

New Projects in 2021-2022

Advanced Materials and Manufacturing for Cold Regions

- Faculty: **Nick Bruno (PI)**, Grant Crawford (PI), Bharat Jasthi (Co-PI), David Salem (Co-PI), Forest Thompson (Co-PI)
- 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

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

- Faculty: **Nick Bruno (Sc-PI)**; Co-PI's: Grant Crawford, Ed Duke (Admin PI), 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

Investigating the Impact of Arts on Student Learning by Introducing Glass Science in the Materials Engineering Curriculum

- Faculty: Jon Kellar (PI), Michael West, **Cassandra Birrenkott**, Katrina Walker, Matthew Whitehead (co-PIs)
- Funding Source: NSF Improving Undergraduate STEM Education (IUSE)
- Project Period: August 2021 – July 2024
- Budget: \$300,000

Bringing the Entrepreneurial Mindset to South Dakota Mines

- Faculty: **Pierre Larochelle**
- Funding Source: Kern Family Foundation
- Project Period: October 1, 2022-2026
- Budget: \$200,000

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

- Faculty: **Cassandra Birrenkott (PI)**, Student: Kaytie Barkley
- Funding Source: NASA Space Technology Graduate Research Opportunities (NSTGRO)
- Project Period: Year 1, August 2021 – July 2022
- Project Period: Year 2, August 2022 – January 2023
- Budget: Year 1, \$68,924
- Budget: Year 2, \$38,400

Real-Time Sensing and Measurement of Soil Quality Using Machine Learning Assisted Spectroscopy Techniques

- Faculty: **Prasoon Diwakar (PI)**
- Funding Source: SDBoR
- Project Period: August 22, 2022-August 21, 2023
- Budget: \$75,000

Development of a Nanostructured High Specific Energy Lithium Ion Battery – Phase I Option

- Faculty: **Weibing Xing**
- Funding Source: Navy STTR – subcontractor to Lynntech
- Project Period: October 2022 (6 months)
- Budget: \$29,000

Tinkering and Making to Engage Students in an Introductory Mechanical Engineering Course

- Faculty: Micah Lande
- Funding Source: Kern Family Foundation
- Project Period: September 2021 – 2022
- Budget: \$10,000

Modeling thin water film encapsulating and oil droplet as an Extended Dividing Hypersurface

- Faculty: Joseph John Thalakkottor
- Funding Source: Nelson Research Grant of South Dakota Mines
- Project Period: July 1, 2022 – June 30, 2023
- Budget: \$3,750

Material Engineering of Flexible High Energy Density Lithium-Sulfur Batteries

- Faculty: Weibing Xing
- Funding Source: Nelson Research Grant of South Dakota Mines
- Project Period: July 1, 2022 – June 30, 2023
- Budget: \$3,750

Fluid experiments for improved understanding of fluid mechanics concepts

- Faculty: Joseph John Thalakkottor
- Funding Source: South Dakota Mines Faculty Development Microgrant
- Project Period: Spring 2022
- Budget: \$750

Faculty Research Publications in 2021-2022

[Dr. Nickolaus Bruno](#)

- Peer-Reviewed Publications
 - O. Yildirim, S. Yuce, **N.M. Bruno**, E.K. Dogan, H. Yurtseven, E. Duman, and B. Emre, “Investigation of the complex magnetic behavior of Ni_{46.86}Co_{2.91}Mn_{38.17}Sn_{12.06} (at. %) magnetic shape memory alloy at low temperatures”, [Physica Scripta 97 \(2022\) 085806](#).
 - **N.M. Bruno**, Matt R. Phillips, “An analytical approach for computing the coefficient of refrigeration performance in giant inverse magnetocaloric materials”, [Magnetism 2 \(2022\) 10-30](#).

[Dr. Cassandra Birrenkott](#)

- Peer-Reviewed Publications
 - **Birrenkott, C.M.**, Jensen, A., Kellar, J.J., West, M., Carlson, L., Herrera, J., Moore, M. (2022). First-generation student success and the SD-FIRST program, 2022 ASEE Annual Conference and Exposition, Minneapolis, MN, June 28 – 29, 2022.
 - Donovan, K., Kellar, J.J., West, M., **Birrenkott, C.M.**, Kellogg, S.D., Mitchell, D., Whitehead, M. (2022). Investigating the Impact of Arts on Student Learning by Introducing Glass Science in the Materials Engineering Curriculum, 2022 ASEE Annual Conference and Exposition, Minneapolis, MN, June 28 – 29, 2022.
 - Barkley, K., **Birrenkott, C.M.**, Diwakar, P., Arner, J. (2022) Experimental Methods to Understand the Ultrasonic Spot Welding Process for Thermoplastic Polymers, 2022 SEM Annual Conference and Exposition on Experimental and Applied Mechanics, Pittsburg, PA, June 13-16, 2022.
 - Barkley, K. M., **Birrenkott, C. M.**, Diwakar, P. “Temperature Evolution During the Ultrasonic Welding of Thermoplastics”. The Great Scientific Exchange (SciX) Annual Conference, Providence, RI, September 26 – October 1, 2021.

[Dr. Prasoon Diwakar](#)

- Journal Publications
 - C. Tohm*, T. Bheemasetti, **P.K. Diwakar**, Review of Spectroscopy Methods for Characterization of Energy Resource Site, Energy Geoscience 3.2 (2022): 147-159
 - E. J. Kautz , M. C. Phillips, **P. K. Diwakar**, A. Zelenyuk, S. S. Harilal, Comparing the kinetics of ionized and neutral atoms from single and multi-element laser-produced plasmas. IEEE Transactions on Plasma science, Under Revision.
- Conference Publications
 - B.K. Jasthi, James. Tomich, P. Tukkaraja, **P. Diwakar**, G. Ustunisik, and M. J. Dietz*. Rock Breaking Techniques using High Concentrated Energy Sources for Space Mining Applications. ASCE Earth and Space 2022, Apr 2022, Denver CO.
 - **P.K. Diwakar**, Real-time Machine Learning Based LIBS Sensors for Aerosol and Particulate matter, SCIX 2022, Covington, KY Oct 2022
 - **P.K. Diwakar**, Using LIBS to Characterize High Entropy Alloys for Extreme Environments, Covington, KY Oct 2022
 - 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** “Cold Atmospheric Micro Plasma: A Powerful Tool From Biomaterials to Biomedical Applications”
- **P.K. Diwakar** “Tracing the provenance of minerals using advanced machine learning methods on LIBS spectra”

Dr. Joseph John Thalakkottor

- Conference Publications
 - **J. J. Thalakkottor**, “Extending the thermal slip boundary condition at the solid-fluid interface”, *IEEE ITherm conference*, Orlando, FL, May 30th – 2nd June, 2023 (Accepted).
 - **J.J. Thalakkottor** and A. C. DeVoria, “Modeling a shock front as an extended dividing hypersurface”, *AIAA Scitech*, National Harbor, MD, 23-27 January, 2023 (Accepted).
 - **J.J. Thalakkottor** and K. Mohseni, “Unified approach in modeling kinematics and dynamics of fluid and flow discontinuities”, *34th ONR Symposium on Naval Hydrodynamics*, Washington, DC, June 26th – 1st July, 2022 (in press)
 - **J. J. Thalakkottor**, “Extending the thermal slip boundary condition at the solid-fluid interface”, *IEEE ITherm conference*, San Diego, CA, May 26th - 1st June, 2022. (published)

Dr. Micah Lande

- Conference papers
 - Goldsmith, M. & **Lande, M.** (2022, June), Experiences in Creativity and Design as Antecedents to Success and Comfort with Design in College Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. <https://peer.asee.org/42066>
 - White, J. & **Lande, M.** (2022, June), Producibility and Future Artifacts: Students Considering Manufacturing Lightsabers, Magic Wands, and Other Fantastical Products Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. <https://peer.asee.org/41644>
 - Machamer, T. & **Lande, M.** (2022, June), What is Cool Stuff? Exploring Engineering Students’ Motivation to Be Excited About Their School Activities Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. <https://peer.asee.org/41649>
 - Larson, A., Alumbaugh, B. & **Lande, M.** (2022, June), Making Learning Goals More Apparent Across the Curriculum for Mechanical Engineering Fundamentals and Depth Courses Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. <https://peer.asee.org/41646>
- Book Chapter
 - Sheppard, S.D., Chen, H.L., Toye, G., Bunk, T., Elfiki, N., Kempf, F., Lamprecht, J. L., & **Lande, M.** (2022). Decades of Alumni: Designing a Study on the Long-Term Impact of Design Education. In: Meinel, C., Leifer, L. (eds) Design Thinking Research. Understanding Innovation. Springer, Cham. pp 247–269. https://doi.org/10.1007/978-3-031-09297-8_13

Dr. Pierre Larochelle

- Conference Publications
 - **Larochelle, P.** and McCarthy, J.M., editors, Proceedings of the 2022 USCToMM Symposium on Mechanical Systems and Robotics (MSR 2022), Rapid City, SD, May 19–21, 2022. ISBN 978-3-030-99825-7. <https://link.springer.com/book/9783030998257> DOI: 10.1007/978-3-030-99826-4.
 - **Larochelle, P.**, “Synthesis of Watt II Six-Bars for Simultaneous Pick and Place Tasks with Guiding Positions”, in Larochelle, P. and McCarthy, J.M. (editors), Proceedings of the 2022 USCToMM Symposium on Mechanical Systems and Robotics, 2022. ISBN: 978-3-030-99825-7. DOI: 10.1007/978-3-030-99826-4 23.
 - **Larochelle, P.**, “Synthesis of Watt II Six Bars for Simultaneous Pick and Place Tasks with Guiding Positions”, Proceedings of the 2022 USCToMM Symposium on Mechanical Systems and Robotics (MSR 2022), Rapid City, South Dakota, May 19–21, 2022.
 - **Larochelle, P.**, “Interactive Visualization of Spatial Triangles”, Proceedings of the 2022 ASME International Design Engineering Technical Conferences, St. Louis, Missouri, August 14–17, 2022. Paper # DETC2022-90056. ASME Press.
 - **Larochelle, P.**, “Interactive Visualization of Spherical Triangles”, Proceedings of the 2021 CCToMM Symposium on Mechanisms, Machines, and Mechatronics, Oshawa, Ontario, June 3–4, 2021.

Dr. Albert Romkes

- Journal Publication
 - Bernardo Moreno Baqueiro Sansao, William M. Cross, **Albert Romkes**, and Jon J. Kellar. Influence of substrate roughness on particle adhesion and concentration. *Mining, Metallurgy & Exploration*. Vol. 39(1), 3-12, 2022. <https://doi.org/10.1007/s42461-021-00521-9>

Dr. Weibing Xing

- Conference Publications
 - Christopher Poches, Amir Abdul Razzaq, Haiden Studer, Xuguang Li, Krzysztof Pupek, and **Weibing Xing**, Abstract# A03-0188, "High Voltage Electrolytes to Stabilize Ni-Rich Lithium Battery Performance", 242nd The Electrochemical Society Meeting, Atlanta, GA, USA, Oct 9-13, 2022.
 - Strauss Langrud, F. B., Ryan Brow, Shriram Santhanagopalan, and **Weibing Xing**, Abstract# A01-0115, "In-Situ Raman Spectroscopy of Lithium-Sulfur Cells", 241st The Electrochemical Society Meeting, Vancouver, BC, Canada, May 29 – June 2, 2022.
- Journal Publication
 - Langrud, S.; Razzaq, A. A.; Santhanagopalan, S.; Brow, R.; **Xing, W.** "Comprehensive Characterization of Multi-Phase Sulfurized Polyacrylonitrile Cathodes for Lithium-Sulfur Batteries". *Journal of The Electrochemical Society* 2022, 169 (7), 070514. DOI: 10.1149/1945-7111/ac7bb0.
- Book Contribution
 - **Xing, W.**; Snyder, A.; Strauss, L.; Abata, D. Problems of Lithium Dendrite Formation in Solid-State Batteries. In *Green Sustainable Process for Chemical and Environmental Engineering and Science: Solid-State Energy Storage - A Path to Environmental Sustainability*, 1st ed.; Alevtina Smirnova, A. N.-A.-M., Dr. Inamuddin Ed.; Elsevier, 2022; p 462. ISBN: 9780323906357.

Faculty & Student Awards and Honors in 2021-2022

- **Dr. Jason Ash** received the [ASME Dedicated Service Award](#) in 2021.
- **Dr. Micah Lande** was selected as one of nine [2022 Sutton Leaders](#).
- **Dr. Micah Lande** was selected as the board chair for the [Museum Alliance of Rapid City](#) (the Journey Museum and Learning Center).
- **Dr. Micah Lande** co-authored a paper with master's student **Thomas Machamer**, "What is Cool Stuff? Exploring Engineering Students' Motivation to Be Excited About Their School Activities," which was recognized as honorable mention for best paper in the Multidisciplinary Division at the American Society for Engineering Education annual conference, June 2022.
- **Student Awards**
 - **Nana Adoo**, MES PhD student advised by **Dr. Nickolaus Bruno**, won a WAIIME Scholarship from the Society for Mining, Metallurgy & Exploration.
 - **Terrence Kuca**, ME PhD student advised by **Dr. Prasoon Diwakar**, received an ORISE Summer Fellowship at CDC NIOSH Cincinnati.
 - **Christian Leckband**, MS ME student advised by **Dr. Prasoon Diwakar**, won the Best Society for Applied Spectroscopy Student Poster award at the SciX 2021 conference.
 - **Armand Lennard**, **Dr. Nickolaus Bruno**'s undergraduate researcher and the president of the South Dakota Mines' Pi Tau Sigma Honors Society received the Jody Page Leadership scholarship and a C.H.A.D. award this past year.
 - **Philip Litecky**, ME undergraduate, won second place at DSU's Business Competition.
 - **Bennet Outland**, ME undergraduate, was awarded a SMART scholarship.
 - **Nicholas Pugh**, ME PhD student advised by **Dr. Prasoon Diwakar**, received an ORISE Summer Fellowship at CDC NIOSH Cincinnati.
 - **Kaleb Roth**, ME undergraduate, received a 2022 Braun Student Inventor Award, as well as won first place at DSU's Business Competition and second place at USD's Beacom School of Business i2i Business Model Competition.
 - **Margaret Thompson**, ME MS student advised by **Dr. Prasoon Diwakar**, received a NASA Space Grant award for \$5,000 for Academic Year 2022-2023 on the topic "Machine Learning Assisted Laser Ablation- Laser Induced Breakdown Spectroscopy (MALA-LIBS) for Extraction and Characterization of Lunar and Martian Regolith Materials."