EPSCoR NEVADA HIGHLIGHTS

FALL 2020

NSF EPSCoR

VIRTUAL NSHE MENTORING INSTITUTE

The NSHE Sponsored Programs Office & EPSCoR, in partnership with the Council on Undergraduate Research (CUR) hosted The Mentoring Institute: Growing Leadership & Support for STEM Research within NSHE, an intensive virtual workshop series, during the month of October. The mission of the Institute was to serve as a catalyst for future research mentor workshops, that include professional development training and collaboration building retreats to provide mentoring support and resources within Nevada's higher education system. Institute participants included senior and mid-level administrators, faculty and students representatives from all NSHE institutions.

Led by CUR research mentor experts, Institute sessions were held once a week during the month of October. Sessions served to help institutions define and begin planning to build inclusive and intentional research mentoring programs and determine how to prioritize the goals to foster stronger mentor communities. CUR also hosted individual breakout sessions, allowing NSHE institutions to discuss and plan for more support for mentoring on their campuses.

Final follow up sessions will take place with NSHE institutions January 2021. The results will serve to inform future NSHE-sponsored institutes for research mentoring. For more information, contact Michele Casella, NSF EPSCoR Education, Outreach and Diversity Administrator, mcasella@nshe.nevada.edu.

ENGAGING STUDENTS IN STEM WITH HANDS-ON EXPERIENCES

The College of Engineering's Educational Outreach Programs at the University of Nevada, Reno (UNR) received supplemental funds from the Solar Nexus project during Fall 2020 to build upon the work started by Dr. Erica Marti at the University of Nevada, Las Vegas (UNLV) and her team. Faculty, undergraduate and graduate students collaborated to build educational solar energy kits and adapt lessons to a virtual format despite the challenges caused by COVID-19. One of the virtual programs that used the lessons was the newly developed Engineering Explorers virtual after school program. The Mobile Engineering Education Lab (ME2L) presented lessons to more than a dozen classrooms via Zoom. Additional lessons and curriculum units are being designed for future virtual and in-person educational opportunities. Plans are under way for collaboration with community partners such as Desert Research Institute (DRI) and GEAR UP to ensure that these educational resources continue to be used long after the end of the Solar Nexus project.

UNR's Mobile Engineering Education Lab Van

NASA EPSCoR
RESEARCH CAN PROJECTS HIGHLIGHTS

LIFE IN SALTS: A MULTIDISCIPLINARY INVESTIGATION OF MICROORGANISMS AND BIOSIGNATURES IN THE DEATH VALLEY SALT PAN

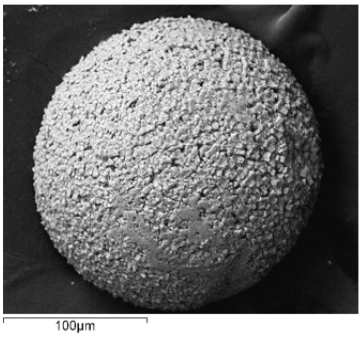
This research was funded by a NASA EPSCoR Cooperative Agreement Notice award # 80NSSC18M0027.

Science PI: Henry Sun (Desert Research Institute), Co-PIs: Brian Hedlund (University of Nevada, Las Vegas), Simon Poulson (University of Nevada, Reno), NASA Collaborators: Chris McKay (ARC); Alfonso Devila (ARC); Aaron Noel (JPL) and Eugene Serabyn (JPL).

Return on Investment (ROI) To Date

New Funding: $662,186 (2 grants)
Presentations: 8
Students trained: 9

Biominerals are a target in the search for life on Mars. Much like dinosaur bones, biominerals may be preserved in the rock record long after the organisms themselves are dead and have decomposed. The last surface waters on Mars, prior to total desertification, would have been saturated with salt. From an astrobiology perspective, there are two significant questions: 1) could bacteria survive in brine pools, and 2) could their growth affect mineral formations that otherwise wouldn't occur? Studies of bacteria isolated from a brine pool in Death Valley indicate that the answer to both questions is yes. When halophilic bacteria are provided with amino acids, they affected not one, not two, but three different minerals. The first is an aggregate of nanophase calcite, stabilized by amino acid chelates. The second mineral is struvite or guano stone, resulting from phosphate from decomposing cells. The third mineral is crystallized exoskeleton of bacteria or cell wall peptides. Ongoing work will determine if current life detection technologies can detect these microbial equivalents of dinosaur bones if they were to occur on Mars. This project has enabled the participation of Dr. Sun in the European Space Agency 2020 mission to Mars to study planetary habitability to salt-loving microbes using the instrument HABIT (HabitAbility, Brine, Irradiation, and Temperature).



Aggregates of nanophase calcite associated with a bacteria from a brine pool in Death Valley

HIGH ENERGY BATTERY MATERIALS AT LOW TEMPERATURES FOR FUTURE NASA MISSIONS

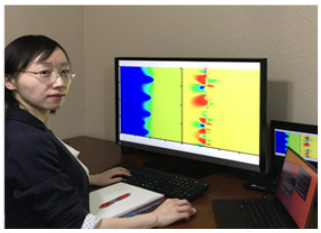
This research was funded by a NASA EPSCoR Cooperative Agreement Notice award # 80NSSC18M0152.

Science PI: Feifei Fan (University of Nevada, Reno), Co-PIs: Dev Chidambaram (University of Nevada, Reno), Xiaoliang Wang (Desert Research Institute), Qiang Zhu (University of Nevada, Las Vegas) (NASA Collaborators: James Wu (GRC) and Marit Meyer (GRC).

Return on Investment (ROI) To Date

New Funding: $500,000 (1 grant)
Publications: 1
Software Code Developed: 1

NASA has a long-term interest in developing robust and lightweight high-energy-density rechargeable batteries that can operate well at low temperatures. One of the major technical challenges is developing high-specific-capacity anode nanomaterials with improved low-temperature performance (–60 °C) for lithium-ion (Li-ion) batteries. The research goal of this project is to improve the power density, energy density, and cycle life of anodes for Li-ion batteries at –60 °C with a fundamental understanding of the controlling mechanisms. The project aims to solve long standing issues of the poor low-temperature performance of Li-ion anodes, which mainly relates to slow ionic diffusion and limited Li storage capacity. The proposed research will provide a better understanding of the battery working principle at low temperatures and generate a database containing electrochemical performance of advanced anode materials under a variety of operational conditions at –60 °C. In collaboration with NASA scientists, the project will lead to a rational design guidance of anodes for future Li-ion batteries for space applications.



Feifei Fan (Science PI)

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