NDSU OFFICE OF RESEARCH AND CREATIVE ACTIVITY

RCA UPDATE

July 1, 2024

NOTE: During the summer, the RCA Update will be delivered only on the first Monday of June, July, and August.

Two Economic Diversification Research Funds projects to study accelerating technologies through wireless test beds for ag and adoption of autonomous trucking

North Dakota State University (NDSU) is investing to accelerate technologies in industries vital to the state's commercial interests, thanks to the Technology Acceleration Program (TAP), an initiative funded by new state legislative appropriations for research.

"The State of North Dakota legislature and Governor Burgum focused on commercialization and advancing technology readiness levels through their support of the Economic Diversification Research Funds (EDRF)," said NDSU Vice President of Research and Creative Activity Colleen Fitzgerald. "We answered that call in part with the new Technology Acceleration Program, and we're very thankful for that support. We can't wait to show how these two investments help drive innovation in critical infrastructure for AgTech as well as in autonomous trucking in rural communities."

TAP aims to accelerate the development of prototypes (e.g. software, IoT, algorithms, sensors, biologics, materials, medical devices) that have potential to leverage public-private partnerships and fit within NDSU's strategic priorities or align

with prior and/or existing research investments at NDSU.

"As we continue to transform campus research through the opportunities for use-inspired research and translational impact, we will continue to leverage both state and federal funding for applied research and innovation, leading to continued growth in awards received and the dollars generated by research expenditures," said Fitzgerald.

The two projects are led respectively by the NDSU Agricultural Experiment Station Associate Director Frank Casey, Ph.D. and NDSU Ag Technology Executive Project Manager Aaron Reinholz, and by Upper Great Plains Transportation Institute Director Denver Tolliver, Ph.D. Both teams have received $175,000 in funding for projects supported by TAP.

Wireless Communication Test Bed

The agriculture-focused project is called "Wireless Communication Test Bed to Support IoT Applications in Agriculture" and involves implementing a prototype test bed system at NDSU to provide strong wireless coverage to nearby agricultural fields and livestock facilities.

Conceptually, the Internet of Things (IoT) provides a means to collect ever more granular data to inform decision-making whether in support of our agricultural research or on the farms and ranches of North Dakota. However, while the technology is available to monitor nearly every aspect of our homes remotely by connecting sensor devices to WiFi technologies, that same level of plug-and-play wireless connectivity in agriculture applications doesn't exist due to reliability and cost-effective connectivity issues.

Reinholz hopes that the wireless communication technology system, which will leverage work proposed by Dakota Carrier Network (DCN) and T3 Broadband, will provide a reliable, scalable, and cost-efficient solution to field connectivity for agriculture. He also sees the system as a catalyst for growth in IoT adoption in the agricultural sector by accelerating development and testing of sensor devices and applications towards solutions that can translate to commercial applications.

Accelerating the Deployment of Autonomous Trucks in Rural Areas

The transportation-focused project is called "Accelerating the Deployment of Autonomous Trucks in Rural Areas" and will study how to speed up the adoption of usage of autonomous trucks in the state.

North Dakota's economy relies heavily on efficient transportation services, particularly commercial trucking. However, the industry faces challenges today including driver shortages and high turnover rates with more than 90% of truck drivers leaving their jobs within a year. This shortage affects crucial sectors such as agriculture and energy. Additionally, human error is involved in 95% of all truck crashes.

Tolliver notes the many ways autonomous trucks can help solve these issues. "They have the potential to improve safety by virtually eliminating crashes attributable to human factors, to address driver shortages, to increase efficiency by operating nearly 24/7, and to enhance freight services, especially in rural areas," he said. "In addition, they provide a benefit to agricultural industries at harvest time and during

other peak periods when trucks need to operate safely, yet transport as many loads as possible during a compressed time period."

Tolliver adds that these benefits may not be realized right away, given the slow pace of deployment in the region. "This is why the project is so important—to facilitate and accelerate the adoption of autonomous trucks in North Dakota."

The project will explore infrastructure improvements, the creation of automated trucking hubs, and the integration of these hubs into supply chains. It will also address economic opportunities, workforce challenges, and cybersecurity considerations. The goal is to develop enhanced autonomous driving systems that can operate effectively in adverse weather conditions and on rural roads.

"Autonomous vehicle research is a very competitive field," added Tolliver. "Many well-funded universities have invested many millions of dollars in test vehicles, tracks, and research time to become leaders in this futuristic field. The EDRF project can help us build our reputation and internal capacity to compete for federal and private funding opportunities in the future. Moreover, the project will allow us to demonstrate that we are engaged in innovative research that will have economic and workforce development benefits in the state for many years to come."

Tolliver hopes to provide valuable information for trucking companies, shippers, and state agencies to make informed decisions about deploying autonomous truck technologies, ultimately leading to more reliable service options, increased efficiency, and reduced labor costs.

These projects join others already funded through the Economic Diversification Research Funds (EDRF) appropriated in the 2023 North Dakota legislative session. The purposes of the EDRF funds include stimulating economic activity across the state through new technology, concepts and products as well as promoting job creation and career and wage growth while providing experiential learning opportunities for students.

Interdisciplinary proposal development initiative on "Hacking Aging" yields innovative digital twin approach to age-related diabetes prevention

The NDSU Office of Research and Creative Activity's Sparking Big Ideas Research Initiative included a March workshop focused on "Hacking aging: Bridging disciplines for a more inclusive future." The workshop was led by KnowInnovation in support of team formation and proposal development, with a goal of fostering seed proposals to advance ideas for the development of competitive proposals in pursuit of significant external funding.
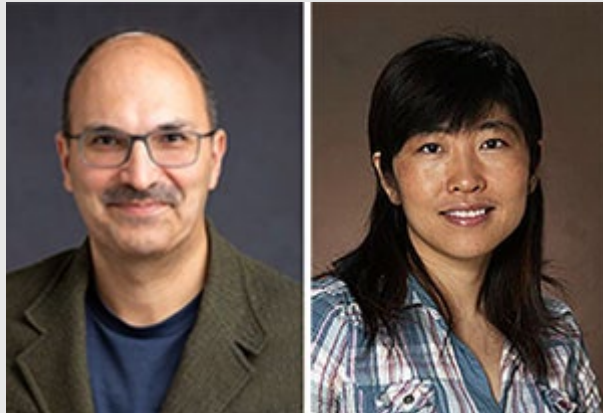
The workshop drew considerable interest from the many faculty whose work has the potential to improve health outcomes for North Dakotans. The resulting funding competition will support work led by NDSU Industrial and Manufacturing Engineering Assistant Professor Harun Pirim and co-pi NDSU Computer Science Professor Jen Li entitled, "A Holistic Approach to Personalized Prevention of Age-Related Diabetes."

The $100,000 project is funded by the Economic Diversification Research Funds (EDRF), which were appropriated in the 2023 North Dakota legislative session. The funding was targeted at stimulating economic activity through innovative technology, promoting job creation, enhancing health care, and providing experiential learning opportunities for students. NDSU expertise is leveraged to find solutions that can enhance outcomes for an aging North Dakota population, valuable use-inspired research with translational impact for the state's needs.

A holistic approach to diabetes using digital twins

Pirim and Li's research is centered on a holistic approach to diabetes and Pirim notes that this is a crucial distinction given traditional research has often focused on singular aspects of the disease, missing the broader interactions between these factors.

"Diabetes in aging populations is influenced by a complex interplay of genetic, environmental, and lifestyle factors," he said. "By integrating insights from genomics, environmental health, behavioral science, and computational biology, we aim to create comprehensive models that better predict individual risk profiles."

Utilizing digital twins, or virtual models of patients that mirror their real-world health status, the researchers hope to be able to predict how they might respond to various health scenarios, treatments, or lifestyle changes.

Digital twins are used to simulate, analyze, and predict outcomes, enabling better decision-making and personalized care. They can incorporate a patient's medical history, genetic information, lifestyle, and current health data and allow doctors to run simulations and predict how different treatments might affect the patient without any risk. With data and advanced algorithms to predict health outcomes, disease progression, and potential complications, digital twins can help in early intervention and personalized treatment plans.

Using the digital twin technology, the research team hopes to develop a predictive system against age-related diabetes that will allow for the development of more effective, personalized prevention and treatment strategies that address the multifactorial nature of diabetes.

> *"We have collaborators from industrial engineering, computer science, psychology, and pharmacology all addressing an aging related problem."*
>
> NDSU Industrial and Manufacturing Engineering Assistant Professor Harun Pirim

The technology promises a highly customized treatment plan for each patient. "We will refine these models with real patient data in the future to improve predictive accuracy and create tailored interventions, ultimately enhancing patient outcomes

and reducing healthcare costs," Pirim said.

Heidi Grunwald, NDSU associate vice president for research development, led the process for selecting the project for funding. She saw merit in the new approach to a health issue many have faced throughout time. "The expertise of both Dr. Pirim and Dr. Li along with their novel approach has the possibility to improve how we help people suffering from age-related diseases like diabetes." Grunwald added how the work fits well into the criteria and objectives set forth for EDRF-funded projects. "This project aligns with stimulating economic activity through innovative technologies while enhancing healthcare in the state."

The timeframe for the project is one year and runs through May 2025.

Given the relatively short period, Pirim hopes to see immediate benefits and results for the work, and he is optimistic about bringing together researchers from many diverse disciplines. "We have collaborators from industrial engineering, computer science, psychology, and pharmacology – all addressing an aging-related problem."

"Thanks to Governor Burgum and North Dakota legislators for these Economic Diversification Research Funds, our researchers are able to carry out this work," said NDSU Vice President of Research and Creative Activity Colleen Fitzgerald. "Many thanks also to Sheri Anderson and the Strategic Research Initiatives team for their work on the Sparking Big Ideas Research Initiative. We hope to see those efforts and EDRF serve as a multiplier effect, leveraging Heidi's deep knowledge of health funders like the National Institutes of Health."

NDSU researcher studying impact of jumping genes

Sarah Signor, an assistant professor of biological sciences at North Dakota State University, has received $1.81 million from the National Institutes of Health to study genes called transposons and their impact on evolution. Signor's research aims to understand how defense systems have evolved against these genes and their important implications for health and fertility in humans and other species.

Transposons, often called "jumping genes," can move to different positions within DNA. Similar to a small segment of text in a book that moves to different chapters and alters the overall story, a transposon's movement often changes how DNA functions by turning genes on or off or modifying their function. Transposons are found widely in plants and animals.

Maintaining DNA stability is crucial for health and fertility, but transposons disrupt this stability by inserting themselves into different parts of the genome. While this plays a role in evolution and genetic diversity, it can also cause mutations and genetic disorders.
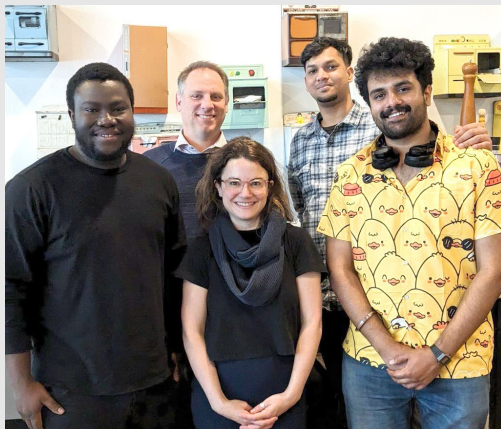
Organisms use a defense system involving small RNA molecules to identify and silence transposable elements. Signor's research explores the evolution of RNA production and other transposon suppression methods. "While dedicated systems exist to stop the processes caused by transposons, new findings suggest other, less understood mechanisms might also be at play as transposons themselves evolve new methods of inserting their genetic material into DNA," she said. "The process of transposon activity and the resulting host suppression activities creates an arms race of sorts, and we want to understand how these defense systems evolve and vary across different organisms."

The research promises advances in fields such as population genetics and gene regulation and could have important implications for health and fertility in humans and other species.

Signor's work, "Co-evolutionary Dynamics Between Transposable Elements and Their Hosts," is supported by NIH award 1R35GM155272-01.

RCA RIC Office renamed to Office of Research Integrity, Security, and Compliance (RISC)

On July 1, 2024, the RCA Research Integrity and Compliance (RIC) office will be renamed the Office of Research Integrity, Security, and Compliance or RISC, which reflects the incorporation of research security into the key functions of the office. The elevation of security is a result of increased federal research security scrutiny and NDSU's efforts to address issues such as data management, cybersecurity, research security, and export control training along with the goal of mitigating risks related to the potential for foreign influence in research.

In addition to research security, the RISC team will continue to be responsible for implementing programs that ensure integrity, compliance, and security while assisting faculty, staff and students in the understanding and compliance of federal, state and university regulations, laws, and policies surrounding funded and unfunded research. Their areas of oversight and administrative support will include research involving vertebrate animals, human subjects, biosafety, dual-use research of concern, controlled substances, financial conflicts of interest or conflicts of commitment related to research, unmanned aerial vehicle compliance, and research misconduct. Given the similar requirements to these areas, export controls oversight will be added to the RISC team.

RISC is composed of RISC Manager Kristy Shirley and her team: IACUC/IBC Administrator Tania Molden, IRB Administrator Andrea Ludwig, and Export Control Administrator Sharon May. A search for a full time Attending Veterinarian is currently underway and this person will remain a part of the RISC unit but will report

directly to VPR Fitzgerald.

Learn more about RISC >>

RCA INTERNAL FUNDING OPPORTUNITIES

➤ SBIR/STTR Phase 0 Funding Program

Research and Creative Activity has designed a program to provide financial support for those pursuing federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Funding for this program will come from Economic Diversification Research Funds (EDRF). Established by the ND Legislature for NDUS institutions, the program's purpose is to:

- Stimulate economic activity across the state through innovation of new technology, concepts, and products;
- Promote job creation and career and wage growth;
- Enhance health care outcomes;
- Address loss of revenue and jobs in communities with economies that depend primarily on the fossil fuel industry; and/or
- Provide experiential learning opportunities for students.

Applications will be accepted on a rolling basis beginning April 23, 2024. Review of submitted proposals began May 15, 2024. The request for applications will be open until funds are fully obligated.

Learn more and apply >>

The NDSU Foundation Grants Committee is accepting applications for the 2024 Impact Fund Grant Program.

The Impact Fund Grant Program provides funding for projects that make a significant impact on excellence and the educational experience for students at North Dakota State University. This program is supported by annual contributions from alumni and friends of the University.

Applications are accepted from faculty, staff, and recognized student groups. The Impact Fund Grant Program offers grants of $20,000 to $75,000.

Find more information on the NDSU Foundation website. Contact Grants Committee Staff Liaison Janna Swanson with any questions.

The application deadline is **Wednesday, July 24, 2024, by 4:30 p.m.**

Apply >>

R - Workshop
August 8 & 9, 2024 8:30am - 4pm
NDSU AGHILL, room 240

North Dakota Water Resources Research Institute will host a workshop led by Travis Seaborn, NDSU AES School of Natural Resource Sciences assistant professor.

This event is open to both faculty and graduate students at NDSU and will be capped at 24 people.

The workshop is designed to be beginner-friendly, enabling participants with no prior experience in R and RStudio to learn essential skills for data analysis. The focus is on reading, cleaning, summarizing, and plotting data.

Workshop agenda:

- Introduction to R and RStudio
- Introduction to Geospatial Concepts
- Introduction to Geospatial Raster and Vector Data with R
- Introduction to making maps in R
- R programming basics
- Data manipulation
- Exploratory data analysis and visualization

Instructor Travis Seaborn is a member of the Carpentries, using their open-source workshop materials maintained via GitHub. Workshops taught include Unix and Git, R for Reproducible Scientific Analysis, and various Data Carpentry workshops for Ecology, Geospatial Data, and Genomics. The ecology workshop material has been used as the foundation for RNG 791 classes, which were conducted in a workshop format in the recent semester and last spring. For specific materials, refer to Data Carpentry and Software Carpentry lessons available online.

Register | *Deadline: July 9, 2024*

Secretary Vilsack Announces USDA and FFAR Innovation Challenge to Catalyze Agricultural Solutions

The U.S. Department of Agriculture (USDA) and the Foundation for Food & Agriculture Research (FFAR) today launched a global challenge to advance scientific research that will produce major breakthroughs for nutrition security while mitigating climate change impacts and advancing equity for underserved communities. The "Nourishing Next Generation Agrifood Breakthroughs" (Innovation Challenge) funding opportunity will fund transdisciplinary teams led by early-career scientists (those who have received a Ph.D. within the past ten years) to catalyze new discoveries and mobilize transformative research that simultaneously tackle our most important societal challenges.

This competitive Innovation Challenge will spark high-risk, high-reward research through innovations at the intersection of nutrition security, equity and justice, and climate-smart agriculture. With a focus on the next generation of research, this opportunity emphasizes providing resources to support highly creative and highly promising early-career researchers. USDA and FFAR will award up to $2 million to successful applicants across multiple teams who propose a compelling vision for how their research can support sustainable food production, promote human health, and reduce inequities while enhancing real-world nutrition security.

*Read complete announcement >>*

INFORMATIONAL WEBINAR REPLAY

(June 13, 2024) This informational webinar provided additional background about this funding opportunity and presented detailed guidance about the application process.

Webinar speakers included Dr. John Rothlisberger from the USDA Office of the Chief Scientist and FFAR Scientific Program Director Dr. LaKisha Odom.

Air Force Office of Scientific Research (AFOSR) AI for Humanity event now available for replay

The AI for Humanity event, hosted by Doug Riecken, AFOSR program officer for the Science of Information, Computation, Learning, and Fusion featured a lively discussion with AI leaders: Carla Gomes, Eric Horvitz, Kimberly Sablon, Steven "Cap" Rogers, Tom Mitchell, and Yann LeCun. The event is now available for replay on demand.

Watch event: https://www.youtube.com/watch?v=Gg8oc2GR26Y
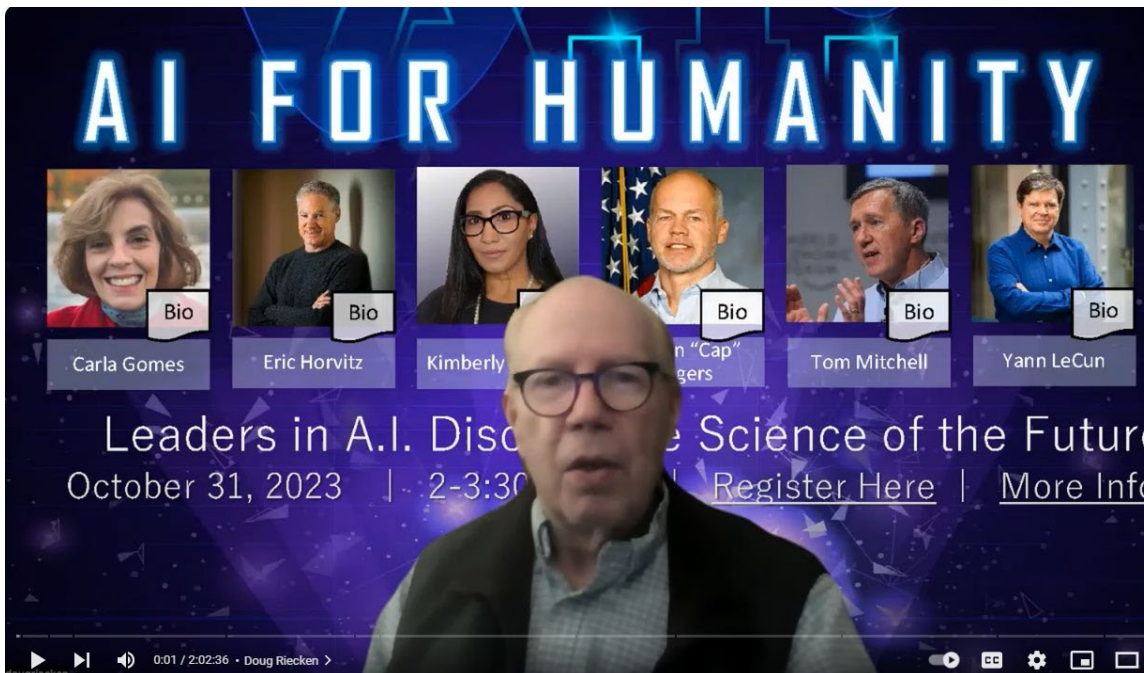
About AFOSR

AFOSR continues to expand the horizon of scientific knowledge through its leadership and management of the Department of the Air Force's basic research program. As a vital component of the Air Force Research Laboratory (AFRL), AFOSR's mission is to discover, shape, champion, and transition high risk basic research to profoundly impact the future Air and Space Force. AFOSR accomplishes its mission by cultivating scientific breakthroughs into world-class solutions to boldly go where no science has gone before. The FUTURE begins with Basic Research!

Join a CASA-Bio workshop and help plan a future to advance the U.S. bioeconomy

Catalyzing Across Sectors to Advance the Bioeconomy (CASA-Bio) is a collaborative, facilitated activity, inspired by the Executive Order (EO) on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy.

Stakeholders from Federal agencies, industry, and non-profits have identified a group of Subtheme Challenges that span the five Bioeconomy EO Themes:

1. **climate change**

2. **food and agriculture**
3. **supply chain resilience**
4. **human health**
5. **cross cutting advances across all these sectors**

Now, there is an opportunity for the research community to provide input for the next step in the CASA-Bio activity!

Six interactive Advancement Workshops - designed to propel the bioeconomy forward - will focus on specific research and development challenges and opportunities for the bioeconomy, bringing together experts from academia, industry, and government. The topics of these workshops have been pulled from the community Town Halls that were hosted earlier in the year as well as meetings with government agencies. Each workshop will include participants selected from open applications from the community and suggested by CASA-Bio organizations, ensuring a diverse range of perspectives and expertise. By working together we can develop strategies that leverage fundamental, use-inspired, and translational research and development to drive innovation and advance the bioeconomy.

Each workshop will be fully virtual and take place over two days in July or August.

Topics include:

- Personalized health and medicine for vaccine and biologics delivery
- Accelerated breeding for crops and animals
- Creating value from waste carbon for a circular bioeconomy
- Enabling resilient bio-based supply chains
- Food protein diversification
- Improving carbon and energy efficiency of biomanufacturing

To apply, visit www.casa-bio.net/ >>

Research Development and Grant Writing News

The Research and Creative Activity office holds a subscription to Research Development and Grant Writing News, a monthly newsletter full of helpful tips and information about funding agencies and writing successful grant proposals.

Here are some articles you will find in the June 2024 edition:

- **Funding Profile: Homeland Security Office of University Programs in Sci. & Tech.** – *an overview of the funding programs available through the DHS S&T Office.*
- **New Faculty Guide to Finding NSF Funding** – *a discussion for new faculty about how to find the right NSF funding opportunity.*
  Heads up! NSF's New Graduate Student Mentoring Plan Requirement – *a discussion of NSF's new requirement for a Mentoring Plan for graduate students.*
  Unsolicited Proposals to Federal Agencies – *A discussion of the various requirements for submitting unsolicited proposals to federal agencies.*
  Win Your Grant on Page 1 – *A discussion of the importance of starting your proposal narrative with a strong first page.*
  To Revise, Re-Write, or Begin Anew? - *When your proposal is declined, how do you decide whether to tweak the proposal to address review comments and resubmit, deeply rewrite it and resubmit, or bury it and start over? (reprinted from the January 2019 issue).*

Access these and many more articles (requires NDSU log-in) >>

WE'RE HIRING:
Director of Animal Resources /
## Institutional Attending Veterinarian

Learn more and apply >>

Legacy IBC system to be phased out

In an effort to modernize all IBC protocols and move them to the Novelution system, the Legacy (paper) system is being phased out. Beginning in November, 2023 all Principal Investigators (PIs) at the time of annual update, or anytime a substantive change is requested, have been or will be notified that their protocols will transition to Novelution.

This process will continue through October, 2024. At this time, the transition will be

nearly complete as we wait for the review process on the last of the converted protocols. Once the transition is finalized the Legacy system will be retired.
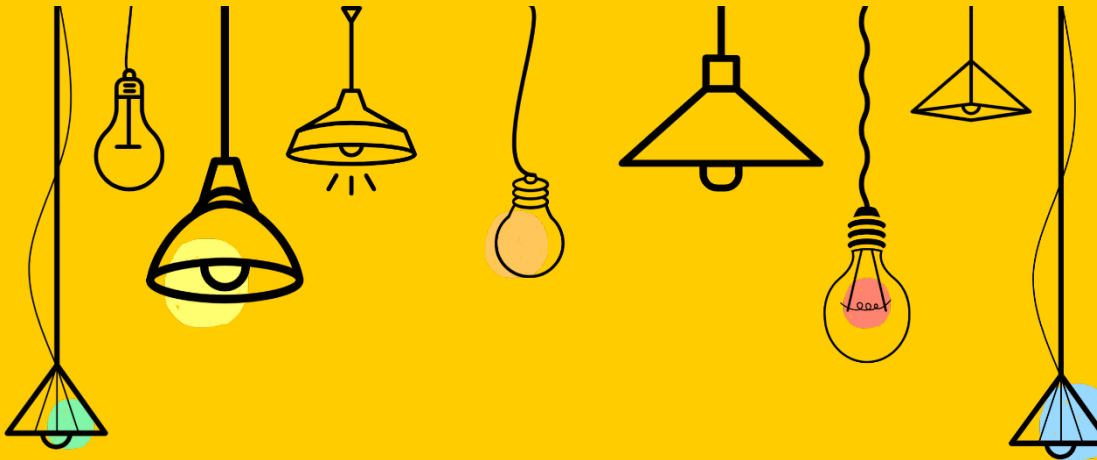
Have a big, bright idea about research at NDSU?

It's important that we continually challenge each other to come up with ambitious, big ideas in our research endeavors at NDSU. So we'd like to hear your ideas, and the bigger they are, the better.

While we can't promise all of them will succeed, we welcome you to share them - from an early concept or thought all the way to developed ideas that may just need some collaboration - send us an email (**bigideas@ndsu.edu**) and get the process started.

Funding Opportunities

Agriculture and Food Research Initiative Competitive Grants Program Foundational and Applied Science Program

The AFRI Foundational and Applied Science Program supports grants in six AFRI priority

areas to advance knowledge in both fundamental and applied sciences important to agriculture. Research-only, extension-only, and integrated research, education and/or extension projects are solicited in this Request for Applications (RFA).

Priority areas:

1. Plant health and production and plant products;
2. Animal health and production and animal products;
3. Food safety, nutrition, and health;
4. Bioenergy, natural resources, and environment;
5. Agriculture systems and technology; and
6. Agriculture Economics and Rural Communities

Note that there are match requirements for this program.

Deadline: December 31, 2024

Additional Opportunities

NIH Grant Funding   **NSF Grant Funding**   **DoD Grant Funding**

RCA INTERNAL FUNDING OPPORTUNITIES >>

Limited submission programs

Limited submission grant programs are those that indicate a limit on the number of proposals that may be submitted by an institution for a particular deadline. A selection process becomes necessary if more applicants express interest in applying than NDSU is allowed to submit to the grant program. Email notifications of interest

to ndsu.researchdev@ndsu.edu by **close of business** on the notification deadline date.

Notice of Intent to Compete in Limited Submission Programs:

The following Limited Submission programs are open for "Intent to Compete" notifications. If you are interested in submitting to any of these programs, please send an email to ndsu.researchdev@ndsu.edu by the dates indicated below. If more than two applicants respond we will run an internal pre-proposal phase.

Early Career Research Award Program: Society for Simulation in Healthcare (SSH)

The Research Committee of the Society for Simulation in Healthcare (SSH) established the Early Simulation Career Research Award Program (formerly the SSH Novice Research Grant Program) to support the development of new investigators and research initiatives. Research awards of up to $10,000 are available.

Early career researchers developing methodologically sound simulation-based research projects using quantitative, qualitative, or hybrid, mixed-method approaches are sought for these awards. Studies that are both innovative and have strong potential for a positive impact on the simulation field are encouraged. The potential impact on the applicant's career is also considered.

Deadline for 2025 Letters of Intent (LOI): July 15, 2024
If invited, full proposals are due Monday, September 30, 2024.

Looking for more funding opportunities?

RCA subscribes to SPIN by InfoEd Global, a database of more than 40,000 funding opportunities. Through this subscription, SPIN is free for current NDSU faculty, staff, and students.

For more information and to access this database, visit the **SPIN page** on the RCA website. If you have questions, please contact **ndsu.researchdev@ndsu.edu**.

Have questions, ideas, or suggestions for the RCA Update?

Contact Us