



**UNC**



**FALL 2017 RESEARCH SYMPOSIUM  
UNIVERSITY OF NORTHERN  
COLORADO**

**2017 Fall Symposium**  
Wednesday, November 15, 2017  
3:00 – 6:00 PM

**Mindful Leaders and Employee Performance**

Pearl Marquez

Psychology

**Growing on a Scar: Population Genetics of a Colorado Wildflower**

Ace Spitzer

Biology

**Estimating Biological Distance between Flexed and Supine Burials at the Ancient Greek City of Himera Using Dental Nonmetric Data**

Jessica Czapla

Anthropology/Biology

**The Pollination and Reproductive Biology of *Thermopsis divaricarpa* in the Central Rocky Mountains.**

Olufisayo Awolaja

Biology/Chemistry

**The Four-Block Journey: Attending College in Your Hometown**

Madeline Azari

Theatre Education

**An Analysis of Urbanization in Mongolia and Post-Soviet Central Asia**

Laya Buchanan

Geography/ Economics

**Environmental Factors regulating Swallow Bug populations**

Paul McPhail

Ecology & Evolutionary Biology/Anthropology

**The Effect of Technology on Language Development in Children from Birth to Three**

Jenna Zink

Audiology/Speech Language Sciences

**Ecological Health of the Poudre River**

Katie Dorman

Earth Environmental Science/Business

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## **Mindful Leaders and Employee Performance**

Pearl Marquez

Mindfulness Based Interventions (MBI) serves as a medium to teach mindfulness techniques which organizations are becoming increasingly interested in due to the possibility of increasing attention and job performance. MBIs have also been used to identify the effects of trained mindfulness on intrapersonal relationships; however, these possible effects on interpersonal relationships have not been examined in an occupational setting. The present study assessed the effects of trained mindfulness in supervisors from a four-year university on the performance of their employees. Supervisors received a low dose 6-week Mindfulness Based Stress Reduction (MBSR) program. Employee performance was assessed by both supervisors and employees during the first week of the program, the final week of the program, and a week following the program's end, (i.e., self-report). There was a (non-significant) linear trend, with employee performance increasing steadily across the three time points. However, the evaluation patterns were different for employees and employers. More specifically, employers rated job performance best one-week post intervention, which suggests enduring benefits of MBSR training. In contrast, employees saw the greatest benefit during the final week of program, which suggests immediate benefits of MBSR training. Thus, MBSR training is a potentially useful way to improve interpersonal relationships in an occupational setting in addition to improving job performance.

## **Growing on a Scar: Population Genetics of a Colorado Wildflower**

Ace Spitzer

Speciation is a natural process in organisms caused by geographic isolation and adaptation to novel conditions. Human activity is a source for environmental changes in the air, soil, and waterways of an ecosystem. Organisms living around agricultural or industrial developments must adapt at a much faster rate than organisms subjected to natural selection pressures. Plant and invertebrate communities studied in affected ecosystems have less species diversity and exhibit changes to individual's health and behavior, which highlights the impacts of chemical toxicity to an ecosystem. New molecular biology technologies allow us to study how genetic variation changes in populations subjected to human disturbances, with preliminary studies on plants showing more mutations and genetic diversity in rapidly evolving microsatellite markers in the genome, contrary to how organisms are expected to respond to anthropogenic pressures. Therefore, it is important to add more information and examples of how plant communities are responding to these changes to approach a more definitive understanding. Leaf tissue from the plant western yarrow, *Achillea millefolium*, was collected within and around a reclaimed uranium mine outside of Meeker, CO. Plant DNA was extracted and analyzed for variations in microsatellite regions. Plants at the mine are expected to have more variation in their genome compared to outside of the mine's influence, due to greater selection pressures from the mine's run-off. Plants subject to greater rates of mutation present initial indicators of divergence and show how human activities drive biological processes.

## **Estimating Biological Distance between Flexed and Supine Burials at the Ancient Greek City of Himera Using Dental Nonmetric Data**

Jessica Czaplá

This research investigates potential differences in genetic relatedness of flexed and supine burials in the necropolis of Himera using biodistance analysis of nonmetric dental traits. We hypothesize, individuals buried in the supine position will be more closely related to Greeks from Euboea (indirect founders of Himera) and those buried in the flexed position will be genetically distinct, possibly representing locals. This research explores potential interaction between Greeks and locals to test whether locals adopted Greek burial styles, Greek and local customs hybridized, and/or each group maintained a distinct burial style. To test our hypothesis, we recorded presence and absence of 34 dental nonmetric traits using the Arizona State University Dental Anthropology System in 57 individuals (23 flexed and 34 supine). Pseudo-Mahalanobis  $D^2$  matrices were created using different trait combinations and principal components analysis was used to visualize the data. These analyses showed that the individuals buried in flexed and supine positions are genetically similar, suggesting that there are no major genetic differences between these burial types. The only trait that showed a significantly different frequency between the two groups was the interruption groove on the lateral incisor, which was significantly more common in the flexed graves (present in 88% of flexed graves and 59% of supine graves; Fisher's Exact test  $p=0.0496$ ). Genetic similarity of the flexed and supine individuals suggests that despite cultural differences (in burial practice), the populations likely interbred. Alternatively, individuals living in the Mediterranean may be too genetically similar for differences to be captured with these data.

This research was funded by the National Science Foundation's Research Experience for Undergraduates (REU) program, the University of Georgia, and the University of Northern Colorado

## **The Pollination and Reproductive Biology of *Thermopsis divaricarpa* in the Central Rocky Mountains.**

Olufisayo Awolaja

As global abiotic conditions change, uncertainties regarding the future survival of plant species are becoming more prevalent. Biodiversity is integral to ecosystem functioning, and will depend on effective conservation practices. In order to determine how conservation efforts should be carried out, preliminary data on the species of interest are required. During the summer of 2017, the reproductive ecology of a native, montane plant species, *Thermopsis divaricarpa*, was studied at the University of Colorado Mountain Research Station in Nederland, Colorado. We worked in two sites located in Roosevelt National Forest, both within the montane elevational zone (about 8,000 to 10,000 feet above sea level). In addition to observing plant-pollinator interactions of *T. divaricarpa*, we conducted pollen-limitation experiments to quantify fruit set in self-pollinated plants compared to cross-pollinated plants. Data from pollination experiments specifically demonstrate the role of floral visitors in reproductive success of plants, allowing us to predict population dynamics of plant species in the absence of insect pollinators. Native bumble bees were the most abundant floral visitor to *T. divaricarpa*, transporting pollen among individual plants. Preliminary results also suggest that this species is self-compatible, capable of self-pollination, although fruit set benefits from cross-pollination. Understanding breeding patterns of plants and plant-pollinator interactions enables land managers to predict species-specific survival and potential shifts in community compositions, particularly in the context of climate change. Trophic mismatch, the phenomenon that occurs when the timing of pollinator emergence and flowering are not in relative sync, may become more common as the climate warms. Thus, data on native plant-pollinator interactions are useful in managing these potential mismatches.

## **The Four-Block Journey: Attending College in Your Hometown**

Madeline Azari

Greeley Central High School sits approximately four blocks away from the University of Northern Colorado in Greeley, CO. The University attracts multiple Greeley Central graduates each year, and in return, the city and the University aid in financing and aiding these students on a path towards a bachelor's degree. Due to Greeley's agricultural background and diverse multicultural demographics, the attendance of students from Greeley Central (a high school of about 1,500) at the University of Northern Colorado (a school of about 12,000) remains a phenomenon for students in these types of communities. In association with the relationship that the high school, community, and the University share, this phenomenological study uncovers themes explored from the lived-experiences of attending college in your hometown. Between 10-15 Greeley Central graduates—who consider Greeley, CO as their hometown—participated in either an interview or a focus group. The interviews and focus groups addressed topics relating to the lived experiences of these students, including the topics of identity development, success at UNC, and the relationship to community through college. The participants involved in the study helped in clarifying the successes, downfalls, and surprises of attending college in one's hometown so that future students and researchers in higher education and student affairs can understand the influential experiences that could help or hinder a student's success through this phenomenon. With little research or literature regarding the phenomenon of students attending college in their hometown, this study remains crucial in accessing information that has not yet been uncovered. The research acquired in this study also acts as a catalyst for directors and staff in various enrollment departments through Universities (including Housing, Admissions, Orientation, etc.) to harness a foundation of understanding for future enrollment of students from these populations.

## **An Analysis of Urbanization in Mongolia and Post-Soviet Central Asia**

Laya Buchanan

Urbanization presents problems for developing countries around the world. Cities undergoing urbanization are typically receiving an influx of immigrants from rural areas and a high natural increase rate. They experience problems such as poor sanitation, lack of waste management services, lack of improved water, lack of electricity, informal housing and economic activities, and congestion. However, urbanization in post socialist Central Asia is unique. While these problems are present in these cities, including Almaty, Astana, Bishkek, and Ulaanbaatar, their histories and political systems have created unique urban environments with unique problems. Soviet influence combined with their nomadic cultural heritage has created urban spaces with a unique set of challenges. Mongolia, in particular, has created urban environments unlike any other cities in the world, and has a very unique set of problems. This research aims to determine the viability and social and economic sustainability of these cities, as well as residential satisfaction in these cities. Patterns of development are currently being analyzed by digitizing remotely sensed time series images of Ulaanbaatar to measure the changes in the number of ger and permanent structure in the central city, central ger, middle ger, and fringe ger areas of Ulaanbaatar. This process will be completed for aerial imagery going back several years, preferably since 1990. Government records and World Bank data is currently being examined to obtain information relating to the city's history, immigration, and economic or political conditions. Preliminary results have shown a surprising pattern, with fringe ger areas tending to be growing in more sustainable patterns, while the central city and the central ger areas are the least sustainable. This is the opposite of the patterns seen in squatter settlements in most developing countries, and more closely resembles the suburban development patterns that tend to be associated only with the United States.



## **Environmental Factors regulating Swallow Bug populations**

Paul McPhail

Swallow Bugs, or *Oeciacus vicarius*, are a bloodsucking parasite that are very closely related to the bedbug. They feed almost exclusively on Cliff Swallows, and large numbers of them effect chick survival, migration patterns, and nest choice. Because of these effects, our study aimed to better understand what helps regulate Swallow Bug populations. Specifically, we looked at four potential factors: nesting colony size, seasonality, the number of other parasites, and the location of the colony. Research has shown that larger bird colonies have larger Swallow Bug populations. Additionally, the parasites can survive very well inside the nest while the Cliff Swallow is wintering in South America. Because Swallow Bugs compete with other parasites for the blood of the baby bird, we expected to find less Swallow Bugs when more parasites were present. Finally, we expected to find significantly different Swallow Bug population sizes on colonies built on man-made structures, such as bridges and overpasses. To test which of these environmental factors influenced Swallow Bug populations, empty nests were removed from the colony, insects were removed from the nests, and all the parasites were identified and counted. We confirmed the previous research, but found that the presence of the number of other parasites did not have a negative effect on Swallow Bug populations. This means that Cliff Swallow nests can potentially have to cope with large infestations of all three parasites at the same time. Finally, we found that colonies built on a man-made surface hosted significantly more Swallow Bugs. The reason for the increased number of Swallow Bugs is still a mystery. It's possible that extra food from living near the highway may help the chicks host a larger number of parasites and survive, or that predation from Canyon Wrens in the more rural locations keeps Swallow Bug numbers down.

## **The Effect of Technology on Language Development in Children from Birth to Three**

Jenna Zink

The abundant use of technology over the recent years has led to an increased digital exposure to young children. Because the first few years of life is characterized by rapid development, it is important to explore the effects of technology exposure during this essential developmental period. One of the areas of development that occurs rapidly during the first three years of life is language development. The possibility that exposure to technology could be harmful to the acquisition of language during the first few years of childhood should be closer examined. The objective of this systematic review is to (I) examine the effects of technology on language development in children from birth to 3 years of age and (II) explore the association between technology use and parent-children interaction. The methods used for this research was computerized searches on databases, reviewing reference sections of articles, and systemically reviewing literature that was published within the last ten years. The inclusion criteria for collecting sources included: recent publication date, sample size greater than 20, examined children between the ages 0 to 3 years, focused on technology and language learning. The results of this study concluded that there is a correlation between technology exposure during infancy and negative language development. As well as, a decrease in qualitative and quantitative time associated with parent-child interaction when technology is present.

## **Ecological Health of the Poudre River**

Katie Dorman

The Cache la Poudre River has important economic and ecological uses and runs through two major cities in Colorado. The river is under threat from many sources of pollution, including urban and agricultural runoff, as well as spills from the oil and gas industry which has seen a prolific expansion over the past decade. Continual monitoring of water quality is important in understanding the effectiveness of current regulations put in place to mitigate water pollution. Benthic macroinvertebrates are a commonly used biological indicator for water quality as they are able to paint a fuller picture of the river health than chemical and physical tests alone (Kaboré, 2016). Benthic macroinvertebrates are small organisms that live on the bottom of riverbeds and can be seen with the naked eye. They behave in a predictable way and have been widely studied for decades. In general, healthy ecosystems support a wide variety of species, but polluted waterbodies will only support hardy and pollution tolerant species. This study will use benthic macroinvertebrates as biological indicators to assess the health of the Cache la Poudre River in northern Colorado. The objectives of this research are to: 1) Collect data on how the benthic macroinvertebrate community and the physical and chemical characteristics of sites along the Poudre change over time. 2) Create a citizen scientist page for students of the Poudre Learning Center to add data they collect and make a long-term record of these sites. 3) Compare the results to data that has been collected in the past to test the hypothesis that the ecosystem health of the Poudre River has gotten poorer over time as a result of increased agriculture and urban development in Weld County. Preliminary results show Biotic index scores between “very good” and “fair” which indicates possible to fairly significant organic pollution.

## **Ursidae**

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URJ has issued a call for papers for the Spring 2018  
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It is possible, however, to submit papers to the journal at  
any time for consideration for the next issue.

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Seven UNC students presented papers in 2017.

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