ND EPSCoR
Established Program to Stimulate Competitive Research

News & Notes

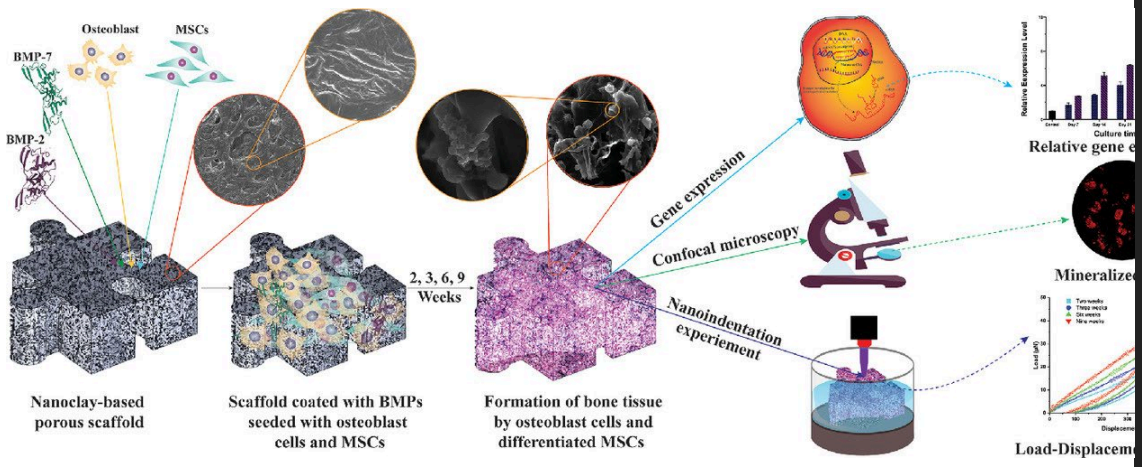
July 27, 2023

Krishna Kundu, Ph.D., receives esteemed award for graduate research, considers ND EPSCoR instrumental

Bioengineer Krishna Kundu, Ph.D., has always been fascinated by the potential of science to solve real-world problems. It drove him to study science and participate in the ND-ACES project as graduate student at NDSU. These experiences were the groundwork for his research that recently won the highly prestigious Acta Student Award.

The Acta Student Award is granted to graduate students who have research papers published in one of the four esteemed Acta journals. Krishna's article, "Initial upsurge of BMPs enhances long-term osteogenesis in in-vitro bone regeneration," was published by Materialia and partially funded by the North Dakota EPSCoR's current NSF EPSCoR RII Track-1 award (NSF OIA 1946202), also known as ND-ACES. Materialia is a materials-focused, multidisciplinary journal that publishes original, peer-reviewed research articles that advance the understanding of the relationship between processing, structure, property, and function of materials.

Krishna and other researchers at NDSU examined the change in the nanomechanical properties of newly formed bony tissue over nine weeks and reported a 120% increase in the elastic modulus at nine weeks with BMP coated scaffolds. In addition, the alizarin Red S staining images and gene expression results they discovered suggest that BMPs play a significant role in mineralized ECM formation and influence osteogenesis initiation. Read the full article here.



Graphic Abstract: "Initial upsurge of BMPs enhances long-term osteogenesis in in-vitro bone regeneration". Materialia. Volume 26, December 2022, 101576. DOI: 10.1016/j.mtla.2022.101576

Materialia editors said Krishna's paper demonstrates exceptional value to the materials community by providing deeper understanding of the mechanisms of the BMPs association with bone tissue formation. They further reported that his personal credentials and recommendations are also exemplary.

In addition to this research of bone regeneration at NDSU, he also studied breast cancer as an ND-ACES participant at NDSU. He graduated in December 2022.

Krishna is honored to receive the Acta Student Award and appreciates the support ND EPSCoR provided him.

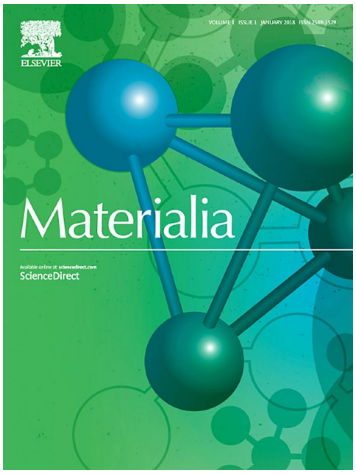
“ND EPSCoR has been instrumental in shaping my academic journey,” he says. “Their support has enabled me to conduct groundbreaking research, access state-of-the-art facilities, and foster collaborations with talented scientists in the field.”

“Studying at NDSU has been a transformative experience, especially under the guidance of Dr. Kalpana Katti and Dr. Dinesh Katti, has been invaluable,” Krishna explains. “Working with scientists has allowed me to engage in multidisciplinary projects, broadening my perspectives, and enhancing my skill set.”

ND-ACES team leads, Dr. Dinesh Katti and Dr. Kalpana Katti, co-advised Krishna as a graduate student at NDSU.

Dr. Kalpana Katti says participating in ND-ACES provided Krishna “the opportunity to engage his teamwork and leadership qualities and establish the patience required to conduct detailed and long experiments. He is a great role model to junior students.”

Krishna himself encourages students “to stay curious and embrace challenges. Pursuing a STEM career offers endless opportunities for innovation and impact.” He advises them to “stay committed to learning, and never underestimate the value of perseverance in research.”



ND EPSCoR is proud of Krishna’s own curiosity, innovation, and perseverance and to have been a platform for his academic and professional success in STEM.

He currently works as a bioengineer and focuses on cell and gene therapy at ThermoFisher Scientific. His research involves developing innovative solutions to enhance gene delivery and therapeutic applications for various medical conditions.

The Acta Student Award will be formally presented to Krishna during the 2024 Acta Symposium, March 3-7, in Orlando, Fla.

Congratulations, Krishna, for receiving the Acta Student Award and your rapidly evolving research career!

Let your Bright Spots SHINE!

The public, the STEM community, and others want to know and understand the value of STEM, and ND EPSCoR wants to help the story be told.

Please send information about events, achievements, outcomes and ideas so ND

EPSCoR can get the word out using social media, press releases, News and Notes, professional networks and other tools.

When you say, “Wow!”, others want to know.

Submit a story>>

STTAR PROGRAM

Students in Technology Transfer And Research

The STTAR (Students in Technology Transfer And Research) program. STTAR provides students (college juniors through graduate students) studying STEM (science, technology, engineering, and mathematics) the opportunity to use their academic training and experience to address the most challenging science and technology-based problems facing North Dakota companies.

Elinor Coatings, **CorVent Medical,** and **Swanson Health Products** participate in STTAR. Let's take a look at what these businesses have to say.

Tell us about Elinor Coatings.
Founded in 2006, Elinor Coatings specializes in research in galvanic corrosion and the creation of anti-corrosion and surface protection solutions. By employing cutting edge technology and comprehensive material research, evaluation, and testing procedures, we produce high-quality chromate-free coating products for use in military and commercial applications. www.elinorcoatings.com

Who are Elinor's STTAR interns and why is their work important? Elinor has hired three STTAR interns this summer!

- **Braden Soderberg**, Chemical Engineering, UND, undergraduate
- **Bogdan Nechepurenko**, Chemical Engineering, UND, undergraduate
- **Nafisa Bala**, Chemistry, UND, Ph.D. candidate

As Research Assistants, our interns formulate, work on the bench, prepare panels and apply product, and do numerous characterizations, or tests. They also get to learn new instrumentation alongside our scientists, like our confocal microscope and brand new optical profilometer. The work our interns do allows

the Elinor lab to run at 150% productivity.

Braden Soderberg

Nafisa Bala

Nafisa Bata (L) and Bogdan Nechepurenko (R)

How do STTAR interns benefit from working at Elinor?

Elinor internships allow students to utilize classroom skills in a commercial laboratory setting. It allows students to expand their knowledge of science and coatings and gain valuable hands-on skills. Interns get the opportunity to work closely with our team of chemists and scientists and see an idea turn into a

solution for our customers.

How does Elinor benefit from hiring STTAR interns?
We get the opportunity to showcase our work to new students and gain helping hands, but we also get the privilege of their new perspectives and ideas. We also use this opportunity to test potential future employees and explore new positions within our organization. It's a win-win situation that fosters growth and innovation.

Has Elinor previously partnered with STTAR?
Elinor is lucky enough to share a building with the ND EPSCoR operation in the NDSU Research Park. This is the first time we have utilized the STTAR program after hearing about the program via email. Elinor wanted to participate as we are passionate about bringing new industry to North Dakota and growing the population of scientists in our area. We work closely with the NDSU Department of Coatings and Polymeric Materials to encourage students to study coatings and the STTAR program allowed us to expand our summer intern offerings. Because of the STTAR program we currently have five Research Assistant Interns in our labs this summer from NDSU and UND.

CORVENT

Tell us about CorVent Medical.
CorVent Medical is a medical device company that provides simple, sophisticated respiratory solutions for post-ICU and home environments. Developed to meet the critical need for ventilators during the pandemic, we

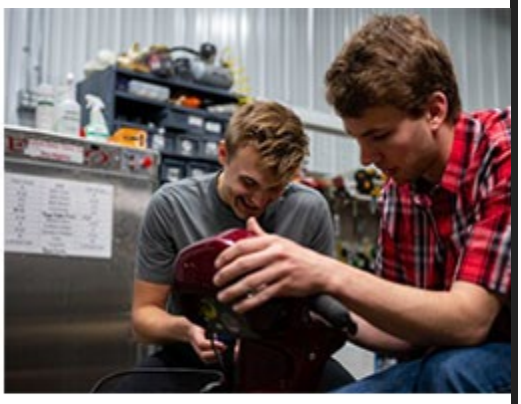
pivoted our solutions towards post-ICU markets, including home health, which have been historically fragmented and neglected. www.corventmedical.com

Who are CorVent's STTAR interns and why is their work important?
We are fortunate to have 3 interns supported through the STTAR program:

- **Jericho Limke**, Computer Engineering, NDSU, undergraduate
- **Srilakshmi (Sri) Gundlakunta**, Electrical/Biomedical Engineering, NDSU, Ph.D. candidate
- **Tara Treml**, Mechanical Engineering Major/Biomedical Engineering Minor, NDSU, undergraduate

Our interns support R&D activities such as developing test protocols to verify the design meets specifications and regulatory requirements, create test fixtures to support their testing, validate the design against user needs and usability testing, and develop robust transfer to manufacturing plans to ensure these devices are designed safely and effectively. Their work directly supports our ability to qualify our ventilator for human use, ensuring that any issues are identified and resolved before being put into a hospital or onto a patient.

Tara Tremi



Jericho Limke (R)

Volunteering at Healthcare Equipment Recycling Organization (HERO)

Sri Gundlakunta

How do STTAR interns benefit from working at CorVent?

Our STTAR interns are translating their education into practical knowledge by engaging in the development cycle, risk management, and verification process of our product design cycle. This hands-on application of their engineering backgrounds helps reinforce their education and provides an insight into what they are most passionate about to pursue following graduation.

How does CorVent benefit from hiring STTAR interns?

CorVent is looking to develop both respiratory solutions and the North Dakota bioscience ecosystem as a whole. Our initiative calls for finding and retaining talent in North Dakota, and working with our STTAR of interns allows us to develop our talent right next door. These students are paramount to the success of our product development cycle, as they bring a fresh take and energy to drive our product to FDA submission. We are fortunate to have students willing to learn and to believe in our company.

Has CorVent previously partnered with STTAR?

No, but our current headquarters are located in the same building with ND EPSCoR, which allowed us to learn about its programs. We have been working closely with NDSU's Career and Advising Center over the last year and they also shared the STTAR program with us as an opportunity to support our interns as we develop our next generation technology.

Tell us about Swanson Health.

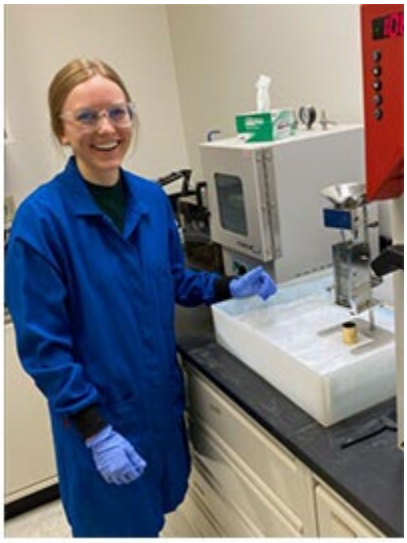
Swanson Health began in 1969 with a simple mission to offer pure and potent wellness solutions for everyone. This commitment grew into a mission to share pure and potent health products directly with others, at a great value. More than 50 years later, we continue to innovate and develop science-backed supplements, self-care products, home goods, and more to bring wellness within reach for health-seekers around the world. www.swansonvitamins.com

Who are Swanson Health's STTAR interns and why is their work important?

- **Kristina Korhonen,** Chemistry, MSUM, undergraduate
- **Nate Aufman,** Chemistry, NDSU, undergraduate

We try to give our interns the opportunity to work in a variety of related fields. It's important for all employees including interns to understand the "why" behind the roles and tasks that we expose them too so that they can perform the task in a more conscientious manner. Be it customer safety, legal limitations, liability issues and/or FDA compliance regulations.

Nate Aufman



Kristina Korhonen

How do STTAR interns benefit from working at Swanson?

Nate says: I have the opportunity to learn about and utilize a variety of scientific instruments and testing methods that are vital in the day-to-day work of an analytical chemist. This experience has been, and continues to be very beneficial, not just for learning how to handle the daily testing of samples at Swanson, but also for understanding how a quality control lab operates.

Kristina says: Interning at Swanson has given me unique and invaluable opportunities to grow in the chemistry field and to expand my skills in related fields. Working as a regulatory writing assistant, quality lab analyst, and research lab assistant has broadened my perspective on utilizing resources around me to support product innovation and development as well as customer needs.

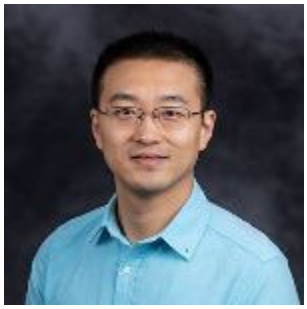
How does Swanson benefit from hiring STTAR interns?

We get to increase the awareness of our company within our local schools. We get an opportunity to expose students to a variety of professional experiences that perhaps broadens their career aspirations. Our internship program is robust,

and we have them working on projects and initiatives alongside the entire team of professionals at Swanson.

Has Swanson previously partnered with STTAR?
This is our first time participating in the STTAR program. Our CEO is passionate about having a great intern program, and he heard about STTAR through his networking. We were excited to participate and highlight our interns in News and Notes!

Meet the researcher



Binglin Sui, Ph.D.
UND Dept. of Chemistry

What are your primary research and scholarly interests?
My research primarily focuses on developing diagnostic and therapeutic nanomaterials for advanced cancer diagnosis and treatment.

How does this tie into the work you are doing with ND-ACES?
I synthesize new biocompatible and biodegradable polymers that can be formulated into polymeric nanomaterials. These nanomaterials serve as drug

delivery nanocarriers to transport therapeutic drug molecules into cancer cells and kill them, which aligns with the goal of ND-ACES in cancer treatment.

Where are you from and where did you pursue your education?
I come from Shandong, China. I got my Ph.D. degree in chemistry from the University of Central Florida.

What excites you about ND EPSCoR?
It provides good opportunities for collaborations between scientists in different research fields and from other research institutes, especially those researching at predominantly undergraduate institutions and tribal community universities.

What motivates you?
If my efforts help people live better one day, it will be my utmost honor.

If you could time travel, where would you go?
Mars.

If you could have coffee / tea with anyone, who would it be?
Elon Musk

What was your first job?
I worked as a research scientist in a life science company once.

What does your very best day include?
The best is still on the way.

What's your favorite quote?
"I never dreamed about success. I worked for it." - Estée Lauder

“If you really want to do something, you'll find a way. If you don't, you'll find an excuse.” - Jim Rohn

Meet the researcher

Khwaja Hossain, Ph.D.
Mayville State University Dept. of Biology

What are your primary research and scholarly interests?
Biomimetic polymeric scaffolds with a broad spectrum of biophysical and biochemical cues that recapitulate the behavior of human extracellular matrix and support the growth of cancer cells and multicellular cancer spheroids (MCSs) that are essential tools for regulating cancer cell behavior. Our interest was to develop soft scaffolds with natural polymers for cancer cell growth and development. Among all types of scaffolds, arabinoxylan extracted from wheat bran in our lab was mixed with Na-alginate showed sustainable growth and development of cancer cells and MCSs. This natural polymer-based scaffold may be with excellent biocompatibility and tunable mechanical properties.

How does this tie into the work you are doing with ND-ACES?
One of the goals was to develop polymeric soft scaffolds that support cancer cell growth and development, and this work is within the scope of the material pillar.

Where are you from and where did you pursue your education?
I was born in Bangladesh, completed my Bachelor's in Agricultural Sciences, Master's in Genetics and Plant Breeding from Bangladesh Agricultural University, Mymensingh, Bangladesh, and Ph.D. with commonwealth scholarship from the University of Wales, UK. I was a recipient of the Japan Society for the Promotion of Sciences fellowship and conducted postdoctoral Research at Chiba University, Japan. I came to the USA to undertake a postdoctoral research work at NDSU.

What excites you about ND EPSCoR?
Academic and research collaboration with the universities and colleges in North Dakota.

What motivates you?
North Dakota is one of the wheat growing states in the USA and in my research, I am using a polymer extracted from wheat bran.

If you could time travel, where would you go?
I would travel to Bangladesh.

If you could have coffee / tea with anyone, who would it be?
My students.

What was your first job?
Rice Breeder at Bangladesh Rice Research Institute.

What does your very best day include?
Spending some time with student researchers.

What's your favorite quote?

"You were born to serve people."

Guess what,

OPEN POSITIONS

Project Manager

Open until filled

Commercialization Outreach Coordinator

Open until filled

Funding opportunities / Training sessions

- NEH Dynamic Language Infrastructure - Documenting Endangered Language Fellowships
- NIH: Interventions to Expand Cancer Screening and Preventative Services to ADVANCE Health in Populations that Experience Health Disparities

- NIH: Maximizing Investigators' Research Award for Early-Stage Investigators
- NIH: Neuroscience Development for Advancing the Careers of a Diverse Research Workforce - **LIMITED**
- NSF: Division of Chemistry - Disciplinary Research Programs
- USDA: AFRI - Education and Workforce Development
- EPA: Community-Based Research for Effective Programs, Policies, and Decisions to Mitigate Cumulative Health Impacts and Environmental Health Disparities in Underserved Communities

Have questions, ideas, or suggestions for News and Notes?

Contact Us

Acknowledgement

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.