New Projects in 2022-2023

RII Track-2 FEC: Center for Climate-Conscious Agricultural Technologies (CCAT)

- Faculty: Srinivas Janaswamy (PI, SDSU), Co-PI's: **Prasoon Diwakar** and Febina Mathew (SDSU)
- Funding Source: National Science Foundation's EPSCoR Program
- Project Period: August 1, 2023 – July 31, 2027
- Budget: $4,000,000

High Specific Energy Lithium-Ion Battery with Carbon-Based Nanostructures

- Faculty: Weibing Xing
- Funding Source: Lynntech/Navy STTR Phase II
- Budget: $1,300,000

A Scalable, High Energy Density Lithium-Sulfur Battery

- Faculty: Weibing Xing (PI)
- Funding Source: NASA EPSCoR
- Project Period: August 22, 2023 – August 21, 2024
- Budget: $750,000

Bringing the Entrepreneurial Mindset to South Dakota Mines

- Faculty: Pierre Larochelle (PI)
- Funding Source: The Kern Entrepreneurial Engineering Network (KEEN)
- Project Period: July 1, 2022 – June 30, 2026
- Budget: $200,000

A Flipped Classroom Strategy to Teach Systems Thinking to Engineering Students

- Faculty: Cassandra Birrenkott (Mines PI), Micah Lande (Mines Co-PI)
- Funding Source: Office of Naval Research (sub-award via Texas State University)
- Project Period: June 1, 2023 – May 31, 2026
- Budget: $141,130

High Energy Density, Long Cycle Life Lithium-Sulfur Batteries

- Faculty: Weibing Xing (Co-PI)
- Funding Source: SDBOR
- Project Period: July 31, 2023 – August 30, 2024
- Budget: $82,113

Next-Generation Energy Storage Research and Development

- Faculty: Weibing Xing (PI)
- Funding Source: ADA Technologies
- Project Period: July 1, 2020 – December 31, 2024
- Budget: $70,000

ELviS: Engineered Living metaSurface, for biofouling

- Faculty: Joseph John Thalakkottor (PI)
- Funding Source: National Science Foundation
- Project Period: October 2023 – September 2024
- Budget: $50,000

High-Performance Solid-State Lithium-Sulfur Batteries

- Faculty: Weibing Xing (Co-PI)
- Funding Source: Governor's Research Center – CEES
- Budget: $42,000

Kern Entrepreneurial Engineering Network (KEEN) Partner Support Package

- Faculty: Pierre Larochelle (PI), Micah Lande (Co-PI)
- Funding Source: Kern Family Foundation
- Project Period: July 2023 – June 2024
- Budget: $25,000

Advancing STEM Learning through Research Laboratories in Schools

- Faculty: Prasoon Diwakar (PI)
- Funding Source: National Science Foundation Vital
- Project Period: August 7, 2023 – October 16, 2023
- Budget: $20,000

Reviving the supersonic wind tunnel for study of super- sonic flows

- Faculty: Joseph John Thalakkottor (PI)
- Funding Source: SD Space Grant Consortium - Project Innovation Grant
- Project Period: February 23, 2023 – February 22, 2024
- Budget: $9,127

Faculty Research Publications in 2022-2023

Dr. Prasoon Diwakar

- Ciniglia, D., F. Migliorini, R. Dondè, **P. Diwakar**, and S. De Iuliis. "sLoading effect of matrix compounds in aerosol LIBS measurements." *Spectrochimica Acta Part B: Atomic Spectroscopy* (2023): 106784.
- Barkley, Kaytie M., Jaden S. Arner, Timothy A. Pike, **Prasoon Diwakar**, and **Cassandra M. Birrenkott**. "Correlation of surface and interfacial temperature during differential ultrasonic spot welding." *Journal of Advanced Joining Processes,* Volume 7 (2023): 100142.
- Kautz, Elizabeth J., Mark C. Phillips, **Prasoon K. Diwakar**, Alla Zelenyuk, and Sivanandan S. Harilal. "Comparing the kinetics of ionized and neutral atoms from single and multi-element laser-produced plasmas." *Physics of Plasmas,* Volume 30, no. 5 (2023).
- Hoops, Jordan, Kristen I. Haller, Mikaya M. Elliott, Rylie N. Andrews, Nicole Miller, Timothy Brenza, and **Prasoon K. Diwakar**. "Electroporation and Cold Atmospheric Plasma as a Novel Cancer Treatment." In 2022 AIChE Annual Meeting. AIChE, 2022.
- **Prasoon K. Diwakar**, Pramod Kulkarni, Nicholas E. Pugh, Margaret Thompson. “Realtime Machine Learning Based LIBS Sensors for Aerosol and Particulate matter”, SCIX 2022, Covington, KY, Oct 2-7, 2022.
- **Prasoon K. Diwakar**, Bharat Jasthi, Nicholas E. Pugh “Using LIBS to Characterize High Entropy Alloys for Extreme Environments”, SCIX 2022, Covington, KY, Oct 2-7, 2022.

Dr. Joseph John Thalakkottor

- **Joseph J Thalakkottor** and Adam C DeVoria, Modeling a shock front as an extended dividing hypersurface, AIAA 2023-2481, AIAA SciTech 2023 Forum, 23-27 January 2023, National Harbor, MD
- **Joseph J Thalakkottor**, Understanding and modeling the internal dynamics of an interface in reference to bubble dynamics, L09.00003, APS DFD, 20-22 November 2022, Indianapolis, Indiana.

Dr. Micah Lande

- Sever Gilbertson & **Micah Lande** (2023). Making Spaces to Supporting Formal, Informal, and Nonformal Learning Spanning a University’s Design and Makerspace Learning Ecology. American Society for Engineering Education annual conference. Baltimore, MD.
- Felix Kempf, Nada Elfiki, Aya Mouallem, Helen L. Chen, George Toye, **Micah Lande**, Kei Hysi, Xiao Ge & Sheri D. Sheppard (2023). The Nexus of Entrepreneurship and Innovation–a new approach to looking at the creative contributions of engineering graduates. American Society for Engineering Education annual conference. Baltimore, MD.
- **Micah Lande** (2023). Learning through PBL with Emphasis of People, Process, and Product Across Courses. American Society for Engineering Education annual conference. Baltimore, MD.
- Katherine Mathieu, **Micah Lande** & Karim Muci (2023). Adopting a Common Product Design Process Across the Undergraduate Mechanical Engineering Curriculum. American Society for Engineering Education annual conference. Baltimore, MD.
- David Prohofsky & **Micah Lande** (2023). Roles for Take Home Exams from the Perspective of Students and Instructors. American Society for Engineering Education annual conference. Baltimore, MD.

- Sommer Scott & **Micah Lande** (2023). Mapping Skill Recognition and Development of Undergraduate Mechanical Engineering Students for the Automotive Industry. American Society for Engineering Education annual conference. Baltimore, MD.
- Sheri D. Sheppard, Helen L. Chen, George Toye, Aya Mouallem, **Micah Lande**, Lauren Shluzas, Timo Bunk, Nada Elfiki, Johannes J.L. Lamprecht, Katharina Prantl. (2023). Decades of Alumni: Perspectives on the impact of project-based learning on career pathways and implications for design education. In Design Thinking Research. Cham: Springer International Publishing.
- **Micah Lande** (2023). Learning through PBL with Emphasis of People, Process, and Product Across Multi-Disciplinary Courses. Dym Mudd Design Workshop XIII. Claremont, CA.
- Sheppard, Sheri D., Helen L. Chen, George Toye, Timo Bunk, Nada Elfiki, Felix Kempf, J. L. Lamprecht, and **Micah Lande**. (2022). Decades of Alumni: Designing a Study on the Long-Term Impact of Design Education. In Design Thinking Research: Achieving Real Innovation (pp. 247-269). Cham: Springer International Publishing.

Dr. Pierre Larochelle

- **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.**, “Interactive Visualization of Spatial Triangles”, Proceedings of the 2022 ASME International Design Engineering Technical Conferences, St. Louis, Missouri, August 14–17, 2022. Paper # DETC2017-68144. ASME Press. DOI: 10.1115/DETC2022-90056.

Dr. Weibing Xing

- Publications
  - Poches, C.; Razzaq, A. A.; Studer, H.; Ogilvie, R.; Lama, B.; Paudel, T. R.; Li, X.; Pupek, K.; **Xing, W**. "Fluorinated High-Voltage Electrolytes to Stabilize Nickel-Rich Lithium Batteries". ACS Applied Materials & Interfaces 2023, 15 (37), 43648-43655. DOI: 10.1021/acsami.3c06586.
  - Lou, D.; Chen, S.; Langrud, S.; Razzaq, A. A.; Mao, M.; Younes, H.; **Xing, W.**; Lin, T.; Hong, H. "Scalable Fabrication of Si-Graphene Composite as Anode for Li-ion Batteries". Applied Sciences 2022, 12 (21), 10926. DOI: https://doi.org/10.3390/app122110926.
- Conference presentations
  - **Weibing Xing**, Md Wahidul Hasan, Amir Abdul Razzaq, Gulam Smdani, Khang Huynh, Rajesh Shende, and Tula Paudel, Abstract #A01-0099, “A Novel Approach for the Development of a Scalable, High Energy Density, and Long Life Lithium-Sulfur Battery Technology”, 244th ECS Meeting, Gothenburg, Sweden, Oct 8 – 12, 2023.
  - Md Wahidul Hasan, Khang Huynh, Amir Abdul Razzaq, Gulam Sumdani, Rajesh Shende, Tula Paudel and **Weibing Xing**, Abstract #A01-0417, “An Effective Polysulfide Trapping Strategy for the Development of a Scalable, High Energy Density Lithium-Sulfur Battery”, 243rd ECS Meeting, Boston, MA, May 28 – June 2, 2023.

- **Weibing Xing**, Wahid Hasan, Khang Hyynh, Amir Razzaq, Gulam Smdani, Rajesh Shende, and Tula Paudel, “Scalable, High Energy Density Lithium-Sulfur Batteries”, NASA Aerospace Battery Workshop, Huntsville, AL, USA, Nov 15-17, 2022.
  https://www.nasa.gov/sites/default/files/atoms/files/nabw22_nasa_battery_workshop_2022_weibing_xing_public.pdf
- 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 ECS Meeting, Atlanta, GA, USA, Oct 9-13, 2022.

- Patent applications
  - **Weibing Xing**, Amir Abdul Razzaq, Christopher Poches, Regan Ogilvie, and Haiden Studer, “High voltage lithium batteries comprising a nickel-rich cathode and fluorinated electrolyte”, U.S. Provisional Patent Application No. US 63/511,797, July 3, 2023.

Faculty & Student Awards and Honors in 2022-2023

- **Dr. Cassandra Birrenkott** earned a spot in the 2023-24 cohort of the Executive Leadership in Academic Technology, Engineering, and Science (ELATES) program.
- **Drs. Micah Lande** and **Weibing Xing** were recognized by the Office of Faculty Development & Advancement at South Dakota Mines for their exceptional dedication to mentoring fellow faculty members.
- **Dr. Pierre Larochelle** was Elected to serve as chair of ASME's Committee on Engineering Education (CEE) (2024 – 2027). The CEE is responsible for promoting high quality ME and MET educational programs. Specifically, the CEE advances effective accreditation processes for ME and MET programs, and, supports ME and MET education leaders with networking and professional development opportunities.
- **Dr. Daniel Rederth** has received the 2023 James and Connie Green CAMP Faculty Award.
- **Student Awards**
    - Under **Dr. Joseph John Thalakkottor's** guidance, **Melissa May, Kade Schroeder,** and **Conrad Thorman** won first place in the Undergraduate Poster Presentation at the 13th Annual South Dakota Mines Student Research Symposium.
    - ME junior **Gretchen Noble** secured the DoD SMART Scholarship.