger dialogue between our state undergraduate and research institutions and our local school districts by creating a K-12 STEM Needs White Paper. This project, facilitated by ND EPSCoR STEM manager **Paula Comeau,** follows up on a prior survey of K-12 administrators. An anonymous method to collect information about current activities and needs in our K-12 system will be used. The White Paper will provide a compilation of data for use by faculty researchers in the ND University System and ND Association of Tribal Colleges to support the broader impact components of their research.

We encourage all ND K-12 teachers, counselors, principals, and superintendents to participate in this important survey! The survey can be found at: https://ndstate.co1.qualtrics.com/jfe/form/SV_8dXbYIwSYIP6pg1 or by using the QR code below:

To learn more about the K-12 STEM Needs White Paper and the survey ND EPSCoR is conducting, please e-mail paula.comeau@ndus.edu.

Paula will be traveling to the River Watch Workshop at the Prairie Waters Education and Research Center near Valley City in March. If you would like Paula to stop by your school for a visit, please contact her!

Activities of note

Mohsen Tahmasebi Nasab, was inducted into the Tapestry of Diverse Talents on February 27, 2019. The Tapestry is a pictorial mosaic that recognizes students, faculty, staff, and alumni for their contributions to diversity.

Paula Comeau, ND EPSCoR STEM manager, will be discussing the K-12 STEM Needs White Paper at the River Watch Workshop at the Prairie Waters Education and Research Center near Valley City on March 21, 2019.

Ghasideh Pourhashem (below), CSMS researcher, assistant professor in CPM at NDSU, and life cycle analyst, presented *The Secret Life of Things, a voyage into an environmentally conscious consumption* on March 5, 2019, for the Science Café, Stoker's Basement at the Hotel Donaldson in Fargo.

Broader Impacts Seminar: A discussion on research interests, outreach programs, and successful collaborations with the five tribal colleges, three primarily undergraduate institutions, and one master's college/university in the state, using the ND EPSCoR's Broader Impacts White Paper, will be held March 25, 2019, at the NDSU Memorial Union. **Scott Hanson**, ND

EPSCoR Tribal Colleges liaison manager and director of ND EPSCoR NATURE program, will lead the discussion, along with an experienced faculty panel who have developed successful education and research collaboration projects. NDSU panelists include: **Dilpreet Bajwa**, professor in Mechanical Engineering; **Julia Bowsher**, associate professor in Biological Sciences and ND EPSCoR NATURE Sunday Academy co-coordinator; and **Britt Heidinger**, assistant professor in Biological Sciences and ND EPSCoR NATURE Sunday Academy co-coordinator.

Center for Regional Climate Studies (CRCS)-related publications

Detection of Shelterbelt Density Change Using Historic APFO and NAIP Aerial Imagery by **Morgen W.V. Burke**, **Bradley C. Rundquist**, and **Haochi Zheng** (all UND), in Remote Sensing, 2019, 11(3), 218. doi: 10.3390/rs11030218

New Model for Simulating Hydrologic Processes under Influence of Surface Depressions by **Xuefeng Chu** (NDSU), **Xiaodong Zhang** (UND), and **Ning Wang** (NDSU), in Journal of Hydrologic Engineering, 2019, 24(5), 04019008, 1-13. doi: 10.1061/(ASCE)HE.1943-5584.0001772

Wetland Loss Impact on Long Term Flood Risks in a Closed Watershed by **Sergey Gulbin** (UND), Andrei Kirilenko, Gehendra Kharel, and **Xiaodong Zhang** (UND), in Journal of Environmental Science and Policy, 2019, 94, 112-122. doi: 10.1016/j.envsci.2018.12.032

Center for Sustainable Materials Science (CSMS)-related publications

Macromolecular Inversion-driven Polymer Insertion into Model Lipid Bilayer Membranes by **Andriy Voronov** (NDSU) with Sivaramakrishnan Ramadurai, **Ananiy Kohut** (NDSU), Nirod Kumar Sarangi, **Oksana Zholobko** (NDSU), Vladimir Baulin, and Tia Keyes in Journal of Colloid and Interface Science, 2019, 542, 483-494. doi: 10.1016/j.jcis.2019.01.093

Effect of Highly Hydrophobic Plant Oil-based Monomers on Micellization of Sodium Dodecyl Sulfate by **Kyle Kingsley**, **Andriy Voronov** (both NDSU), Oleh Shevchuk, and Stanislav Voronov in Colloids and Surfaces A: Physicochemical and Engineering Aspects 2019, 568, 157-163. doi: 10.1016/j.colsurfa.2019.02.013

Catalyzed Non-isocyanate Polyurethane (NIPU) Coatings from Bio-based Poly(cyclic Carbonates) by **Arvin Z. Yu**, **Raul A. Setien**, **Jonas M. Sahouani**, **James Docken, Jr.**, and **Dean C. Webster** (all NDSU), in Journal of Coatings Technology and Research, 2019, 16(1), 41-57. doi: 10.1007/s11998-018-0135-7

Jurisdictional Travel Seed Awardee

Dilpreet Bajwa, CSMS researcher and professor in NDSU's Mechanical Engineering, and **Kerry Hartman**, CRCS researcher and academic dean and Sciences chair at Nueta Hidatsa Sahnish College (NHSC), are exploring a research partnership with Cecily Ryan, assistant professor in Mechanical and Industrial Engineering at Montana State University, another EPSCoR jurisdiction. In addition, Israt Jahan, Computer Science instructor at NHSC and Sayeed Sajal, assistant professor in Computer Science at Minot State University, will be collaborating on using sustainable materials (cellulosic) to develop low cost, recyclable polymeric materials. Computational tools will be used in the design, formulation, and testing of the polymer composite materials.

Emerging Areas Seed publications

Synthesis and Characterization of Novel Foams by Pyrolysis of Lignin by **Surojit Gupta, Maharshi Dey**, **Caleb Matzke**, **Grant Ellis**, **Sabah Javaid**, **Kathryn Marie Hall**, **Yun Ji** (all UND), and Scott Payne in Tappi Journal, 2019, 18(01), 45-56. doi: 10.32964/TJ18.1.45

Doctoral Dissertation Assistantship (DDA) presentation, publications

Detection of GPS Spoofing Attacks on Unmanned Aerial Systems was presented by **Naima Kaabouch** (UND), at the IEEE Consumer Communications and Networking Conference, January 11-14, 2019 in Las Vegas, NV.

Achieving Fast Kinetics and Enhanced Li Storage Capacity for $Ti_3C_2O_2$ by Intercalation of Quinone Molecules by **Deniz Çakır**, **Edirisuriya Siriwardane** (both UND), Ilker Demiroglu, and Cem Sevik in ACS Applied Energy Materials, 2019, 2(2), 1251-1258. doi: 10.1021/acsaem.8b01801

Strain Engineering of Electronic and Magnetic Properties of Double-Transition Metal Ferromagnetic Semiconductor MXenes by **Edirisuriya Siriwardane** and **Deniz Çakır** (both UND), in Journal of Applied Physics, 2019, 125, 082527. doi: 10.1063/1.5054131

Alkali Metal Intercalation in MXene/Graphene Heterostructures: A New Platform for Ion Battery Applications by **Deniz Çakır** (UND), Ilker Demiroglu, François M. Peeters, Oğuz Gülseren, and Cem Sevik in

Journal of Physical Chemistry Letters, 2019, 10(4), 727–734. doi: 10.1021/acs.jpclett.8b03056

Upcoming events

- **Tribal Nations Research Group Data Matters Conference**, March 20-21, 2019, at Sundance Casino & Resort, Belcourt, ND. (Registration is open at http://www.tnrg.org/data-conference-registration.html)
- **ND EPSCoR Annual State Conference,** March 27, 2019, FargoDome, Fargo (registration is closed)
- **Northern Plains Weather/Climate Product, Service and User Engagement Workshop**, March 28, 2019, at NDSU Memorial Union (registration is open at https://apps.ndus.edu/northern-plains-climate-workshop)
- **7th Annual Tribal College Research Symposium**, April 2, 2019, at Cankdeska Cikana Community College, Fort Totten, ND. Registration and more information available at http://www.littlehoop.edu/research.html
- **CRCS and CSMS monthly meetings:** Hosted via IVN to all campuses. Dates are posted for each on their respective websites.

Funding and RFPs

ND EPSCoR will showcase EPSCoR-related funding opportunities when they become available. ***Please work with your own campus-sponsored program staff to ensure that you're meeting internal deadlines and crafting appropriate budgets.***

Travel Awards for ND EPSCoR RII Track-1 CRCS and CSMS Participants

Issued: February 4, 2019
Deadline: Until funding is exhausted
Who can apply: ND EPSCoR RII Track-1 Faculty
From: ND EPSCoR State Office
To underscore the importance of industry collaborations in the sustainability of ND EPSCoR's current RII Track-1 centers for regional climate studies (CRCS) and sustainable materials science (CSMS), NSF has approved the funding for two travel seed awards of up to $4,500 to travel to an industry partner's domestic (now excludes Canada and Mexico) location for the purpose of pursuing research collaborations in climate studies or sustainable materials. Please see https://www.ndepscor.ndus.edu/fileadmin/ndus/ndepscor/TravelAwards/EPSCoRIndustryTravelAwardsRFP_February_2019.pdf

Stay in touch

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- For a link to ND EPSCoR's prior newsletters, https://www.ndepscor.ndus.edu/news/newsletters/
- To submit a story or idea by the end of the month to joyce.eisenbraun@ndus.edu, please complete: https://www.ndepscor.ndus.edu/fileadmin/ndus/ndepscor/documents/NewsTemplateFillable_2018-10.pdf
- To be added to the newsletter mailing list, please email ndepscor@ndus.edu, subject line: newsletter.