2015-2016 Nevada Space Grant Fellowship Recipients

ABOUT NEVADA SPACE GRANT FELLOWSHIP OPPORTUNITIES

The Nevada Space Grant Fellowship program provides Nevada graduate level STEM students with up to $21,000 per academic year in support. The program is designed to support independently conceived or designed research or projects by graduate students, in disciplines that will help advance missions and goals of NASA; thus, providing an opportunity to directly contribute to advancements in STEM-related areas of study. Students work closely with a faculty mentor to complete their research or project.

2015-2016 FELLOWSHIP RECIPIENTS

Nicholas Beres, Desert Research Institute

Rachael Carmichael, University of Nevada, Reno

Theresa Clark, University of Nevada, Las Vegas

Benjamin Hatchett, Desert Research Institute

Christine Hedge, Desert Research Institute

Alexander Jones, University of Nevada, Las Vegas

Patrick Longley, University of Nevada, Reno

Blake Naccarato, University of Nevada, Las Vegas

Nina Oakley, Desert Research Institute

Whalmany (Linglee) Ounkham, University of Nevada, Reno

Rose Petersky, University of Nevada, Reno

MIchael Picker, University of Nevada, Las Vegas

Patricio Piedra, Desert Research Institute

Jared Rice, University of Nevada, Las Vegas

Joshua Sackett, University of Nevada, Las Vegas

Scott Thomas, University of Nevada, Las Vegas

Sarah Trabia, University of Nevada, Las Vegas

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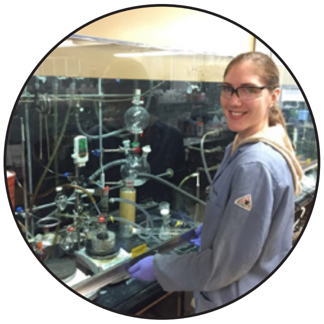
NIcholas Beres: I conduct research in DRI's Laboratory for Aerosol Science, Spectroscopy, and Optics (LASSO.dri.edu). This includes: development of instrumentation for real-time, in-situ aerosol light absorption and light scattering properties; exploration of the formation, morphology, and radiative forcing of carbonaceous aerosol, found both in ambient air and produced in laboratory settings.

My current project aims to develop novel instrumentation to explore how the deposition of aerosols on a snow surface alters its reflectivity – a key component to understanding the Earth's energy balance – thereby inducing further changes in the snowpack and the atmosphere. Upon completing my Ph.D., I hope to continue working in a research environment to study the impacts of human-influenced climate change.



Rachael Carmichael is a Ph.D candidate in the Department of Chemistry at the University of Nevada, Reno. She currently works with Dr. Wesley Chalifoux on sustainable organic synthetic methodology. Her research focuses on an efficient synthesis of important target molecules while minimizing the negative environmental footprint that typically coincides with chemical method development. Over the course of the following year she intends to develop an enantioselective assay and demonstrate the method's utility through direct application. Rachael plans on applying for a post-doctoral position and would like to work as a synthetic chemist researching and designing economically valuable "green" chemistry suitable for future generations.

Theresa Clark: Pursuing a PhD under the mentorship of Dr. Lloyd Stark at the University of Nevada, Las Vegas (UNLV) will forward three professional goals of mine, which are to publish novel experimental research in high-impact journals, to pave a less-traveled road for future study in arid bryophyte ecology, and to refine my iwnstructional approach to teaching. My dissertation will enable me to collaborate with aridland scientists as I study how the smallest plants in the surrounding Mohave Desert are able to survive extensive periods in a completely desiccated state. Upon graduation with my PhD, I envision a career that will call upon my passion for doing and sharing science; joining academia or the research team at an herbarium or botanical garden would fulfill my ultimate aim to teach biology and continue research in plant ecology. When teaching science today, and in the future, I seek to inspire an appreciation and stewardship for the natural world in people of all ages and backgrounds.

Assessing the vulnerability of plant species to modern climate change is a multi-faceted endeavor. Research has focused almost exclusively on vascular species, although mosses are an equally important model group as they contribute directly and indirectly to ecosystem functioning and biodiversity. Their small stature and unique water relations necessitate an ecological assessment of the resiliency offered by desiccation tolerance (i.e. drying with dying) and the potential to evade the brunt of climate change by living in microhabitats buffered from climatic extremes. My project seeks to quantify how macro- and micro-scale climate and climate buffers interact to affect the stress response of mosses along a 2000 m aridity gradient in the Mojave Desert. Modeling how mosses respond physiologically to present-day climate will help predict their vulnerability in a changing natural world. The scope of this research aligns with NASA's Objective 2.2 which seeks to explore mechanisms behind fluctuations in the global earth system today and into the future.

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Benjamin Hatchett is a Ph.D. student in Geography at the University of Nevada, Reno. Benjamin's research focuses on the the physical mechanisms that produced past abrupt climate changes and the impacts of these changes on the hydrology of Great Basin terminal lake systems. His work utilizes theoretical, computational and field methods to investigate these problems. He is investigating how the rain shadow created by the Sierra Nevada influences moisture transport into the Great Basin. This project will examine the regional circulations that favor weaker or stronger rain shadow effects and how the rain shadow intensity impacts the water balance on annual to decadal timescales. The goal of this work is improve our understanding of how a warming world may alter water availability in dryland regions found on the leeside of mountain ranges.

Christine Hedge: I began a PhD program in Environmental Engineering in the fall of 2014 at the University of Nevada, Reno. My research focus is to investigate the spatial distribution of mercury concentrations and pools in tundra soils and vegetation in Alaska and to assess potential impacts of climate change for Arctic pollution. The Arctic is believed to be a large sink of atmospherically-derived mercury with potentially significant reservoirs stored in carbon-rich tundra soils from increased anthropogenic loadings since the Industrial Revolution. My goal is to understand how profound changes occurring in the arctic – permafrost thaw, increasing wildfires, and perturbation to soil carbon dynamics impact the release of mercury into surrounding sensitive ecosystems. I currently work under the guidance of Dr. Daniel Obrist on a collaborative National Science Foundation Polar Program entitled 'Collaborative Research: Soil-Snow-Atmosphere Exchange of Hg in the Interior Arctic Tundra'-a project that seeks to understand the cycling of mercury in an area where almost no data is present. Our main site is at the Toolik Field Station in northern Alaska. My project includes additional sampling along the Dalton Highway, Denali National Park and the Noatak National Preserve. Upon completion of my degree, I would like to work as an environmental research scientist or engineer in a related field.

Alexander Jones is a Ph.D. student in the Biological Sciences at University of Nevada Las Vegas. He is studying pupfish found in the Southwestern United States and Mexico. These fish live at or near their physiological limits in the wild. The Death Valley Pupfish (Cyprinodon salinus) lives in the extreme and hypervariable environment of Salt Creek. Anecdotes tout this fishes' assumed adaptations to extremely high temperatures but there is little evidence to support these claims. Salt Creek is an ideal system to test the influence of temperature and other variables on the population dynamics of these unique fish. As global temperatures continue to rise, other freshwater systems are likely to resemble stream systems like Salt Creek in terms of increased temperature and variability. Understanding the population dynamics and physiology of fish found in extreme areas like Death Valley could inform fisheries conservation efforts elsewhere as temperature and variability increases in freshwater systems worldwide due to global climate change. Following graduation Alexander aims to continue his research on deserts and the organisms found there while helping others to appreciate these unique, endangered ecosystems.

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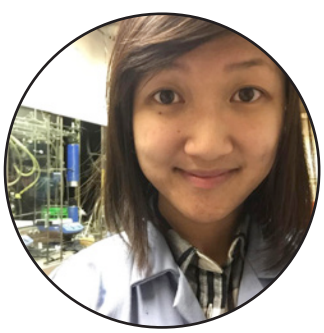
Patrick Longley: I graduated from Western Washington University with a bachelor's degree in mathematics in 2014. I am currently working to complete a master's degree in hydrology at the University of Nevada Reno. For my thesis work I am studying how regional warming and drought interact to impact snowpack dynamics across the Great Basin. Additionally, I am interested in how changing snowpack dynamics impact important surface water resources in Nevada. After graduation I plan to seek a government job in water resource management or a private sector job in environmental consulting.

Blake Naccarato: I was born and raised in Las Vegas. In 2009, I enrolled in the Howard R. Hughes College of Engineering at the University of Nevada, Las Vegas. I obtained my Bachelor of Science degree in Mechanical Engineering in 2014, and am currently pursuing a Master of Science in the same field. My project entails the visualization of dropwise condensation on treated surfaces. It has been shown that promoting this type of condensation can improve multiphase heat transfer. I will observe the condensation phenomenon with a high-speed camera in hopes of better understanding droplet interactions. I enjoy my research, and would like to conduct more research like it in the future.

Nina Oakley is a second year atmospheric science Ph.D. student at the University of Nevada, Reno. In addition to studying, she also works as a research climatologist with the Western Regional Climate Center at the Desert Research Institute. Nina's Ph.D. research is focused on extreme precipitation events and precipitation events that produce landslides in the transverse (east-west oriented) mountain ranges of southern California. This research will help establish early warning systems and improve forecasting of landslide events. During her career in atmospheric science, Nina wants to better understand the types of meteorological events that bring precipitation to the western US and their variability over time. This research can be used to improve seasonal weather forecasts and support resource management. Nina also participates in research and outreach activities to improve communication of climate information and science education.



Whalmany (Linglee) Ounkham is currently a Ph.D. candidate in the Department of Chemistry at the University of Nevada, Reno. She conducts research under Dr. Brian J. Frost synthesizing and investigating the applications of water-soluble ruthenium phosphine complexes for aqueous phase catalysis. A key focus of her research is incorporating green chemistry to the application of novel water-soluble ruthenium phosphine complexes as potential catalysts for aqueous phase nitrile hydration. Upon completion, Linglee plans to pursue a career in academia remaining in the area of green chemistry with an emphasis in catalysis.

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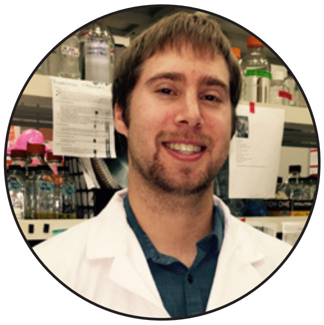
Rose Petersky: My name is Rose Petersky and I am a 23 year old Hydrology Masters student from Bellevue, Washington. I obtained my undergraduate degree from SUNY College of Environmental Science and Forestry in May 2015. My research interests are hydrology, watershed science and remote sensing. I am using the NVSGC Higher Education Fellowship to help fund my research into the range and extent of Great Basin ephemeral snowpack along with how it co-varies with vegetation cover and topography. Mapping for this project will be done using NASA data products. Ephemeral snowpack research is important because climate change is likely to alter the rain-snow transition, which will lead to seasonal snowpacks becoming ephemeral. That transformation may result in water stress for Great Basin communities due to changes in the timing and availability of water resources. Despite the importance of ephemeral snowpack, it is an understudied part of snow science. As a result, I am hopeful that my research will be a valuable contribution. After I graduate, I would like to work in water resources management helping communities adapt to climate change and water stress.



Michael PIcker is a Ph.D. candidate at the University of Nevada Las Vegas, where, under the guidance of Dr. Helen Wing, he studies virulence gene regulation in the bacterial pathogen Shigella flexneri. Shigella species cause bacillary dysentery in humans, which lead to over 1.1 million deaths worldwide each year. The overall goal of Michael's project is to improve our understanding of virulence gene expression in this highly infectious bacterium. After completing his Ph.D., he wants to continue to identify and characterize novel targets in microbial pathogens that can be used for the next generation of antibiotics in order to improve human health in the area of infectious disease.

Patricio Piedra: I grew up in a small town of Ecuador called Cayambe which is located north of the country's capital, Quito, at an altitude of nearly 12,000 ft. I immigrated to the U.S. in 2004 because my father moved to California when I was 15 years old, and I became a U.S. citizen in 2009. Thorough my years in the U.S., I have spent most of my time studying, researching and/or teaching science. I obtained a B.S. in Physics from the University of California, Davis in 2010, and a M.S. in Physics from San Jose State University in 2014. Currently, I am pursuing the degree of Ph.D. In atmospheric science at the University of Nevada, Reno, where I am undergoing my second year. My ultimate career goal is to become a professional researcher or research professor. My interests of specialization lie in studies regarding electromagnetic waves interacting with matter (i.e. optics, photonics, radiation therapy, biophysics, etc.). At my current institution, I am studying the optical parameters that deteriorate the transmission of electromagnetic energy to solar panels caused by deposition of particles. Using both a theoretical and an experimental approach, my research team expects to be able to predict solar panel performance under dust being deposited. Theoretical modeling of the optical properties of deposited particles would allow one to mimic the performance of distinct combinations of panel materials and different types of dust. This will minimize the need to perform field experiments on sites that may be not easily accessible such as Mars. In addition, this study will allow to estimate optimal cleaning schedules to save scarce resources such as water. The theoretical component of this study is nearly complete and the experimental part will take place within the next months. Upon completion of this project, my goal is to publish at least one first author peer reviewed article, and to write a dissertation.

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Jared Rice: My research project this year is a study of the detectability and observational characteristics of distant high-redshift tidal disruption events (high-z TDEs) in collaboration with my indefatigably awesome PhD advisor Dr. Bing Zhang. When a star ventures too close to a supermassive black hole it is shredded by powerful tidal interactions. A fraction of the resulting tidal debris stream is swallowed by the black hole, emitting high-energy photons in a transient accretion disk. Under the right conditions intense magnetic fields in the accretion disk thread through the black hole horizon and produce a prodigious jet of high-energy particles. Jetted-TDEs may be visible from Earth at large distances if the jet aligns with our line-of-sight. Our goal is to characterize the observational properties of these high-z TDEs to probe early universe astrophysics.

Joshua Sackett is a Ph.D. student in the School of Life Sciences at the University of Nevada Las Vegas. Joshua is also a graduate research assistant at the Desert Research Institute (DRI) in Las Vegas, NV working with Dr. Duane Moser in the Division of Earth and Ecosystems Sciences. Upon completing his Ph.D., Joshua hopes to work in academia as a research professor. His research focuses on using single cell genomic and metagenomic approaches to gain insights into the early evolutionary events that led to diversification and speciation within the tree of life. This work will also contribute to the elucidation of novel metabolic pathways or physiological adaptations that have allowed organisms to persist and thrive in unique, subsurface environments.

Scott Thomas is persuing a Ph.D. in microbial ecology, with a focus on geothermal ecosystems, which has led to a wide interest in microbiology from biogeochemical cycling to industrial applications of microbial enzymes. Scott believes that if humans are to inhabit the Moon or Mars, we will need to replicate many of the ecosystem services provided by microbial biogeochemical cycling here on Earth. Upon completion of his Ph.D., he aims to persue a career in biotechnology with the goal of utilizing the extraordinary biological diversity of microorganisms to provide ecosystems services and industrial products for the betterment of all mankind. His research project focuses on examining the effect of temperature on carbon use efficiency, using pure cultures of thermophilic bacteria and archaea. As the temperature of an environment increases, cellular damage due to thermal denaturation of proteins and other macromolecules increases. At a certain point (critically low Carbon Use Efficiency; CUE), an organism will no longer be able to perform essential anabolic reactions due to the overwhelming demand for energy in catabolic reactions. This point will dictate the upper temperature limit for reproduction. A greater understanding of the metabolic underpinnings to "why" there is an upper temperature limit to life is necessary if we are to address "…the potential for life elsewhere". Using pure cultures of thermophilic archaea and bacteria with 13CO2 based metabolic flux analysis, we aim to address our overarching hypothesis that "the maximum growth temperature of a species is dictated by a critically low CUE" by determining if there is an inverse relationship between CUE and temperature.

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Sarah Trabia: Born and raised in Las Vegas, Nevada, I always knew I loved math and science. I attended the University of Nevada Las Vegas (UNLV) for my B.S. and M.S. in Mechanical Engineering, and am currently attending UNLV for a Ph.D. in Mechanical Engineering. During my Ph.D. education, I plan on submitting journal articles, attending and presenting at conferences, and conducting new, innovative, exciting research. I hope to work at a national laboratory when I graduate and continue conducting research on smart materials.

My research project is on the study of soft robotics. I am interested in designing and building a fully functional soft robot, where every component is flexible and synergetic with each other. The components of the soft robot include the body, wiring, actuator(s), and power source. Also, I am interested in Ionic-Polymer Metal Composites (IPMC), which are platinum-coated smart material made of Nafion®. IPMCs actuate when a voltage is applied to the surface. I intend to work on finding an easier way to manufacture IPMCs and will create Finite Element Models for the smart material.