

COLLEGE HAPPENINGS

January 19, 2021

FROM THE DEAN

Engineering Innovations and Grand Challenges Scholars

Lately, I've been working on keeping my new year's resolution, which involves a torture device (a.k.a, a stationary exercise bike) each morning. To help pass the time on the bike, I've been steaming history documentaries while exercising. One of the themes I see is that technology has been the driver of societal progress throughout history. From the printing press to the compass to steel, engineering innovations have changed human history.

Think about the engineering innovations from just the past century and how much these innovations have changed society. Several years ago, the National Academy of Engineering and several engineering societies undertook an effort to identify the greatest engineering achievements of the 20th century. The 20 innovations they identified and published in the book, *A Century of Innovation*, included electrification. (Clearly, the wide distribution of electrical power that we use in our homes and businesses, and that powers the electrical appliance and devices we use every day, exemplifies how engineering changed the world during the 20th century). The top 20 list also included the automobile, airplanes, and advances in water supply and distribution (waterborne diseases were the third largest cause of death at the onset of the 20th century). The list also included electronics, radio and television (which were significant social change agents), agricultural mechanization, computers, the internet, and more. Thinking about how society changed in just a few generations from 1900 to 2000 is mind-blowing. However, we are now one-fifth of the way into the 21st century. Eighty years from now, when historians look back on this century's most significant engineering innovations, what will be on the list. We can only imagine; however, as Astronaut Neil Armstrong said, "It is not unreasonable to suggest that, with the help of engineering, society in the 21st century will enjoy a rate of progress equal to or greater than that of the 20th."¹

That is one reason I am so excited about our mission as an engineering college to prepare innovative problem solvers and to create new knowledge to improve lives in North Dakota and beyond. By equipping our students with a 21st-century engineering, computer science, or construction management education, they will become the drivers and leaders of innovation in the 21st century. Their innovation will help to solve some of the big problems that our society faces. And equipping students to solve some of those problems is why I've made the Grand Challenges Scholars Program a priority.

The NAE Grand Challenges Scholars Program (GCSP) was developed in response to the [14 Grand Challenges](#) (or goals) for Engineering in the 21st century identified by the NAE in 2008. Essentially, the GCSP is a response to the question, "If the NAE identified the 14 Grand Challenges as being of utmost importance to make the world better, shouldn't we be preparing students with the skills and mindset today to be able to solve these challenges tomorrow?"

More than 90 engineering schools around the world (including NDSU) have implemented the GCSP. At NDSU, our first cohort of Grand Challenges Scholars will be graduating at the end of this semester. These students will have completed the combined curricular, co-curricular and extracurricular program, and as such, will have a special designation on their transcripts.

The NDSU Grand Challenges Scholars program has five components to ensure that each GCSP participant has developed competencies required by the NAE:

1. A research experience nominally related to a grand challenge.
2. An interdisciplinary curriculum that prepares engineering students to work at the overlap with public policy, business, law, ethics, human behavior, risk, medicine, and the sciences.
3. Entrepreneurship to prepare students to translate invention to innovation and to develop market ventures that scale to global solutions in the public interest.
4. A global dimension that develops the students' global perspectives necessary to address challenges that are inherently global and lead innovation in a global economy.
5. Service-learning for developing and deepening students' social consciousness and their motivation to bring their technical expertise to societal problems.

These components are driven by the idea of the 21st-century engineer, those well-rounded engineering leaders and innovators who put knowledge into practice to meet the challenges people and society will face in this century. Please consider being a part of the GCSP at NDSU. We will need additional research projects and mentors as we grow the program. This semester alone, there are 44 students (mostly freshmen) officially in the ENGR 191 Grand Challenges Scholars Seminar course, and those that persist will need research mentors and projects. I encourage you to get in touch with the director of GCSP at NDSU, Achintya Bezbaruah, to learn how you can get involved.



¹ A Century of Innovation Twenty Engineering Achievements that Transformed our Lives (2003)

IN THE NEWS

[Fellowships awarded to top NDSU graduate students](#)

[AFRL engineering award winner proclaims a first for the U.S. Space Force](#)

CONGRATULATIONS

Please let [College Happenings](#) know about honors, awards, new grants and other announcements so we can share them with other faculty and staff.

UPCOMING EVENTS

Wednesday, February 17, 2021, **3rd Annual Student Success Summit: “Supporting Student Growth through Grit and Gratitude”**. Presentations will be held virtually from 8:30 a.m. to Noon. See the schedule and presentation descriptions here: <https://career-advising.ndsu.edu/student-success-summit/>

CLASSROOM UPDATES

The Classroom Technology team continues to install student microphones and cameras in all classrooms, prioritizing student microphones. You will notice that most rooms have cameras physically in the room, but they don't work. Because we prioritized microphones, we have not completed the programming of these cameras.

For the status of your classroom(s) refer to the following list: <https://kb.ndsu.edu/100854>. As the technology is programmed, the list will be updated. If you have any questions, or difficulties using the student microphones or cameras please contact the Help Desk at 231-8685, or put in a Help Desk ticket: <https://www.ndsu.edu/it/help/>

NEW NDSU RESEARCH EXPERIENCES FOR UNDERGRADUATES PROGRAM

The RCA office is seeking faculty mentors and research projects for a campus-wide Research Experiences for Undergraduates (REU) Summer Program in 2021. The proposed projects can be wide ranging, but related to STEM areas with a preference in Biotechnology. This program is expected to run for 6 weeks from June 21st to July 30th (final dates may vary). During the 6-week summer REU program at NDSU, the participating students are expected to conduct research independently (approximately 40 hours per week) through weekly mentoring by the project faculty mentors or project leaders in addition to attending workshops, trainings, and other activities organized by the RCA office (five hours per week). The RCA office will cover the costs for each undergraduate researcher in this summer REU program, including:

- \$3000 (\$500/week) for stipend in addition to housing costs on NDSU campus at MLLC (~\$1500).
- Funds up to \$500 to purchase consumable research materials and the use of core facilities at NDSU.
- Cost of travel to Fargo may also be available upon request for students who have financial needs.

If you are interested in engaging in this summer REU program, please submit a project proposal. The project proposal (one-page) will need to include:

1. A project title and contact information for the faculty mentor(s). Collaborative faculty mentors are encouraged.
2. An abstract describing the project and the expected outcomes from the REU research experiences, which will be available to student applicants. Since interested applicants may not have past research experience please keep the descriptions at a technical level that is easy for undergraduate students to understand.
3. Each project may have up to two REU students in summer 2021. If two students are expected, describe the anticipated role of each undergraduate researcher in the research project;
4. A short description of the relation of the proposed project to biotechnology.

Project proposal submissions are due to ndsu.researchdev@ndsu.edu by 5:00pm on January 26, 2021. Please use "Summer REU 2021 Project Proposal" as the email subject line. Final project selection for this REU program for Summer 2021 will be notified mid-March, after student applications have been received and participating students have been selected for evaluations.

FUNDING OPPORTUNITIES

NIH Research Education Programs (R25)

The NIH Research Education Program (R25) supports research education activities in the mission areas of the NIH. There are multiple upcoming R25 program deadlines, some of which are [limited submission programs](#). See below for details.

- **Biomedical Engineering Education [PAR-19-215]**
Applications are encouraged from institutions that propose to establish new or to enhance existing team-based design courses or programs in undergraduate biomedical engineering departments or other degree-granting programs with biomedical engineering tracks / minors. *Limited Submission Program: [Notify RCA](#) by 02/15/2021, 5:00 p.m. if you are interested in submitting to this program.*
- **Enhancing STEM Educational Diversity [PAR-20-223]**
This opportunity will support creative educational activities with a primary focus on courses for skills development and research experiences for undergraduate freshmen and sophomores from diverse backgrounds. *Limited Submission Program: [Notify RCA](#) by 3/9/2021, 5:00 p.m. if you are interested in submitting to this program.*

University-Industry Demonstration Partnership: Avery Dennison Open Innovation

[Avery Dennison](#) is a global materials science and manufacturing company specializing in the design and manufacture of a wide variety of labeling and functional materials. The company is seeking collaborative partnerships with university or industry researchers on the cutting edge of packaging design, with specific interest in three areas:

- sustainable materials and processes for labels;
- intelligent label, where labels can store and capture information and wirelessly transmit data; and
- digital ID: Provide a unique identification to each label.

With operations in more than 50 countries and 30,000 employees worldwide, Avery Dennison products are used in nearly every major industry. [Register](#) for this free webinar about how to partner with Avery Dennison for future materials and products that serve an ever-changing marketplace.

Wednesday, January 20, 2021 / 11:00am

[Learn more >>](#)

RECENTLY FUNDED GRANTS

- Ravi Yellavajjala (PI). A complex-step decoder for interpreting cancer cell growth images. \$26,000 from ND EPSCoR (ND-ACES). 12/15/2020 – 06/30/2021.
- Jordi Estevadeordal (PI). ND NASA EPSCoR Supplemental Project Funding Award. \$24,999 from ND EPSCoR. 12/09/2020 – 06/30/2021.

RECENTLY SUBMITTED PROPOSALS

- Danling Wang (PI), Qifeng Zhang (CPI), Yiwen Xu (CPI), Juan Li (CPI). RII Track 2 FEC: Smart Breath-Based Wearable Device for Point-of-Care Diabetes, Prevention and Management. \$1,526,226 from the National Science Foundation. 08/01/2021 – 07/31/2025.
- Halis Simsek (PI). Fate and transport of pharmaceuticals and personal care products (PPCPs) originating from biosolids and their accumulation in wheat (*Triticum aestivum* L.) plant. \$823,563 from the Environmental Protection Agency. 08/01/2021 – 07/31/2024.
- John F Nowatzki (PI). Demonstrate the Use of Unmanned Aerial Vehicles to Plant Cover Crop Seed. \$53,753 from the ND Department of Agriculture. 03/01/2021 – 02/28/2022.
- Shafiqur Rahman (PI). Impact of Canola Production Practices on Nitrogen Management, Carbon Footprint, and Yield under North Dakota Management Practices. \$28,384 from the Northern Canola Growers Association. 05/01/2021 – 06/30/2022.
- Zhibin Lin (PI). Proposed AASHTO Guidelines for Applications of Unmanned Aerial Systems Technologies for Element-Level Bridge Inspection. \$340,000 from the National Academies. 06/01/2021 – 12/31/2023.
- Abdulaziz Ali H Banawi (PI), Zhili Gao (CPI). Developing an Interactive model to Integrate human experience with Artificial Intelligence in the Construction Industry. \$557,371 from the National Science Foundation. 06/01/2021 – 05/31/2026.
- Dharmakeerthi Nawarathna (PI), Benjamin Davis Braaten (CPI). RII Track-2 FEC: NANO manufacturing of next-generation Radio Frequency devices for aggressive environments (NANORF Center). \$838,548 from the National Science Foundation. 09/01/2021 – 08/31/2025.
- Sudarshan Kumar Srinivasan (PI). SaTC: CORE: Small: Formal Verification Techniques For Microprocessor Security Vulnerabilities and Trojans. \$354,655 from the National Science Foundation. 08/15/2021 – 08/14/2024.
- Ademola Monsur Hammed (PI), Nurun Nahar (CPI), Ewumbua Monono (CPI). Development of organic ammonia from pulse for biofertilizer and biofuel production. \$38,998 from the Northern Pulse Growers Association. 04/01/2021 – 03/31/2022.
- Yao Yu (PI). Multi-Source Heat Pump System with Ambient Temperature Distribution Loop. \$270,700 from the Department of Energy. 10/01/2021 – 09/30/2024.

- Qifeng Zhang (PI). Planning on the creation of a virtual Electrical Engineering Lab for NDSU, College of Engineering students. \$5,000 from the Department of Treasury. 11/16/2020 – 06/30/2022.
- Jun Kong (PI). Dakota Digital Academy (DDA) funding for development of a course - CSCI 488 Human Computer Interaction. \$5,000 from the Department of Treasury. 11/16/2020 – 06/30/2021.

RECENT PUBLICATIONS

For 2021, 19 publications by authors with the College of Engineering affiliation have appeared in various journals, according to the ISI Web of Science and submissions from faculty. Here are some of the most recent publications:

- Cao, Zhiqiang, Zhaofan Li, Song Zhang, Luke Galuska, Tianyu Li, Changwoo Do, Wenjie Xia, Kunlun Hong, and Xiaodan Gu. 2020. "Decoupling Poly(3-Alkylthiophenes)' Backbone and Side-Chain Conformation by Selective Deuteration and Neutron Scattering." *Macromolecules* 53 (24): 11142–52.
<https://doi.org/10.1021/acs.macromol.0c02086>.
- Chen, X., W. Ogdahl, Md S. Borhan, and X. Sun. 2020. "Evaluation of Beef Cattle Temperament Using Video Technology." *Transactions of the ASABE* 63 (6): 1905–11. <https://doi.org/10.13031/trans.14044>.
- Hassanijalilian, Oveis, C. Igathinathane, Sreekala Bajwa, and John Nowatzki. 2020. "Rating Iron Deficiency in Soybean Using Image Processing and Decision-Tree Based Models." *Remote Sensing* 12 (24): 4143.
<https://doi.org/10.3390/rs12244143>.
- Kundu, Krishna, Ayda Afshar, Dinesh R. Katti, Mohan Edirisinghe, and Kalpana S. Katti. 2021. "Composite Nanoclay-Hydroxyapatite-Polymer Fiber Scaffolds for Bone Tissue Engineering Manufactured Using Pressurized Gyration." *Composites Science and Technology* 202 (January): 108598.
<https://doi.org/10.1016/j.compscitech.2020.108598>.
- Mulinti, Pranothi, Deep Kalita, Raquib Hasan, Mohiuddin Quadir, Yechun Wang, and Amanda Brooks. 2020. "Development and Processing of Novel Heparin Binding Functionalized Modified Spider Silk Coating for Catheter Providing Dual Antimicrobial and Anticoagulant Properties." *Materialia* 14 (December): 100937.
<https://doi.org/10.1016/j.mtla.2020.100937>.
- Pradhan, S. Sandeep, Arun Padakandla, and Farhad Shirani. 2021. "An Algebraic and Probabilistic Framework for Network Information Theory." *Foundations and Trends in Communications and Information Theory* 18 (2): 173–379. <https://doi.org/10.1561/01000000083>.
- Shirzadifar, Alimohammad, Mohammadmehdi Maharlooei, Sreekala G. Bajwa, Peter G. Oduor, and John F. Nowatzki. 2020. "Mapping Crop Stand Count and Planting Uniformity Using High Resolution Imagery in a Maize Crop." *Biosystems Engineering* 200 (December). <https://doi.org/10.1016/j.biosystemseng.2020.10.013>.
- Svyantek, Andrej, Bulent Kose, John Stenger, Collin Auwarter, and Harlene Hatterman-Valenti. 2020. "Cold-Hardy Grape Cultivar Winter Injury and Trunk Re-Establishment Following Severe Weather Events in North Dakota." *Horticulturae* 6 (4): 75. <https://doi.org/10.3390/horticulturae6040075>.
- Wu, Xiang-Fa, and Oksana Zholobko. 2020. "Experimental Study of the Probabilistic Fatigue Residual Strength of a Carbon Fiber-Reinforced Polymer Matrix Composite." *Journal of Composites Science* 4 (4): 173.
<https://doi.org/10.3390/jcs4040173>.
- Zeng, Lan, Jingli Shao, and Xuefeng Chu. 2020. "Improved Hydrologic Modeling for Depression-Dominated Areas." *Journal of Hydrology* 590 (November): 125269. <https://doi.org/10.1016/j.jhydrol.2020.125269>.
- Zhang, Z., R. Lu, and C. Igathinathane. 2020. "A Time and Motion Study for Evaluation of Apple Harvest Processes with Different Harvest Methods." *Transactions of the ASABE* 63 (6): 1957–67.
<https://doi.org/10.13031/trans.14144>.
- Zhao, Muxin, Minwei Xu, Ewumbua Monono, Jiajia Rao, and Bingcan Chen. 2020. "Unlocking the Potential of Minimally Processed Corn Germ Oil and High Oleic Soybean Oil to Prepare Oleogels for Bakery Application." *Food & Function* 11 (12): 10329–40. <https://doi.org/10.1039/d0fo02451a>.

See your name on this list? Help us get the word out about your amazing work by submitting it as a **Breakthrough Alert**. [This online form](#) is an easy, step-by-step guide for summarizing published research for the general public.

College Happenings is distributed to the NDSU College of Engineering staff and faculty every other Tuesday.

Read past issues of *College Happenings* [here](#).

Deadline for submissions to *College Happenings* is 12:00 p.m. Fridays.

Contact kyle.bosch@ndsu.edu to submit items for *College Happenings*.

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