

New Projects in 2020-2021

Advanced Materials and Manufacturing for Cold Regions

- Faculty: **Nick Bruno**, Grant Crawford, Bharat Jasthi, David Salem, Forest Thompson
- Funding Source: US Army Corps of Engineers, Engineer Research and Development Center – Cold Regions Research and Engineering Laboratory
- Project Period: February 2021 – February 2026
- Budget: \$11,200,000

SD Governor's Research Center for Electrochemical Energy Storage

- Faculty: **Weibing Xing** (Director)
- Funding Source: South Dakota BOR
- Project Period: August 2021 – August 2026
- Budget: \$3,900,000

South Dakota Space Grant Consortium (SDSGC)

- Faculty: Ed Duke (PI), Tom Durkin (Co-PI), **Hadi Fekrmandi** (Senior Personnel)
- Funding Source: NASA
- Project Period: February 23, 2020 – February 22, 2024
- Budget: \$2,755,000

Adaptation: Empower through inclusivity: developing pathways to success

- Faculty: Lisa Kunza, **Andrea Surovek**, Laurie Anderson and Lance Roberts
- Funding Source: National Science Foundation
- Project Period: July 2021 – July 2024
- Budget: \$1,000,000

SD-FIRST: A program aimed to increase recruitment, retention, and success of first-generation students

- Faculty: **Cassandra Birrenkott** (PI); Co-PI's: Lisa Carlson, Jon Kellar, Michael West
- Funding Source: NSF DUE S-STEM Track 2: Design and Development (Single Institution)
- Project Period: January 2021 – December 2025
- Budget: \$988,819

NASA EPSCoR Major Research Grant – Advanced Soft-Magnetic Materials for Electrified Propulsion Systems

- Faculty: **Nick Bruno** (PI); Co-PI's: Grant Crawford, Ed Duke, Bharat Jasthi, Carter Kerk, Parashu Kharel, Todd Letcher, **Karim Muci**, Tula Paudel
- Funding Source: NASA EPSCoR
- Project Period: October 1, 2021 – September 29, 2024
- Budget: \$750,000

Driving Toward Innovation and Intellectual Diversity – Evidence-Based STEAM Program Development

- Faculty: John Kellar (PI); Co-PI's: **Cassandra Birrenkott**, Katrina Donovan, Michael West, Matthew Whitehead
- Funding Source: NSF DUE IUSE – Engaged Student Learning: Level 1
- Project Period: July 2020 – June 2023
- Budget: \$300,000

Materials and Processes for All Solid-State Batteries for Electric Aircraft: Multi-Dimensional Networked Antiperovskite Electrolytes for All Solid-State Batteries for Electric Aircraft

- Faculty: Edward Duke (PI); **Weibing Xing** (Co-PI)
- Funding Source: NASA
- Project Period: October 1, 2021 – September 30, 2022
- Budget: \$100,000

Next-Generation Energy Storage Research and Development

- Faculty: **Weibing Xing** (PI)
- Funding Source: ADA Technologies, Inc
- Project Period: October 6, 2020 – December 31, 2022
- Budget: \$70,000

Employing Experimental and Analytical Methods to Understand the Ultrasonic Spot Welding Process for Thermoplastic Polymers to Guide Joint Design

- Faculty: **Cassandra Birrenkott** (PI), Kaytie DeWitt (Student)
- Funding Source: NASA Space Technology Graduate Research Opportunities (NSTGRO)
- Project Period: August 2021 – August 2023
- Budget: \$68,924

Autonomous Guidance, Navigation, and Control for Lunar Surface Mobility Applications

- Faculty: **Hadi Fekrmandi**
- Funding Source: L3Harris
- Project Period: September 1, 2020 – September 1, 2021
- Budget: \$27,368

Real-time Machine Learning Based Sensors for Coal Dust and silica

- Faculty: **Prasoon Diwakar** (PI)
- Funding Source: NIOSH- MCOHS-ERC
- Project Period: October 2021 – October 2022
- Budget: \$20,000

Tinkering and Making as a Means to Engage Students Across a 1st Year Introduction to Mechanical Engineering course

- Faculty: **Micah Lande** (PI)
- Funding Source: KERN Family Foundation
- Project Period: September 1, 2021 – August 31, 2022
- Budget: \$10,000

Faculty Research Publications in 2020-2021

[Dr. Jason Ash](#)

- Patent
 - L. Kolb, C. R. Tolle, N. Williams, and J. Ash. Patent awarded for “Acoustic Resonance Chamber.” Patent #11,029,284: June 8, 2021.

[Dr. Cassandra Birrenkott](#)

- Conference Publications
 - Barkley, C.; **Birrenkott, C.M.** “Utilizing 3D Digital Image Correlation for Validation of Computational Models to Predict the Response of Thermoplastic Matrix Composite Lap Joints”. 2021 SEM Virtual Conference, June 14 to 17, 2021.
 - Lovett, M.; Bedillion, M.D.; **Birrenkott, C.M.**; Muci- K uchler, K.H. and Pottmeyer, L.O. “Building and Revising an Assessment to Measure Students’ Self-Efficacy in Systems Thinking”. 2021 ASEE Annual Conference and Exposition, Virtual Conference, July 26 to 29, 2021. Selected as the ASEE Systems Engineering Division’s (SED) Best Paper for the 2021 Conference.
 - Bedillion, M.D.; Muci- K uchler, K.H.; **Birrenkott, C.M.**; Lovett, M. and Pottmeyer, L.O. “A Combined Online Learning / In-Class Activity Approach to Teach Systems Thinking and Systems Engineering Skills to Freshman Engineering Students”. 2021 ASEE Annual Conference and Exposition, Virtual Conference, July 26 to 29, 2021.
 - **Birrenkott, C.M.**; Muci- K uchler, K.H.; Bedillion, M.D.; Lovett, M. and Pottmeyer, L.O. “Evaluation of Targeted Systems Thinking and Systems Engineering Assessments in a Freshmen-Level Mechanical Engineering Course”. 2021 ASEE Annual Conference and Exposition, Virtual Conference, July 26 to 29, 2021.
 - Barkley, K. M., **Birrenkott, C. M.**, Diwakar, P. “Temperature Evolution During the Ultrasonic Welding of Thermoplastics”. The Great Scientific Exchange (SciX) Annual Conference, September 26 – October 1, 2021, Providence, RI.

[Dr. Nickolaus Bruno](#)

- Peer-Reviewed Publications
 - **N.M. Bruno**, Ronald D. Noebe, Vladimir Keylin, Alex Leary, Grant Feichter, “Preliminary stress-annealing process and its effect on magnetic properties of Fe-based soft magnetic alloys”, NASA Technical Memorandum NASA/TM-20205006799 (2021).
 - **N.M. Bruno**, S. Yuce “On the instability of the giant direct magnetocaloric effect in CoMn_{0.915}Ge_{0.085} at.% metamagnetic compounds”, Sci. Rep. 10 (2020) 14211.

[Dr. Prasoon Diwakar](#)

- Conference Papers
 - **P.K. Diwakar** “Cold Atmospheric Micro Plasma: A Powerful Tool from Biomaterials to Biomedical Applications” SciX 2021, Providence, RI (Poster) Sep 2021
 - C. Leckband, S. Bheemasetti, V. Gadhamshetti, **P.K. Diwakar**, “Cold Atmospheric Plasma Induced Defects in 2-D Graphene: Pathway to Improved Functionalities.” SciX 2021, Providence, RI (Poster) Sep 2021
 - T. Machamer, H. Benson, **P.J. Diwakar**, “Laser Diagnostic Methods for Biofuel Analysis”, SciX 2021, Providence, RI (Poster) Sep 2021

- J. Gormley, **P.K. Diwakar**, “Mars Geological Classification Through an Intelligent Laser Based Spectroscopy System”, SciX 2021, Providence, RI (Poster) Sep 2021
- K. Barkley, **PK Diwakar**, C. Birrenkott, “Temperature Evolution during the Ultrasonic Welding of Thermoplastics” SciX 2021, Providence, RI (Poster) Sep 2021
- **P.K. Diwakar** “Tracing the provenance of minerals using advanced machine learning methods on LIBS spectra” SciX 2021, Providence, RI (Poster) Sep 2021
- T. Bright, K. Dewitt, **P.K. Diwakar** “Reactive Oxidative Species: How the Powerhouse of the Cell can be Infiltrated”, SciX 2020, Virtual
- N. Miller, **P.K. Diwakar**, Use of Ultra-Portable LIBS in an Underground Mining Environment, SciX 2020, Virtual
- Peer-Reviewed Publications
 - M. Hossen, **P.K. Diwakar**, & S. Ragi, (2021). Total nitrogen estimation in agricultural soils via aerial multispectral imaging and LIBS. Scientific Reports, 11(1), 1-11. Published

Dr. Hadi Fekrmandi

- Conference Papers
 - **Fekrmandi, H.**, Frye, A. J., Tamjidi, A., Rakoczy, J., & Hoover, R. C. (2021, March). Autonomous Multi-agent Systems Using SVGS Camera Sensor for Lunar Surface Mobility Applications. In 2021 IEEE Aerospace Conference (50100) (pp. 1-10). IEEE. DOI: 10.1109/AERO50100.2021.9438414
- Peer-Reviewed Publications
 - **H. Fekrmandi**, P. Hillard, and S. Rutan-Bedard, South Dakota Board of Regents, 2021. Modular robotic crawler with hybrid locomotion for inspection of small diameter pipe. U.S. Patent Application 16/953,237
 - **H. Fekrmandi**, Swarm of autonomous multi agent robots using Smart phone video guidance dance camera sensor guidance, navigation, and control and lunar surface mobility applications.
 - Yaser Banadaki, Nariman Razaviarab, **Hadi Fekrmandi**, Safura Sharifi, “Toward enabling a reliable quality monitoring system for additive manufacturing process using deep convolutional neural networks”
- Presentations
 - **H. Fekrmandi**, A. Frye, M. Tatge. A. Tamjidi, M. Renken. “A Novel Hybrid Method for Self-Localization and Intelligent Maneuvering (SLIM) of Autonomous Underwater Vehicles (AUVs)” in Workshop on Naval Applications of Machine Learning (NAML2021), NIWC Pacific (Point Loma), Virtual, March 23-25, 2021.

Dr. Micah Lande

- Conference Publications
 - Mycala Read & **Micah Lande** (2021, July). Appraising Student Design Learning: Comparing Design Processes of First-year and Senior-year Engineering Students. American Society for Engineering Education (Virtual) Annual Conference. Education & Research Methods division. <https://peer.asee.org/36696>.
 - Jarod White & **Micah Lande** (2021, July). Investigating How Mechanical Engineering Students Design and Make the Now and the Future. American Society for Engineering Education (Virtual) Annual Conference. Design in Engineering Education Division. <https://peer.asee.org/37394>.
 - **Micah Lande** (2021, July). Learning Trajectories Through Learning Making and Engineering, and Implications. American Society for Engineering Education (Virtual) Annual Conference. NSF Grantees Session. <https://peer.asee.org/37432>.

- Presentations
 - **Micah Lande** (2021). How might we welcome tinkering as a means to learn to build, create, and learn in engineering education? Rocky Mountain Section (virtual) conference, American Society for Engineering Education.
 - **Micah Lande**, panelist (2021). Makerspaces on Campus: A Discussion With Makerspace Managers From Colleges and Universities. Make: Magazine (virtual).
 - **Micah Lande**, (2021). Tinkering to Learn Engineering. Clive L. Dym Design (virtual) Workshop, Harvey Mudd College.

[Dr. Pierre Larochelle](#)

- Conference Publication
 - **Larochelle, P.**, “Interactive Visualization of Spherical Triangles”, Proceedings of the 2021 CCToMM Symposium on Mechanisms, Machines, and Mechatronics, Oshawa, Ontario, June 3-4, 2021.
- Journal Publication
 - **Larochelle, P.** and Mao, X., “SphereWalker: A Hexapod Walking Machine”, ASME Journal of Autonomous Vehicles and Systems, 2020. DOI: 10.1115/1.4048483.

[Dr. Karim Muci](#)

- Conference Publications
 - Lovett, M.; Bedillion, M.D.; Birrenkott, C.M.; **Muci- K uchler, K.H.** and Pottmeyer, L.O. “Building and Revising an Assessment to Measure Students’ Self-Efficacy in Systems Thinking”. 2021 ASEE Annual Conference and Exposition, Virtual Conference, July 26 to 29, 2021. Selected as the ASEE Systems Engineering Division’s (SED) Best Paper for the 2021 Conference.
 - Bedillion, M.D.; **Muci- K uchler, K.H.**; Birrenkott, C.M.; Lovett, M. and Pottmeyer, L.O. “A Combined Online Learning / In-Class Activity Approach to Teach Systems Thinking and Systems Engineering Skills to Freshman Engineering Students”. 2021 ASEE Annual Conference and Exposition, Virtual Conference, July 26 to 29, 2021.
 - Birrenkott, C.M.; **Muci- K uchler, K.H.**; Bedillion, M.D.; Lovett, M. and Pottmeyer, L.O. “Evaluation of Targeted Systems Thinking and Systems Engineering Assessments in a Freshmen-Level Mechanical Engineering Course”. 2021 ASEE Annual Conference and Exposition, Virtual Conference, July 26 to 29, 2021.
 - Frybarger, M.R. and **Muci-K uchler, K.H.** "Distribution of Bacterial Contamination in Partial Penetration Surrogate Ballistic Wounds". 2020 ASME International Mechanical Engineering Congress & Exposition (IMECE 2020), Virtual Conference, November 16-19, 2020. ASME Paper IMECE2020-23897.

[Dr. Khosro Shahbazi](#)

- Journal Publications
 - **Khosro Shahbazi**, Analytical temperature profiles for laser-irradiated gold nanorod immersed in an optically non-absorbing medium, International Journal of Heat and Mass Transfer, 179 (2021) 121707 (17 pages).
 - **Khosro Shahbazi**, Positivity-preservation of a first-order scheme applied to quasi-conservative compressible two-material model, SIAM Journal on Scientific Computing, 43(2021) B1029–B1055 (27 pages)

Dr. Andrea Surovek

- Journal Publication
 - Akinci-Ceylan, S., Cetin, K. S., Ahn, B., **Surovek, A.**, & Cetin, B. (2022). Investigating Problem-Solving Processes of Students, Faculty, and Practicing Engineers in Civil Engineering. *Journal of Civil Engineering Education*, 148(1), 04021014. <https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29EI.2643-9115.0000054>
 - Liebl, A. L., Rowland, P., Kiesow, A., Podhradsky, A., Redlin, M., Gaiani, M., Eduful J., **Surovek A.**, & Emery, M. (2021). Salaries in Higher Education Systems: A System-wide Perspective on Career Advancement and Gender Equity. *ADVANCE Journal*, 26007. <https://www.advancejournal.org/article/26007>
- Video Showcase
 - NSF / TERC 2021 STEM for all Video Showcase, COVID, Equity and Social Justice, May 11-18 2021, <https://stemforall2021.videohall.com/presentations/2254> “Equity for STEM Faculty through policy change” Redlin, M., **Surovek, A.** Anderson, C., Emery, M., Liebl., A., Kieslow, A. and Rowland. P

Dr. Weibing Xing

- Patent
 - **Weibing Xing**, “High Energy/Power Density, Long Cycle Life, Safe Li-Ion Battery Capable of Long-Term Deep Discharge/Storage Near Zero Volt and Method of Making and Using the Same”, U.S. Patent No. US 11,024,846 B2, June 1, 2021.
 - Weibing Xing, "5V High Voltage Lithium Battery", U.S. Provisional Patent No. 63/008,517, April 10, 2020.
- Conference Publication
 - **Weibing Xing**, Abstract # A01-0054: “Lithium-Sulfur Batteries with Robust Cycle Life for Space Applications”, 240th Electrochemical Society Meeting, Orlando, FL, Oct 10 – 14, 2021.

Faculty & Student Awards and Honors in 2020-2021

- **Dr. Jason Ash** received the James and Connie Green CAMP Faculty Award on April 28, 2021, which included a plaque and a \$1,200 honorarium. Dr. Ash was selected by the CAMP team leads in collaboration with CARA.
- Drs. Mark Bedillion, **Cassandra Birrenkott**, Marsha Lovett, **Karim Muci** and L.O. Pottermeyer wrote “Building and Revising an Assessment to Measure Students’ Self-Efficacy in Systems Thinking,” which was selected as Best Paper for the ASEE Systems Engineering Division (SED) for the 2021 ASEE Conference.
- **Dr. Prasoon Diwakar** received a DoE Visiting Faculty Fellowship Award at Pacific Northwest National Laboratory from May to August 2021.
- **Dr. Micah Lande** was named “Community catalyst” for the KEEN Engineering Unleashed engineering & entrepreneurship online community to support and evangelize entrepreneurship activities across engineering education.
- **Dr. Micah Lande** was appointed Vice-Chair for Publications for the Engineering & Research Methods division of the American Society for Engineering Education.
- **Dr. Micah Lande** was named a 2021 Engineering Unleashed Fellow for the KEEN Foundation. According to the Foundation, “the Fellows, who were selected by their peers, are being recognized for their contribution to engineering education, and specifically entrepreneurial engineering.”
- **Student Awards**
 - ME graduate student Kaytie Barkley, advised by Dr. Cassandra Birrenkott, won a prestigious Space Technology Graduate Research Opportunity.
 - ME graduate student, James Gormley, advised by Dr. Prasoon Diwakar, won a \$5,000 stipend from NASA.
 - ME junior Ian Helgeson received an Outstanding Student Organization Member award for the Society of Physics Students at the 2021 Leadership Hall of Fame.
 - ME senior Blake Hyla received an Outstanding Student Organization Member award for Moonrockers at the 2021 Leadership Hall of Fame.
 - ME graduate student Strauss Langrud was awarded a DOE internship under the DOE Office of Energy Efficiency and Renewable Energy’s Energy Storage Internship Program in Summer 2021. He worked with researchers at the National Renewable Energy Lab (NREL) on battery research and continues the work with a goal of publishing a paper in a scientific journal.
 - MS mechanical engineering student Christian Leckband, advised by Dr. Prasoon Diwakar, won the Best Poster award for the Society for Applied Spectroscopy at SCIX 2021 in Providence, RI.
 - Samuel Ryckman, ME senior, received the 2021 ASME Melvin R. Green Scholarship for \$8,000 based on his demonstrated leadership, scholastic ability, potential contribution to the mechanical engineering profession and financial need.