NEW MEXICO HIGHLANDS UNIVERSITY

The New Mexico Highlands University
Faculty Research Committee Presents

THE 12th ANNUAL RESEARCH DAY

Friday April 4,
Student Union Ballroom

Celebrating the Research and Scholarly Accomplishments of Faculty and Students

President's Statement

Learning and the advancement of knowledge represent the *raison d'etre* for any university. Here at New Mexico Highlands University, this is represented by faculty and students alike through a wide array of research, scholarship, and other creative activities. Research Day is an opportunity to share and disseminate the results of one's work with the broader community and for everyone to learn more through the reactions and interactions that result. I want to applaud and congratulate everyone who is sharing their work on this 12th Annual Research Day and to thank all those responsible for pulling it together.

Jim Fries
President

Table of Contents

Faculty Posters

Student Posters

Welcome

Welcome to the 12th Annual New Mexico Highlands University Research Day. Highlands University in 2014 continues our tradition of showcasing the passion for scholarship, research excellence and creativity of our faculty and students. Much of the faculty research presented today represents work that was supported by funds awarded by the Faculty Research Committee. Research and travel grants are awarded each term to faculty members through a rigourous review and selection process. In addition, faculty members may apply for time away from teaching duties to pursue grants and awayds from outside NMHU. The Faculty research Committee congratulates all grant recipients and encourages all faculty members to apply for research funds, conference travel support, and grant-writing release time.

Many of the student presentations represent work that was funded through the Student Research Fund of the NMHU chapter of Sigma Xi, the Scientific Research Society. We congratulate them on their accomplishments and applaud all of our student participants from every discipline for their hard work and dedication to research, creativity and academic advancement. The New Mexico Highlands University Sigma Xi chapter's mission is to enhance the health of the research enterprise, foster integrity in science, and promote the public's understanding of science for the purpose of improving the human condition. The society is a diverse, chapter-based organization dedicated to the advancement of science and engineering through outstanding programs and services delivered in a collegial and supportive environment. For more information about the NMHU chapter and its activities, please visit nnmex.net/sigmaxi.

For more information about the Faculty Research Committee and programs, please contact Sara Brown (2013-2014 Faculty Research Committee Chair) at 505-454-3320 or sarabrown@nmhu.edu. You are also invited to visit the Faculty Research Committee's web page at: www.nmhu.edu/FacultyStaff/research/committee.aspx.

Acknowledgements

The Faculty Research Committee wishes to thank New Mexico Highlands Univeristy for its continued recognition and support of the research and scholarly activities of its faculty and students. In particular, we thank President Fries, and Vice Presidents Terisita Aguilar and Linda LaGrange for their continued support of faculty research. We recognize Sara Brown, chair of the Faculty Research Committee for coordinating this event, and the members of the Faculty Research Committee for their help and support. We thank the NMHU Sigma Xi chapter for judging the student poster and oral competition, and extend our gratitude to the NMHU Graduate Student Senate for sponsoring the poster sessions. We kindly acknowledge Ms. Germaine Alarcon for her enthusiastic assistance and continued support of the Faculty Research Committee and its grant awardees.

Additional financial support for this event is provided by the Faculty Research Committee

2014 NMHU Research Day Schedule of Events –Student Center Ballroom

8:00 Poster Setup; Oral Presentation Loading; Poster Display (Ongoing until 4:30pm)

8:45 Introduction and Opening Remarks (President Fries, Vice President Aguilar, Associate Vice President LaGrange)

Faculty Oral Presentations

9:00 Dr. Donna Woodford-Gormley (English)
Othello, The Moor Of Miami: Cuban Adaptations Of Shakespeare's Othello

9:30 Dr. Jennifer Lindline (Environmental Geology)
New U-PB Zircon Geochronology Data Supporting 1.7 GA Crystallization Age For The Hermit's Peak Granite.

10:00 Dr. Julius Harrington (Social Work)
The Relationship Between Race-Based Self-Talk Among African-American Women and Poor Birth Outcomes.

10:30 MORNING BREAK—beverages available

10:45 Drs. Patricia Cruz and Seonsook Park (Educational Leadership Department; Curriculum and Instruction Department)
A Bridge Between K-12 and Higher Education: The Implementation of a Professional Development School at an Elementary School.

11:15 David Lobdell, M.F.A.
Sculpture Process at the NMHU Foundry

Student Oral Presentations

11:45 Molly Wright (Biology)
The Impacts Of Wildfire On The Population Dynamics Of Amphibians In Northern New Mexico And Southern Colorado

12:00 LUNCH BREAK—on own

12:30 Robert Ortega (Natural Resources Management)
The Impact Of Invasive Bullfrogs On The Demographics Of Northern Leopard Frogs In Northern New Mexico

12:45 Jennie Guilez (Natural Resources Management)
Evaluating The Impact Of The Invasive Bullfrog (Lithobates catesbeianus) In The Aquatic Fauna's Trophic Cascade At The New Mexico Río Mora National Wildlife Refuge

1:00 Marcie Davis and Selena McGinn (Educational Leadership)
What Do Parents Really Think About Their Local Public Schools?

1:15 Jessica Parker (Natural Resources Management)
The Relationship Between Precipitation and Aboveground Vegetation Biomass in Arid Grasslands: Exploring Spatial and Temporal Dynamics

1:30 Elyssa Duran (Natural Resources Management)
Soil Characteristics Across Severity in the Las Conchas Fire, Valles Caldera New Mexico

1:45 Jose Griego (Biology)
A Genetic Assessment and Hybrid Status of the Northern Leopard Frog (Lithobates pipiens) Along the Mora River in Northern New Mexico

2:00 Casey Taylor (Biology)
Does a Bear Live in the Woods? An Analysis of Urban Black Bear Populations in Northern New Mexico

2:15 Shantini Ramakrishnan (Biology)
Plague Dynamics In Small Mammal Communities Of Northern New Mexico

2:30 Saul Ruiz (Biology)
The Classification and Identification of Northern New Mexico Chironomids using DNA Barcoding and HSP70 Gene Sequencing

2:45 Erica Guaba (Chemistry)
Analysis of Phosphate Retention on a Biochar Amended Agricultural Southwestern Soil.

3:00 Carlos Ordonez (Chemistry)
How Cations Acting As Structural Directing Agents Affect The Fluorescence Of Metal-Organic Frameworks

3:15 Danielle Cedillo (Environmental Geology)
The Hermit's Peak Granite: Synkinematic Plutonism at 1.70 GA In The Las Vegas Range, NM

3:30 Adam Brister
*Paleomagnetic, Anisotropy of Magnetic Susceptibility, and Structural Data Bearing on Magma Emplacement and the Growth of a Miocene, Cinder Cone***.**

3:45-4:45 (Poster Session—Authors will present from 3:45-4:45)

4:45 Closing Remarks (Dr. Sara Brown, FRC Chair)

5:00 Poster Pick-up (until 5:30)

Abstracts

Presenting Author's Name is/are Underlined

Faculty Oral Presentations (listed in order of presentation)

Othello, The Moor Of Miami: Cuban Adaptations Of Shakespeare's *Othello*

Donna Woodford-Gormley
Department of English

Although *Othello*, like many of Shakespeare's plays, in well-known in Cuba, great liberties are often taken with the text in order to make it more relevant or more appealing to a Cuban audience. One version might set the play in revolutionary Cuba and another might condense it to make it shorter and more action-packed. In the two adaptations I will look at in this paper, the most intriguing change made to Shakespeare's plot is the shift in focus. Both adaptations put less emphasis on the hero, Othello, and more on the villain, Iago. Indeed, in one pair of plays by Tomás González, Othello actually becomes the villain and Iago becomes the more sympathetic character. In another recent version of *Othello*, directed by Nelson Dorr, Iago is made even more villainous, but he also becomes the central character in the play. In a play that raises questions about whether outsiders can ever truly fit in, this shift in focus reveals much about the ambivalent Cuban views of outsiders, of Shakespeare, and perhaps of the U.S.

NEW U-PB ZIRCON GEOCHRONOLOGY DATA SUPPORTING 1.7 GA CRYSTALLIZATION AGE FOR THE HERMIT'S PEAK GRANITE

Jennifer Lindline, Danielle Cedillo, and Andrew Romero
Environmental Geology Program, Natural Resources Management Department, New Mexico Highlands University, P.O. Box 9000, Las Vegas, NM 87701, U.S.A.

Numerous Proterozoic granitoid plutons are exposed in the Las Vegas Range, the most prominent of which is the Hermit's Peak granite (HPG). The HPG is a tabular body that intrudes quartzofeldspathic gneisses and amphibolites >1.70 Ga. The HPG has often been categorized as a 1.4 Ga pluton and considered part of the enigmatic trans-Laurentian Mesoproterozoic rhyolite-granite magmatic event. The HPG displays a fairly regular steeply dipping N-NW trending biotite foliation and abundant synplutonic pegmatite sills. In thin section, the biotite occurs as euhedral plates, quartz shows straight to undulose extinction, quartz-feldspar boundaries range from curviplanar to moderately interdigitate, and feldspars show recrystallized margins. The HPG foliation is strongly developed and parallel to that of the amphibolitic country rock at its western and southwestern contacts. The fabric intensifies to an ultramylonite defined by a very fine grain size, ribboned feldspar and quartz, and gneissic banding before being truncated by the Hermit's Peak thrust fault to the east. The elongate pluton shape, the parallelism between granite and country rock foliations, and the continuum between magmatic and high-temperature solid-state fabric development are strong evidence for the syntectonic emplacement of the HPG. Four HPG samples showing variable degrees of fabric development yielded U-Pb zircon crystallization ages of 1.714±0.017 Ga (n=19), 1.705±0.017 Ga (n=24), 1.700±0.012 Ga (n=25), and 1681±0.023 Ga (n=22). Thus, the HPG belongs to the suite of ca. 1.7 Ga plutons intruded during Proterozoic province assembly.

THE RELATIONSHIPN between RACE-BASED SELF-TALK among AFRICAN-AMERICAN WOMEN and POOR Birth OUTCOMES

Julius Harrington, DSW, Marva Lewis, PhD, Thomas M. Brinthaupt, PhD, and Barbara F. Turnage, PhD

J. Harrington, DSW, NMHU School of Social work Albuquerque, M. Lewis, PhD, Tulane University School of Social work, T.M. Brinthaupt, PhD, Middle TN State University Dept. of Psychology, and B.F. Turnage, PhD, Middle TN State University Dept. of Social work

Although income and education are generally associated with more positive birth outcomes, African American women show poorer birth outcomes regardless of their income or education levels. An unrecognized psychosocial mechanism contributing to racial disparities in poor birth outcomes may be the self-talk of pregnant African American women in response to race-based stressors in their everyday lives. Along with self-talk and maternal effects on fetal development a conceptual framework is presented.

A BRIDGE BETWEEN K-12 AND HIGHER EDUCATION: THE IMPLEMENTATION OF A PROFESSIONAL DEVELOPMENT SCHOOL AT AN ELEMENTARY SCHOOL

Dr. Patricia Cruz and Dr. Seonsook Park

Educational Leadership Department and Curriculum and Instruction Department, NMHU

Using a mixed methods design the authors are currently conducting research to determine the impact of Professional Development Schools (PDS) on student learning, as well as to document the processes for implementation of PDS, and the effects of the PDS on both the higher education students and the elementary school teachers. There is limited research in the area of PDS partnerships and their impact on student learning, as well as the process for an institute of higher learning to implement a PDS in a K-12 setting.

Through a partnership between the professional education program at New Mexico Highlands University (NMHU) and two K-5th grade public schools, undergraduate and graduate students in the School of Education have the opportunity to observe, in real-world classroom settings, certified elementary teachers as they implement reading curriculum and programs, and execute reading instruction and assessment in their classrooms.

Since its inception, the PDS program has grown to include two public schools. One of the authors has served as an instructor and supervisor of the PDS reading courses and supervisor since the fall of 2010. The other author was the Principal of the first public school where the initial partnership began. The study results reveal that the partnership between New Mexico Highlands University School of Education and two local public elementary schools, has the potential to enhance teacher quality and student achievement.

Sculpture Process at the NMHU Foundry

David Lobdell, M.F.A

Student Oral Presentations (listed in order of presentation)

The Impacts Of Wildfire On The Population Dynamics Of Amphibians In Northern New Mexico And Southern Colorado

*Molly Wright**[a], *Sara H. Brown*[a], *Justin Saiz*[b], *Steven Salinas*[b], *Rick McNeill*[c], *Edward A. Martinez*[a], *Sarah Corey-Rivas*[a], *and Jesus Rivas*[a]
*Graduate Student in Biology at New Mexico Highlands University
[a] Department of Forestry at New Mexico Highlands University
[b] Department of Biology at New Mexico Highlands University
[c] New Mexico Forest and Watershed Restoration Institution Ecologist

Climate models suggest that the planet is becoming hotter and drier. As a result, natural disturbance cycles, such as forest fires, have been altered across many ecosystems in the Southwest. Wildfires are becoming increasingly larger and are burning more severely, affecting wildlife habitat, especially amphibian habitat. One of those large forest fires was the Track Fire, which burned 11,247 ha in 2011 on the boarder of New Mexico and Colorado. The purpose of this study is to understand the impacts of the Track Fire on amphibian population dynamics within northeastern NM and southern CO. We identified two research sites, one unburned (Control) and one burned (Treatment). At each site we selected similar reaches of river 500 m long for data collection. We pose the following question: How did the Track Fire impact amphibian population dynamics, vegetation, and water quality? We studied presence and abundance of amphibians using minnow traps, day and night visual surveys, and frog call transects surveys. We also monitored vegetation changes and water quality parameters comparing treatment and control. Our results suggest the burned areas have far fewer amphibians than the control likely related to differences found in several vegetation parameters and TOC at both sites. Our data shows that amphibians may take several years to recover after a severe wildfire. Thus climate change is expected to increase the frequency and severity of wildfires therefore their impact on amphibians are expected to be correspondingly stronger.

The Impact Of Invasive Bullfrogs On The Demographics Of Northern Leopard Frogs In Northern New Mexico

Robert E. Ortega[1], *Steven Salinas*[2] , *Justin Saiz*[2], *and Jesús Rivas*[2].
1. Natural Resources Department, New Mexico Highlands University.
2. Biology Department, New Mexico Highlands University.

Invasive species are able to alter the dynamics of the trophic levels of an ecosystem and have no natural controls. They can displace native species in the food web, and prey on species with no adaptive defenses. The Rio Mora National Wildlife Refuge has both invasive Bullfrogs and native Northern Leopard Frogs. The purpose of this study is to investigate the effects of the presence of the invasive Bullfrog on the demographics of the native Northern Leopard Frog in northern New Mexico. A section of the Mora River in the refuge was divided into two 2000-meter long section a control site containing Bullfrogs and an experimental site, where Bullfrogs were eradicated. Relative abundance surveys were utilized to sample demographic parameters. Fifty one Leopard Frogs were captured, pit tagged, and processed for demographic data. Six frogs were fitted with radio transmitters. Control and experimental regions did not differ in the relative abundance of Leopard Frogs. We did not find a significant difference in the mass of frogs from the two regions. However, preliminary data does show lower average mass and greater abundance in the experimental region suggesting an increase in recruitment of metamorphosis frog into the population. Telemetry data for four frogs in the control region produced a mean home range size of 531.7 square meters. The Telemetry data shows how frogs can have a large range of sizes in their home range area. Further study of the home range will be conducted to determine if there is a difference in home range between the control and experimental areas.

Evaluating The Impact Of The Invasive Bullfrog (*Lithobates catesbeianus*) In The Aquatic Fauna's Trophic Cascade At The New Mexico Río Mora National Wildlife Refuge

Jennie Guilez, Adrian Carter, Alfonso Trujillo, Rebecca Vigil, Dr. Jesus Rivas
New Mexico Highlands University Department of Natural Sciences

Invasive species are known to cause devastating effects in introduced habitats. Invasive species can be introduced on purpose or by accident, most commonly by human activity. They are known to increase competition for habitat and food resources with native species. Invasive bullfrogs (*Lithobates catesbeianus)* were introduced along the Mora River at the Rio Mora National Wildlife Refuge. We have eradicated the bullfrogs in a section of the river to study their impact on the aquatic fauna. We found that the invasive northern crayfish (*Orconectes virilis*) is an important component of the diet of bullfrogs. In this study we hypothesized that the removal of bullfrogs in the Mora River will release the crayfish population from predation, which may lead to a mesopredator release. We used systematic sampling to determine the relative abundance and overall size of crayfish in both sites using baited minnow traps. There is a highly significant difference in mass between control (21.63 g) and experimental sites (18.58 g; p-value< 0.0001). However we did not find a significant difference in abundance between both sites. We hypothesize that the size difference between both sites is the results of increase recruitment and survival of young individuals that now suffer less predation, dragging the average down. Cursory evaluation of data on fish density shows a similar pattern where fish. Further examination of the data will provide us insight to the trophic interactions amongst bullfrogs, crayfish and fishes in the Mora River at the Rio Mora National Wildlife Refuge.

What Do Parents Really Think About Their Local Public Schools?

Marcie Davis, Selena McGinn, H. Warren Kelly, Ann Martinez, Emy Sue Martinez-DeHerrera, Frank Orono, Paul Ortiz, Eric Vigil.
Department of Educational Leadership

Effective home-school communication represents a true challenge for public education in New Mexico. Educators, in a dual role as agents of public intent while drawing from personal expertise and professional preparation, become conflicted between responding to parent expectations and committing to their own expectations as educators. At New Mexico Highlands University, graduate students engaged in a course on School and Community Relations determined that rather than discussing the topic of the home-school relationship solely from their perceptions as educators, they would explore, in some depth, the perceptions of parents of their public school students. In the role of student-researchers, they collaboratively developed a questionnaire and distributed it to the parents of students in eight New Mexico public schools. The questionnaire, consisting of 20-items, and calling for both categorical and open-ended responses, was completed and returned by a total of 287 parents (or adult care-givers) of students across grades K-12*. From this relatively large and broad-based sample, analyses of (1) categorical responses revealed high overall levels of positive parent perception for the schools, especially in the areas of accessibility and responsiveness, and (2) open-ended responses – nearly 650 written comments – detailed both surprising support and worthy concerns from parents. Through these qualitative statements, respondents articulated what they favor and fear in the schools their children attend daily. At their best, they described the schools as welcoming in atmosphere, staffed with knowledgeable faculty, and populated with supportive student peers. This same body of respondents, however, described real concerns about facilities and grounds not being safe or secure; lax communication to parents; certain uncaring adults; and academic expectations, school lunches, and facilities that are, at times, sub-par.

* IRB approved.
Faculty sponsor: Dr. James B. Burns, Educational Leadership, jamesburns@nmhu.edu

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The Relationship Between Precipitation and Aboveground Vegetation Biomass in Arid Grasslands: Exploring Spatial and Temporal Dynamics

Jessica Parker, Charles Curtin, Ph.D.
Department of Natural Resource Management

With an increasing focus on the importance of scale and hierarchy dynamics in ecological research, climate can serve as the broader context upon which to study how cross-scale spatial and temporal interactions influence ecosystems. It has long been recognized that climate is a key driving variable of the structure and function of grassland systems. However, the relationship between climate and vegetation production has yet to be consistently established. This may indicate that complex, non-linear interactions are occurring and that a more comprehensive, cross-scale, and long-term approach is need to understand the abiotic-biotic dynamics. Previous studies using the normalized difference vegetation index (NDVI) for vegetation cover have documented a positive linear correlation between rainfall and vegetation for arid grassland systems in North America and Africa. Using ten years of data from southwestern New Mexico, we analyzed the cross-scale relationship between annual and seasonal precipitation and above-ground vegetation biomass of Chihuahuan desert grasslands to determine the nature, strength,

and direction of the relationship. We used spatial biomass and precipitation data at the m^2 and ha scale and temporal precipitation data from the current and previous season and years to detect a correlation between rainfall and vegetation biomass production.

Annual precipitation and above-ground vegetation biomass showed significant interannual differences from 2000-2009 at both the m^2 and ha scale. The occurrence of a severe drought from 2002-2003 provided optimal conditions for determining the magnitude of the effect climate has on biomass and detecting the presence of precipitation thresholds for biomass production. No relationship was detected between either seasonal or annual average precipitation, from either the current or previous season or years, and biomass from 2000-2009. However, both the magnitude and spatial variation of precipitation influenced the spatial and temporal response of biomass. Above-average precipitation with low spatial variation was correlated with an increase in spatial variation of biomass with a two-year lag time. Below-average precipitation with low spatial variation was correlated with lower spatial variation in biomass the following year until above-average precipitation generated a two-year time lag in the spatial response of biomass. From 2007-2008, there was a two-fold increase in vegetation biomass following a year of above-average precipitation. This study suggests that the relationship between precipitation and aboveground biomass is complex and non-linear while demonstrating discrete thresholds. Moderating factors may include the timing, intensity, and duration of precipitation events interacting with environmental conditions across a range of scales.

Soil Characteristics Across Severity in the Las Conchas Fire
Las Conchas Fire, Valles Caldera New Mexico

Elyssa Durán, Anita Lavadie, Sara Brown, Joseph Zebrowski, Edward Martinez
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New Mexico Highlands University, Las Vegas, NM 87701

Climate change is currently one of the major drivers of increasingly severe wildland fire behavior throughout the Southwest. The Las Conchas fire, Jemez Mountains, New Mesxico, burned during the summer of 2011, which provided an excellent opportunity to study many of the fire effects on soil. Soil characteristics, texture and nutrient flux post fire is not well understood. The purpose of this study was to understand soil effects in differing fire severities, as these impacts can have major implications on water quality and vegetation recovery. We collected and analyzed soils for texture, potassium (K), aluminum (Al), manganese (Mn), ammonium (NH_4^+), iron (Fe), copper (Cu), nitrate-nitrogen (NO_3^-N) and orthophosphate (PO_4) levels from a control (unburned) and three fire severity classes (low, moderate, and high. Soil texture was analyzed using the bouyoucos method, nutrient levels excluding [(NO_3^-N) and (PO_4)] were analyzed using LaMotte Soil Nutrient Kits. NO_3^-N and PO_4 levels were measured using an Analytical FS 3100 Automated Chemistry Analyzer. Our preliminary results suggest there is no strong relationship between severities and nutrient concentrations.

A Genetic Assessment and Hybrid Status of the Northern Leopard Frog (*Lithobates pipiens*) Along the Mora River in Northern New Mexico

Jose Griego, Sarah Corey-Rivas
NMHU Department of Biology & Chemistry

Rapid alterations to aquatic habitats in the Southwestern US are occurring due to climate change. The dramatic declines of the ubiquitous northern leopard frog, *Lithobates pipiens*, in the western US is a cause for concern. In this study, we investigate population-level connectivity of *L. pipiens* across a landscapes of agriculture, acequias, and protected lands and potential hybridization with *L. blairi* using nuclear (FIBI7 and microsatellites) and mitochondrial (ND1) markers. Interestingly, the nuclear FIB7 sequences demonstrate: 1) presence of an indel in morphologically designated *L. pipiens* one study believed to be unique in *L. blairi*, and 2) individuals heterozygous for the indel which may or may not be *L. blairi x L. pipiens* hybrids. The ND1 sequence analysis revealed close genetic distance of samples to *L. pipiens* in other western states. Microsatellite analysis indicates that two locally sampled populations, separated by a major interstate and differing in habitat type (mixed oak scrub vs plains) had limited gene flow (FST = 0.235) in comparison with populations along the riparian zone (FST = 0.0001). One sample, with incomplete insetting of the dorsolateral fold, grouped with *L. blairi* in the phylogenetic analysis of FIBI7 and provides some evidence of hybridization in the Mora Watershed. This study gives further support for what was previously anecdotal evidence of *L. pipiens x L. blairi* hybridization along the Mora River. Anthropogenic impacts as well as apparent isolation by distance provide some insight into factors influencing genetic structure of *L. pipiens* in drought susceptible aquatic habitats in the Southwest.

Does a Bear Live in the Woods? An Analysis of Urban Black Bear Populations in Northern New Mexico

Casey Taylor, Dr. Sarah Corey-Rivas, Dr. Jesus Rivas
Department of Biology, New Mexico Highlands University

Conflicts between humans and Black bears (*Ursus americanus)* have increased in the recent decades, due to human encroachment on wildlife habitats and anthropogenic attractions in urban areas. Urban bears are rather common in New Mexico where bears are often seen in town and foraging around dumpsters. Conventional wisdom states that once a bear has come to town they do not leave, these bears stop being a participant of the rural ecosystem and become urban animals. The purpose of this study is to assess the magnitude of the urban bear problem by determining the abundance, and movements of these urban populations, in comparison with rural populations. Transects were randomly assigned within the city limits and in the neighboring areas to determine relative abundance of Black bears by counting scat and bear sign. Scat and hair samples were collected to identify individual animals through the use of microsatellite analysis, as well as tracking movement patterns. Telemetry was used to track the movements of two sows (one with two cubs) through the summer and fall of 2013. I found more scat in town than in the neighboring areas ($t=2.98$, $df=13$, $p=.005$, one tail). Both sows were collared in town but moved to rural areas in the fall, presumably seeking hibernation dens and local oak mast. My results suggest that this population of Black bears are not permanently urban bears. Instead, they come into town during summer months, likely attracted by constant availability of high calorie food.

Plague Dynamics In Small Mammal Communities Of Northern New Mexico

Shantini Ramakrishnan[1,2], *Dean Biggins*[3], *Jesus Rivas*[1], *Brian Miller*[2]
[1] Department of Biology, New Mexico Highlands University
[2] Department of Conservation, Denver Zoological Foundation
[3] Fort Collins Science Center, United States Geological Survey

More than 200+ mammal species worldwide are affected by plague, and yet, the dynamics of enzootic plague and its inter-species interactions among rodents are largely unknown. Non-epizootic manifestation of the disease on nocturnal or cryptic species is difficult to quantify, and how the disease persists between epizootic events is poorly understood. Enzootic transmission cycles may be maintained in soils, or by small mammals and/or fleas acting as reservoirs for the disease. If so, the invasive plague bacterium, *Yersinia pestis,* may be functioning as a non-native predator, whose effects augment natural mortality.

We hypothesized that enzootic plague is causing chronic mortality in wild rodent species in northern New Mexico. Our objectives included: (1) measuring survival rates of rodents protected from plague via an experimental F1 antigen vaccine; (2) measuring the effects of flea vectors on host mortality by controlling vectors through the application of a pyrethroid, DeltaDust; (3) testing the efficacy and longevity of DeltaDust by tracking flea abundance on host species; and (4) field-testing the efficacy of the F1 experimental vaccine.

Preliminary data indicate that vaccine improved survival of brush mice (*Peromyscus boylii*) by 66% at one plot without demonstrating any benefit for brush mice at a second plot with similar treatment. Survival was higher in short-tailed *Peromyscus spp.* on dusted plots than non-dusted plots. Control for vectors and plague vaccinations may improve survival of small mammals and interdict plague transmission.

The Classification and Identification of Northern New Mexico Chironomids using DNA Barcoding and HSP70 Gene Sequencing

Saul Ruiz, Sebastian Medina, Dr. Sarah Corey-Rivas
New Mexico Highlands University Biology Department Undergraduate Student, Biology Department Masters Student, Biology Department Professor

Abstract: Chironomid species have often been identified painstakingly through the use of morphological characteristics, yet very few of them have been genetically described. In order to identify and classify Chironomids in northern New Mexico, we will use a DNA barcoding method. The CO1 mitochondrial gene will be amplified using PCR and sequenced to compare with NCBI Genbank Chironomid genetic data for identification. We will also look for population intra-interspecific variations among Chironomids under different environmental selection pressures by sequencing the heat shock protein gene, HSP70. HSP70 is an important stress-response gene that is up regulated upon exposure to heavy metals, though responses to chronic metal exposure in the wild have gone mostly unstudied. HSP70 sequences will be analyzed to determine if mutational differences occur between Chironomid populations in copper

contaminated and copper free lakes. The use and development of a DNA barcoding protocol will help rapidly identify species from this area in the future and aid in further use of Chironomid species as bioindicators of environmental health.

Analysis of Phosphate Retention on a Biochar Amended Agricultural Southwestern Soil.

Erika F. Guaba[1], David M. Sammeth[1], Craig Conley[2].
[1] Department of Biology and Chemistry, NMHU
[2] Department of Natural Resource Management, NMHU

Global warming, food security, oil demands, water pollution and soil degradation continue to be topics of great importance around the world today. Due to the astonishing population increase in the past century, more research has been focused on strategically solving some of these problems in a more renewable way. Biochar, more commonly known as pyrolyzed biomass (charcoal), has been speculated to act as a source for the increase of soil fertility, furthermore acting as a key facilitator of plant nutrients such as phosphorus. Addition of biochar has been proven to increase soil fertility, cation exchange capacity, as well as total organic carbon in acidic soils. There has been little to no research on the efficacy of biochar and nutrient retention on alkaline soil such as the ones the Southwest offers. For twelve weeks 12" PVC columns filled with a sandy clay loam soil and amended with 0%, 1%, 3%, and 5% Pinon biochar were drenched with a 0.211M P_2O_5 solution and leached to determine the impact of phosphate retention in soil. Total phosphorus, ortho-phosphorus and organic phosphorus retention in the columns was determined. Total phosphorus showed the ability to retain up to 20 ppm more in the 5% biochar/soil mixture, than in contrast with the 0% biochar/soil mixture. Ortho-phosphate retention rates increased up to 30ppm as percentage of biochar increased. Both total and ortho-phosphate concentrations followed a decreasing linear relationship. Retention rates on organic phosphorus did not follow a linear relationship.

How Cations Acting As Structural Directing Agents Affect The Fluorescence Of Metal-Organic Frameworks

Carlos Ordonez[1], Jennifer Lindline[2], Qiang Wei[1] and Tatiana Timofeeva[1]
Department of Biology and Chemistry[1], Environmental Geology[2], New Mexico Highlands University

The use of highly structurally engineered nano-materials has become extremely important in both the industrial side of chemistry and the academic side of chemistry. The need for nano-technology has increased exponentially in the past decade with the innovation of technology used for drug delivery, gas storage, light emitting materials, chemical separation, and even semiconductor materials. Metal-Organic Frameworks (MOFs) are such type of nanoporous materials that composed from coordination interactions between organic ligands as connectors and metals or metal cluster as nodes. During the past two decades, scientists have not only utilized reticular chemistry to form thousands of MOFs with highly accessible porous structures, but also learned to predict and control the topology of the framework, and functionality arisen

from the framework. In this talk, we will present what the reticular chemistry it, how it is utilized in the MOFs materials, and how we use the reticular chemistry concept in our research. A family of MOFs, which are all composed by Zn^{2+} ions as nodes and organic ligand 1,3,5-benzenetricarboxylic acid (BTC) as connector, and cations such as ammonium as structural directing agents will be presented. More than 14 new crystal structures belonging to this family have been analyzed using X-ray single crystallography at NMHU, and will be discussed in this talk. From crystallography studies, we have observed that the forming hydrogen-bonding capability of cations can significantly affect the frameworks of the Zn-BTC based MOFs. When cations have 4 hydrogen-bonding sites, only one-dimensional chain of Zn-BTC structure is obtained, when cations have 3 hydrogen-bonding sites, a two-dimensional layer of Zn-BTC is produced, however, when cations have two or less hydrogen bonding sites, the three-dimensional framework structures are generated. All the Zn-BTC MOFs show strong solid-state fluorescent emission in the visible spectrum, the observed structural changes caused by the cations furthermore provide us a path to control the emission light wavelength, that is, when cations have more hydrogen bonding interactions with Zn-BTC frameworks, it results to emit light in more violet region of the spectrum, while having less hydrogen bonding with frameworks results the emission light wavelength shifted to the longer wavelength or to more blue region. Furthermore frameworks with no hydrogen bonding or electron donor molecules emitted light even further in the longer wavelength into green region. We also applied X-ray Powder Diffraction to analyze the phase purity of the MOFs materials in this research.

THE HERMIT'S PEAK GRANITE: SYNKINEMATIC PLUTONISM AT 1.70 GA IN THE LAS VEGAS RANGE, NM

Danielle Nicole Cedillo* and *Jennifer Lindline

Environmental Geology Program, Natural Resources Management Department, New Mexico Highlands University, P.O. Box 9000, Las Vegas, NM 87701, U.S.A.

The Hermit's Peak granite (HPG) is a 1.70 Ga biotite-granite that is exposed in the Las Vegas Range of the southern Sangre de Cristo Mountains, northern NM. The HPG is located within the Yavapai province within a broad area that records both Yavapai and Mazatzal deformation – the Yavapai-Mazatzal transition zone. The goals of this study are to map mineral, textural, and structural variations throughout the Hermit's Peak granite in order to address its size and shape, how it was emplaced, and how it figures into the assembly of Proterozoic provinces. This tabular, northwest-trending pluton covers approximately 32 km^2 of the central Las Vegas Range. The HPG intrudes Paleoproterozoic metamorphosed country rock at the western and northern most extents, with a moderate to strong foliation dipping, on average, to the SW. Along its eastern and southern exposures, the pluton is juxtaposed against Pennsylvanian aged sedimentary units along the Hermit's Peak thrust fault. The composition of the Hermit's Peak ranges from syenogranite to monzogranite. Fabric development is defined by an alignment of biotite and is variable across the intrusion, but is generally strongest at the margins and weakest in the center. Several criteria support emplacement of the HPG during deformation, including: parallelism between the pluton and country rock foliation; aligned euhedral biotite crystals; aligned and subhedral feldspar crystals; straight to moderately undulose intergranular quartz; and

predominance of curviplanar feldspar-quartz grain boundaries. These data are most consistent with the synkinematic emplacement of the HPG during Proterozoic province assembly.

Paleomagnetic, Anisotropy of Magnetic Susceptibility, and Structural Data Bearing on Magma Emplacement and the Growth of a Miocene, Cinder Cone.

Brister, A.[1], Petronis, M.S.[1], Lindline, J.[1], van Wyk der vries, B.[2], Rapprich, V.[3]
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Recent studies on rifts zones suggest that cinder cones evolve through the growth of a complex magma plumbing systems. Due to their modest geometry, cinder cones have been commonly perceived to form by a single eruption from a single feeder dike. However, feeder dikes are rarely studied and their remains are easily eroded. Understanding the fundamental system of how magma is redistributed in the Earth's crust and how cinder cone volcanoes evolve is difficult, as most outcrops are usually restricted to cliffs, ravines and anthropogenic sites. This research will study the complexity of volcanic substructures at the exposed roots of a cinder-spatter cone associated with the middle Miocene Jičín Volcanic field in the northeast Czech Republic, Eastern Europe. The approach of study is to prepare a detailed map of the Trosky Volcano based on a collection of structural and geophysical techniques to determine how the magma flowed through and from the volcano. Data from field (e.g. geologic mapping and macroscopic observation) and laboratory methods (petrography, paleomagnetism, anisotropy of magnetic susceptibility (AMS), and rock magnetic data) will provide new insights on the history of Trosky Volcano by determining the relative sequence of volcanic events. Field mapping of the area has revealed that there are many distinguishable volcanic features such as two eruptive vents, dikes, lava flows, Lava tubes, and bombs. Each of the volcanic features are unique and they offer indications of its eruptive past. The AMS directional data yields a magnetic fabric from sub-vertical to sub-horizontal with a sense of NE-SW to NW-SE. Most samples have a high susceptibility with an ellipsoid shape that is predominantly Lineated and prolate. Majority of the sample reveal a reverse polarity with one or two component magnetization. The dominant magnetic mineral phases are hematite and pyrrhotite. The Trosky Volcano offers an exceptional opportunity to apply focused geophysical techniques to interpret the complex formation process of the internal magmatic plumbing system.

Faculty Poster Presentations (listed by department; alphabetical order)

Achieving in Research Mathematics & Sciences (ARMAS)

SUPPLEMENTAL INSTRUCTION AT ARMAS

Russell Baker, Elizabeth Ratzlaff, Monique Esquibel and Edward Martinez
ARMAS In Education Center at New Mexico Highlands University, Las Vegas NM, 87701

Developed by Dr. Deanna Martin in 1973 at the University of Missouri at Kansas City, Supplemental Instruction (SI) is an academic assistance program that increases student performance and retention. Today, over 2000 institutions in over 29 countries have implemented the Supplemental Instruction Program at their respective colleges and universities. Since 2009, ARMAS in Education (Achieving in Research, Math and Science) at New Mexico Highlands University (NMHU) has joined this international movement. In particular, SI at NMHU has targeted STEM (Science, Technology, Engineering and Math) gateway courses that students are required to pass before entering upper division courses in most of the STEM disciplines.

One of the major principles of SI is program evaluation. After every semester, a summary report is issued that highlights student outcomes. One of the major measurements examined is completion rates for each course. In particular, student completion rates are registered with grades of A, B or C and compared against the marks of D, F and W. Data collected, both cumulative and from the Fall 2014 semester, will demonstrate that the SI program provided by the ARMAS in Education Center has had an overall positive impact on student success in STEM gateway courses.

ARMAS Internship Program

Monique Esquibel, Elizabeth Ratzlaff, Russell Baker, Edward Martinez
ARMAS in Education Center at New Mexico Highlands University, Las Vegas NM, 87701

ARMAS (Achieving in Research, Math and Science) in Education has provided grant funded internship opportunities to upper level science, technology, engineering and math (STEM)students and research fellowships to incoming freshman STEM students since Fall of 2010. Internships enable students to earn money in their field of study while gaining experience and building community partnerships. The semester and summer internships are related to students' future career choice there by allowing students to experience work in their field of study prior to making a career choice. These internships allow students to make informed decisions about their future. The undergraduate research fellowships are Paid faculty-lead research and mentoring opportunities for STEM students early in their academic careers.

Since 2010 a total of seventy five student intern and fellowship combined have been placed with faculty and thirty two area partner-agencies. ARMAS in Education community partner include but is not limited to the US Forest Service, Las Vegas Fish and Wildlife Refuge and Hermits Peak Watershed Alliance. Over the past thirteen semesters, these partners have enriched the lives of the interns with specific professional skills and experiences.

ARMAS: Five Years Of STEM Student And Faculty Support

Elizabeth Ratzlaff, Monique Esquibel, Russell Baker, Edward Martinez
ARMAS In Education Center, New Mexico Highlands University, Las Vegas, NM 87701

The Achieving in Research, Math and Science (ARMAS) Center opened in October 2009 with funding provided by the US Department of Education. Student services include Supplemental Instruction in STEM gateway courses, academic coaching to support students in achieving their

academic goals, math tutoring, a textbook lending library, and support for identifying undergraduate research and internship opportunities and assistance in identifying and applying for scholarships. Additionally, the ARMAS Center provides STEM faculty support by providing professional development workshops. Data on student use of the Center was compiled from sign-in sheets for six semesters and an electronic ID scanning system was piloted in the Fall 2013. Data on ARMAS Center utilization indicate that the number of students using the Center has increased dramatically from 116 registered students in the first semester to 430 students in Fall 2013 (370% increase). In the same period from Fall 2009 to Fall 2013, the number of STEM majors has increased from 242 to 312 (128% increase) and the ratio of underclassmen STEM majors to upperclassmen STEM majors has increased from 0.67 (63/93) to 0.73 (87/119). Results on retention and graduation show that STEM majors who participate at ARMAS are 3.8 times more likely to graduate with STEM degrees or still be enrolled in STEM majors compared to STEM majors who do not participate at ARMAS ($p<.01$). To date, twelve faculty professional development workshops have been sponsored which focused on enhancing faculty skills in the areas of working with diverse students with a wide range of academic preparation, active learning techniques, alignment of assessment and learning objectives, and STEM strategic planning.

Department of Natural Resources Management--Environmental Geology

Emplacement of Zebín Hill, Jičín Volcanic Field, Bohemian Paradise, Czech Republic

Petronis, Michael[1]; Rapprich, Vladislav[2]; Valenta, Jan[3], Brister, Adam[1]; Lindline, J[1], van Wyk de Vries, Benjamin[4]

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The Jičín Volcanic Field, Czech Republic preserves a well-preserved set of Middle Miocene scoria- and tuff-cones and their feeders. Zebín Hill is a tuff cone that has been quarried to reveal the volcanoes feeder system. This edifice offers the opportunity to understand how magma is transported through a monogenetic pyroclastic cone. Rock types include a coarse-grained basal phreatomagmatic layer and a stratified upper wall facies both of which are penetrated by feeder dikes. The character of magmatic fragments suggests quench fragmentation during a phreatomagmatic eruption. Anisotropy of magnetic susceptibility (AMS) data were collected at twenty-one sites from feeder dikes and the main conduit of the volcano. Magnetic susceptibility intensity ranges from $100E^{-3}$ to $300E^{-3}$ SI indicating that the dominant magnetic mineral is a ferromagnetic phase with little contribution from paramagnetic minerals. AMS ellipsoids shapes are both oblate and prolate with the shape varying across the intrusions. Curie point estimates

yield a spectrum of results indicating a mixture of magnetic minerals from high-Ti titanomagnetite, iron sulfide, and low-Ti titanomagnetite. The AMS inferred magma flow directions yield flow away from the central vent area and subhorizontal flow towards and away from the axial conduit; both upward and downward magma flow is evident at some sites. Paleomagnetic data reveal a high coercivity normal polarity magnetization that varies spatially between the sampled sites. We interpret these data to indicate that subvolcanic deformation occurred during the emplacement of the dikes; although we can not rule out the possibility that the dispersion between sites represents secular variation. We find this unlikely given the short lived emplacement time scale ($< 10^1$ yrs) for the growth on monogenetic volcanoes. The simple external structure of cinder cones hides a rather complex magmatic plumbing system that continues to evolve during the life of the volcano. The growth of many volcanoes occurs not due to a simple central axis feeder system but rather through interplay of local structures, magmatic effects, and constructs evolution throughout the life time of the volcano. The comparison between structural observations, paleomagnetic, and AMS show that these methods provide valuable complementary data on dike propagation and subsequent magma flow.

Student Poster Presentations
(listed by department; alphabetical order)

Biology and Chemistry

The Response of Snapping Turtles (*Chelydra serpentina*) Population to Bullfrog Removal in the Mora River of Northern New Mexico

Adrian Carter and Jesus Rivas
NMHU Department of Natural Sciences

Snapping turtles (*Chelydra serpentina*) are not well studied in New Mexico, and they have not been studied with relation to invasive species in Northern New Mexico. Recently, there have been many studies on herpetofauna and their responses to the invasive American bullfrog (*Lithobates catesbeianus*) along the Mora River at the Rio Mora National Wildlife Refuge. In a past study, bullfrogs were eradicated experimentally for a basis to learn about their impacts on native species. Snapping turtles live in the same habitats as bullfrogs and their hatchlings are potentially prey for bullfrogs. After bullfrogs eradication we have found neonate snapping turtles while no neonates were seen in the area where bullfrogs are still present. So I surmise that bullfrogs may have an impact on the population of snapping turtles. In this study I will evaluate the behavior and abundance of both adult and juvenile snapping turtles in response to the presence or absence of bullfrog. I will equip 8 snapping turtles with ATS radio telemetry transmitters and follow them for the next year documenting their preferred habitat, mating and nesting grounds. I will also perform systematic mark and capture throughout the summer to understand their demography and distribution. Understanding the habitat that snapping turtles select will help land managers incorporate protection of these habitats for this unrecognized and

elusive species.. Not only will this study provide baseline data on the behavior of snapping turtles in this region, it will provide a better understanding of the interactions between invasive and native species.

Prospective Charge Transfer Complexes of Trimeric Perfluoro-*o*-Phenylene Mercury and Electron-Donor Compounds

Raúl Castañeda[1], *Sergiu Draguta*[1], *Andrey Yokovenko*[2], *Marina Fonari*[1], *and Tatiana Timofeeva*[1]

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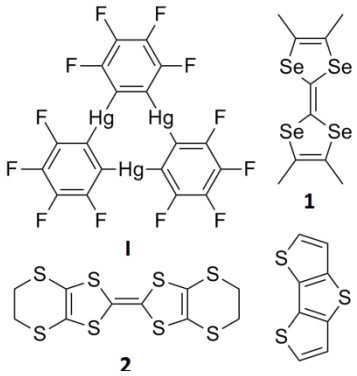

Figure 1, chemical structure of used compounds

Trimeric perfluoro-*o*-phenylene mercury (**I**, Figure 1) is a versatile electron acceptor which form complexes with different π-conjugated systems such as benzene, carbazole, azulene, polyenes and corannulene [1-5]. Using macrocycle **I** as a conformer it is possible alter physical properties as emission spectra[4], or chemical stability[5] of these π-conjugated systems. In continuation of our project in this field, adducts with the electron donor compounds tetramethylselenafulvalene (**1**), bis(ethylenedithio)tetrathiafulvalene (**2**), and dithienothiophene (**3**) (Figure 1) with macrocycle **I** were obtained. Liquid-liquid diffusion was used to make complex (**I**·**1**); **I** was dissolved in ethyl acetate and **1** in pure carbon disulfide. The complex (**I**·**2**) was obtained by slow evaporation of mixture **1** and **2** in carbon disulfide. Using different solvent environment it was possible to obtain two different pseudo-polymorphs of **3**, one with dichloromethane (**A**) and another one with dichloroethane (**B**). By slow evaporation of dichloromethane solution of **1** and **3** complex (**I**·**3**·**A**) was obtained. Using a 1:1 mixture of carbon disulfide and dichloroethane solution of **1** and **3** the second pseudo-polymorph (**I**·**3**·**B**) was obtained. All structures of crystalline adducts were characterized with X-ray diffraction. Most adducts form in crystals molecular stacks with alternating positions of donor and acceptor molecules. Such mixed stacks might be favorable for manifestation of charge transfer properties.

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4. A. S. Filatov, E. A. Jackson, L. T. Scott and M. A. Petrukhina, Angewandte Chemie International Edition **48** (45), 8473-8476 (2009).
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Estimating Abundance of Rocky Mountain Elk (*Cervus elephus*) using fecal transects

Wacey Cochise, Jesús A. Rivas

Elk (*Cervus elephus*) density varies across the landscape depending on the habitat and its management. Elk by and large roam free through New Mexico so areas with good habitat and good management have higher densities of elk. Elk hunting can be quit lucrative of an activity. Areas where management has lead to increase of elk population can increase in revenues due to sport hunting fees. For this project, I estimated relative abundance of elk in different parts of the Mescalero Apache Indian Reservation in southern New Mexico, with the aims to determine what areas are better for elk management. I used fixed width transects to estimate the fecal standing crop in 40 transects located in three different habitats on the reservation. The three different types of habitat are mountains that have forests ponderosa pine trees, Douglas fir trees, aspen trees, and oak trees. Another type of habitat is prairie that has small hills with juniper and piñon trees. Other type of habitat is foothills that have ponderosa, oak, and douglas fir trees. Areas with high amount of forest seem to sustain higher density of elk on the reservation. I expect to see a high density of elk in the foothills due to the fact that it contains food, water, shelter, and space which are the key essentials for elk to survive.

Acute effects of vitamin B-12 on human cerebral blood flow

Cognasi TR, Garcia AM, Shrestha K, Greene ER
Biology and Chemistry, New Mexico Highlands University, Las Vegas, NM

Vitamin B-12 regulates substances, such as homocysteine, that can affect the human cardiovascular system. Chronic consumption is known to modulate endothelial function and may change cerebral hemodynamics. Nevertheless, the acute effects of vitamin B-12 on human cerebral blood flow have not been reported. Accordingly, we tested the hypothesis that vitamin B-12 will modulate resting cerebral blood flow. In 12 healthy young adults (20±3 yrs, 6 male/6 female) we used noninvasive duplex ultrasound (3 ms; 0.07 mm; 40db: time, space, and dynamic resolutions; respectively) to measure internal carotid artery blood velocities (BV) lumen diameters (LD). Internal carotid (hemispheric cerebral) blood flow (CBF, ml/min) was calculated as the product of lumen area and BV [$(\pi \times (LD^2)/4 \times BV)$]. Control (supine, resting, and fasting) CBF was calculated and compared to values obtained 15 and 30 minutes post consumption of 1000 mcg of sublingual liquid vitamin B-12. Noninvasive heart rate (HR), mean blood pressure (MBP), and cerebral vascular resistance (CVR=MBP/CBF) were also determined (mean/SD; with $p<0.05$ versus control as significant).

	HR (bpm)	MBP (mmHg)	CBF(ml/min)	CVR(units)
Control	66/11	92/10	420/110	0.23/0.06
Post (15 min)	67/13	94/10	436/121	0.23/0.07
Post (30 min)	66/14	91/11	420/115	0.23/0.09

Preliminary results suggest that a singular, acute 1000 mcg dose of vitamin B-12 does not significantly affect human CBF. Future studies will be needed to determine the effects of chronic or higher doses of vitamin B-12.

Finding GOLGA3 targets: certifying transcriptomic data by analyzing protein expression in *Golga3*^{repro27} mice.

Chrys Djatche de Kamgaing and Carol Cutler Linder, Department of Biology and Chemistry

Genetic defects and environmental insults both contribute to human infertility, a phenomenon that affects approximately 15% of couples trying to conceive. In males, the causes of infertility are often not known and are hypothesized to be genetic in nature. Homozygous *repro27* mice have a genetic mutation in the *Golga3* gene and are completely infertile showing defects in sperm development. GOLGA3 is a Golgi complex protein important in sorting and processing proteins destined for secretion, the lysosome, or the plasma membrane. GOGLA3 and the Golgi also play a role in apoptosis but its role in the testes is still unknown. In the absence of GOLGA3 germ cells die during late meiosis during the first wave of spermatogenesis and surviving germ cells develop abnormally. We hypothesize that in the absence of GOLGA3 proteins, the expression of other proteins within the developing germ cells is altered. Identification of these proteins will increase our understanding of the role of GOLGA3 in spermatogenesis. Previously, we used RNAseq transcriptome sequencing to identify a panel of differentially-expressed genes between repro27 mutant and wildtype testes at 14 days of age (mid-meiosis). This project will use western blotting to examine the protein expression of these genes to certify this transcriptomic data. Protein will be isolated from *repro27* mutant (n=3) and control testes (n=3) at various ages (10 days, 12 days, 14 days, and 70 days), quantified, and protein expression of COX-2, KRT-15, CUZD1, and NGF1-B analyzed by western blotting. Preliminary data showing results from experimental and antibody optimization will be reported.

Acute effects of walking on human cerebral blood flow

Garcia AM, Cognasi TR, Shrestha K, Greene ER
Biology and Chemistry, New Mexico Highlands University, Las Vegas, NM

Due to technical limitations of measuring systems, human cerebral (brain) blood flow was considered to be highly regulated and relatively constant. New data now strongly suggest that brain blood flow is very dynamic and depends directly on cyclic aortic pressures that interact with retrograde pressure pulses from foot impacts. Recently, we and others have published that ergometer exercise (bicycle, no foot impacts) increases human cerebral blood flow. We also have reported that running, with relatively high foot impacts (4-5 G forces), dramatically modulates brain blood flow with the complex interaction of central

aortic pressures and stride rates. Surprisingly, the effects of walking (minimal foot impacts and G forces) on cerebral blood flow have not been reported. Accordingly, we tested the hypothesis that walking modulates cerebral blood flow. In 12 healthy young adults (20 ± 3 years, 6 males/6 females) we used noninvasive duplex ultrasound (3 ms, 0.07 mm; 40db: time, space, and dynamic resolutions; respectively) to measure internal carotid artery blood velocities (BV) and lumen diameters (LD). Internal carotid (hemispheric cerebral) blood flow (CBF, ml/min) was calculated as the product of lumen area and BV [(π x (LD^2)/4 x BV)]. Control (upright, resting, and fasting) CBF was calculated and compared to values obtained during steady state walking at 1.0 m/s and 2.0 m/s. Noninvasive heart rate (HR), mean blood pressure (MBP), and cerebral vascular resistance (CVR=MBP/CBF), were also determined (mean/SD; with * = $p<0.05$ versus control).

	HR (bpm)	Mean BP (mmHg)	CBF (ml/min)	CVR (units)
Control	75/16	97/10	449/155	0.24/0.09
1.0 m/s	87/16*	93/10	558/204*	0.20/0.11*
2.0 m/s	94/19*	94/10	602/205*	0.18/0.07*

Preliminary results suggest that relatively low foot impacts during walking significantly affect CBF. Waveform morphology is dependent on the timing convolution of the heart rate and stride rates. Thus, there is a continuum of hemodynamic effects on human brain blood flow within pedaling, walking, and running. These activities may optimize brain perfusion, function, and overall sense of well being during exercise.

Annotation of Fosmid Contig 13 of *Drosophila biarmipes* with Comparison to *Drosophila melanogaster*

Jones, A.Y. and Shaw, M.E.
Department of Biology and Chemistry

Annotation is important because it can help us understand genomic evolution, adaptation, and conserved function (Kwong 2010). Although there are a number of computerized annotation programs, manual annotation needs to be completed also because there can be many errors in the automated sequences. Comparing the sequences obtained for species of interest to those for other species is also important because that helps determine the similarities and differences between the sequences. Annotation programs such as: Gene Model Checker, BLAST, and Flybase are all helpful tools in completing annotation of *Drosophila* genomes and give relevant information on all aspects of genome sequence. These programs were used to annotate a fosmid of the *D. biarmipes* dot chromosome, contig 13, for this project. One potential gene, CG-31999, has been identified by comparison to *D. melanogaster* sequence and similarities in gene order and structure were determined. Many Genomics Education Partnership (GEP) students are working on other fosmids of *Drosophila biarmipes*, and my research results will be combined with material that they are collecting to annotate the entire dot chromosome. There are many different species of Drosophila and annotation of representative species will show genetic evolution among species. This research will also help scientists understand differences in heterochromatin structure and function because the dot chromosomes of different *Drosophila* species have differing amounts of heterochromatin and euchromatin-like structures.

X-ray Single Crystal Analysis of *n*-Type Metallocene Dopants for OTFTs and Other Applications

Evgheni Jucov[1], *Siyuan Zhang*[2], *Benjamin D. Naab*[3], *Zhenan Bao*[3], *Stephen Barlow*[2], *Seth R. Marder*[2], *Tatiana V. Timofeeva*[1]

[1] Department of Biology and Chemistry, New Mexico Highlands University, Las Vegas, NM
[2] Department of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, GA
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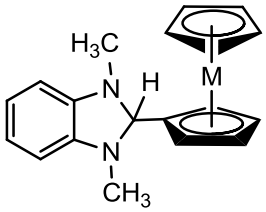
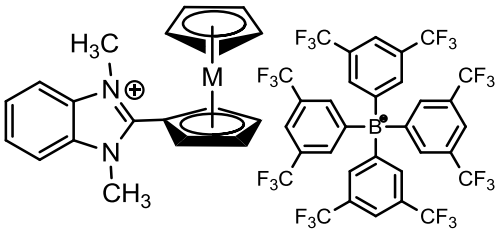
Two ferrocene and two ruthenocene substituted compounds were investigated with X-ray single crystal analysis. These compounds represent a series of new benzimidazole-based *n*-type metallocene dopants, which can be used to dope a variety of semiconductors for organic thin-film transistors (OTFTs) and other applications. They react (faster than similar air-stable organic dopants) with a variety of electron-transport materials, including fullerenes and perylene diimides, to form the corresponding radical anions and monomeric benzimidazolium cations.



1 (M = Fe)
3 (M = Ru)



2 (M = Fe)
4 (M = Ru)

All compounds except **4** have two crystallographically independent molecules in the asymmetric units. Compounds **1** and **3** crystallize in monoclinic $P2_1/c$, but **2** in triclinic P-1 space groups. The angles between the planes formed by benzoic fragment of benzo[d]imidazole and Cp rings of ferrocene lie in the range of 89-108° for **1**, and 30-41° for **2**, that can be explained by the conjugation between benzo[d]imidazole and ferrocene moieties. Ruthenocene substituted compound **4** crystallizes in monoclinic $P2_1/n$ space group. The angle between the two Cp planes of ruthenocene in both compounds **3** and **4** is equal to 5°. The angles between the planes formed by benzoic fragment of benzo[d]imidazole and Cp ring of ruthenocene are equal to 76° and 85° for **3**, and 37° for **4**. Fluorine atoms from one of the anion's CF_3 groups of **4** are disordered over two positions with the occupancies 0.746(3) and 0.254(3).

Acknowledgement: We are grateful to NSF DMR-0934212 (PREM).

Minimum Concentration of American Bullfrog (*Lithobates catesbeianus)* Antimicrobial Peptides Required for Bacteria Inhibition

Lovato, EA, Bentson, L, Plunkett, RM, Shaw, M
New Mexico Highlands University –Department of Biology and Chemistry

Antimicrobial peptides were extracted from the American bullfrog to determine the minimum concentrations of crude protein required to inhibit growth in the following gram-positive and negative bacteria: *Escherichia coli, Pseudomonas fluorescens, Serratia marcescens, Bacillus megaterium, Micrococcus luteus,* and *Staphylococcus aureus*. Absorbency (A_{540}) was used to determine the minimum concentration of crude protein required to inhibit the growth of the bacteria. Previous research shows growth inhibition when AMPs from the American bullfrog were tested against *E. coli* and *S. aureus* (Goraya *et al.*, 1998). Based on previous research that confirmed inhibition for these preliminary gram-positive and gram-negative bacteria, *E. coli* and *S. aureus* it was hypothesized that there would be similar inhibition trends for the additional bacteria tested in this research project. The minimum concentration of AMPs required to inhibit bacteria growth was 0.40 μg/μL. However, only *E. coli, S. marcescens,* and *S. aureus* were inhibited by this extract.

Conservation Genetics In A Cattle-Bison Hybrid Herd At Rio Mora National Wildlife Refuge

Eliza Montoya, Sarah Corey-Rivas, Lisa McBride, Wacey Cochise
Department of Biology & Chemistry, New Mexico Highlands University

North American Bison, *Bison bison*, are a conservation focus for ecologists because of their important role as a keystone species in prairie ecosystems and their long history of population decline. Bison hybridization with domestic cattle in the 1900's has resulted in low levels of cattle genetic introgression that may impact bison fitness in North American landscapes. In this study, we analyze bison mitochondrial DNA to detect any bison-cattle hybridization in a conservation herd located on the Rio Mora National Wildlife Refuge. MtDNA amplification is performed through PCR and sequencing, with post-sequencing analysis using BioEdit and MEGA. MtDNA sequences are compared to a database of bison and cattle sequences to identify hybrids. So far we have identified three hybrid individuals of the 37 total bison sampled. Sequencing of the MtDNA D-loop will be conducted for 15-20 additional individuals to complete the hybrid survey of the herd. Identifying MtDNA hybrid bison will allow for better management of this conservation herd including preserving *Bison bison* lineages that may be associated with higher fitness in prairie ecosystems.

Acute effects of a commercially available energy drink on human arterial endothelial hormonal function

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Commercial energy (stimulant) drinks contain substances (mainly high dose caffeine and additives) that affect the human cardiovascular system. The specific effects of these vasoactive agents on the inside lining (endothelium, a large paracrine organ) of the human major arteries are unknown. Hormones from the arterial endothelium affect arterial diameters and thus systemic blood pressure and blood flow to distal organs. We tested the hypothesis that a popular, commercially available energy drink (Five Hour Energy Drink) decreases human endothelial hormonal function. In 5 healthy young adults (24±3 yrs, 3 female) we noninvasively measured (10 MHz, 2D ultrasound, 0.08 mm axial resolution) mean brachial artery lumen diameters (mm) before (control, LDC) and after (hyperemic, LDH) a 5 minute, proximal, arterial occlusion. This technique, flow mediated dilation (FMD), is a standard, well validated index of shear stress activation of endothelial paracrine release of systemic vasodilators (mainly nitric oxide). FMD (% change) is calculated as: (LDH-LDC)/(LDC)x 100. FMD is linearly related to increased endothelial hormonal function. A low FMD is a significant risk factor for systemic atherosclerosis, and FMD decreases with age. Resting, fasting, supine FMD (pre) was measured and compared to identical FMD measurements 20 minutes after (post) consumption of 57 ml of the stimulant. Noninvasive heart rate (HR) and mean blood pressure (BP) were measured (mean/SD; with * = $p<0.05$ post versus pre; #= $p<0.05$ LDH versus LDC).

Stimulant	BP (mmHg)	HR (bpm)	LDC (mm)	LDH (mm)	FMD (%)
Pre	78/13	58/10	4.19/0.29	4.64 /0.31#	10.3/3.3
Post	89/13*	57/11	4.27/0.31	4.50/0.22#	5.5/2.4*

Preliminary results suggest that acute intake of a highly consumed (9 million/week) energy/stimulate drink (215mg caffeine) significantly decreases endothelial hormonal function and vasodilatation (as indexed by FMD). Thus, it may decrease blood flow. Chronic consumption may have significant physiological and pathophysiologic consequences.

DETERMINATION OF TOXIC ARSENIC IN RICE AND RICE-CONTAIING FOOD PRODUCTS

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Arsenic is an chemical element which is toxic for human health if it is ingested or swallowed. Recently, there have been tremendous concern by the public over the arsenic level in various rice and rice containing products. In this project, I will be working on different kinds of rice from different places. My goal is to find out if all rice contains Arsenic in it and what rice has more Arsenic. I will be using the method of Atomic Absorption Spectroscopy (AAS) which is a technique that will help me to determine the concentration of Arsenic in rice samples. Finding concentration in each rice can help us to predict how much Arsenic people are

consuming a day once they know where the rice comes from and what rice is mostly consumed from a particular place, and hence to take necessary precautions. The association called Food and Drug Administration has pointed out that even a small portion of Arsenic in rice (one- millionth of a gram = 1 microgram), namely, 1ppm, might be harmful to consumers once they are exposed to it for a long time. Last December, the Consumer Reports puts out recommendation for FDA to issue guidelines for diversifying grains in diet and moderating rice consumption.

Synthesis of Anti-Oxidant Compounds Derived From Arginine

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It has been reported that modified arginine compounds, particularly methylglyoxal-derived hydroimidazolones (MH) have shown antioxidant properties, but also that its oxidation leads to the formation of non-beneficial elements for the good functioning of cells. This research is directed toward determining if modification of the easily hydrolyzed amide bond in this arginine derivative will yield a more stable compound that shows similar antioxidant properties. The synthesis and analysis of this modified compound is underway. The synthetic plan and progress, as well as the anticipated evaluation of the reducing properties of these derivatives will be presented.

Scientific Research Experience In Chemistry Class

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In Chemistry department of NMHU, we have established and continued a laboratory based project driven Chem419/519 class. This class is dedicated to guide and train students on how to conduct a scientific research project. In this class, students will be assigned a research topic, and will conduct independent research on that topic and use modern instrumental/analytic methods, such as spectroscopy, chromatography, mass spectrometry, and electrochemical techniques etc. His or her project includes designing experiments, analyzing samples, collecting reliable results, interpretation the data, and finally presenting the results of their work. In this poster, we will give an brief introduction of the Chem419/519 class, and analytic instruments that involved in the research projects, and we will also present three current conducting research topics from the class which will cover the background of the research, the experimental design and some preliminary results from the experiments. The presented research topics are:

1. Applying Cations As Structural Directing Agents To Affect The Fluorescence Of Metal-Organic Frameworks, which is conducted by graduate student Carlos Ordonez
2. Synthesis Phenolphthalein Based Organic Ligands And Applying Them Into Porous Materials, which is conducted by graduate student Bikuram Thapa
3. Capillary Electrophoresis Study Using A MOF-Gel, which is conducted by graduate student Marie-Josiane Ohoueu.

Some Expected and Unexpected Results from Co-Crystallization Crystal Growth of Acetaminophen and Piperazine

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Co-crystallization brings new opportunities for modification of physical and physic-chemical properties of pharmaceutical without alteration of their bioactivity. In attempt to find new prospective ways of improvements for formulation of known pharmaceuticals studies of two series of co-crystal were carried out. One series included crystal growth of Acetaminophen with defferent organic coformers, and the second series included piperazine with several coformers. Acetaminiphen (paracetamol, Tylenol®) co-crystals were tested since numerouls literature data supported that acetaminophene is prone to co-crystals formation.

Acetaminophen cocrystallization was carried out with 1) Pyridine dicarboxylic acid hydrate; 2) Phenyl-2,4-Dinitroaniline; 3) Piperazine hexahydrate; 4) 2-4, Pyridine dicarboxylic acid dehydrate; 5) Quinoline ; 6) 2-Chloroquinoline; 7) 6-Chloroquinoline.

In all the above trials they were mixed in a 1 to 1 molar mixture in solution with ethanol as solvent. Once a suitable crystal was grown, single crystal X-rays studies were obtained and data analyzed to observe the co-crystallization results. For this series ascetaminophen – piperazin cocrystal was obtained.

Studies of the second series of co-crystals combining piperazine with several organic coformers are in progress.

Characterization of MHC Allelic Diversity Within a New Mexican North American Bison Population

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North American Bison (*Bison bison*) are of great conservation concern particularly because of a historical bottleneck limiting genetic diversity and their importance as keystone species in the Great Plains. In New Mexico, the Rio Mora National Wildlife Refuge (RMWNF) hosts a bison herd that is the focus of conservation genetics management by NMHU, the Pojoaque Pueblo, and the Federal bison herd system. The functional genetic diversity within this herd and the federal system is an important metric for management and potential resistance to disease. The Major Histocompatibility Complex (MHC) genes represent such functional diversity. MHC genes code for MHC proteins that bind pathogen peptide fragments and display them on the cell surface for recognition by the appropriate T-cells. So essentially these MHC molecules play a vital role as a prime gatekeeper to adaptive immune response. MHC genes are highly polymorphic, containing many variants of each gene within a population, increasing immune response to a multitude of diverse and rapidly evolving pathogens. Increases or decreases in variance in MHC alleles can directly impact the immune response of a specific population and overall fitness. Past studies have clearly linked MHC class IIa polymorphism with resistance or susceptibility to bison diseases including MCF. In this study, DNA from 20 bison in the Rio Mora NWR herd will be collected from scat, hair, and blood samples, along with 20 other samples from Federal Bison herds across the

country. The MHC class IIa gene will be amplified using PCR, sequenced, and analyzed for allelic diversity. Overall, the results will include baseline indications of polymorphism in MHC class IIa within this bison population and in comparison to bison in the federal herds. This study provides a significant contribution to our understanding of uses of MHC for functional diversity quantification and application to management of conservation populations.

Gender differences in human cerebral blood flow during mental tasks.

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Mental tasks increase human cerebral blood flow to meet increased metabolic demands. Although current, portable technology allows noninvasive and dynamic measurements of brain blood flow during mental tasks, gender differences in healthy young adults have not been reported. We tested the hypothesis that there are significant gender differences in human cerebral blood flow. In 12 healthy young adults (21 $\pm$ 2 yrs, 6 males), we used noninvasive duplex ultrasound (3 ms, 0.07 mm; 40db: time, space, and dynamic resolutions; respectively) to measure internal carotid artery blood velocities (BV) and lumen diameters (LD). Internal carotid (hemispheric cerebral) blood flow (CBF, ml/min) was calculated as the product of lumen area and BV [$(\pi \times (LD^2)/4 \times BV)$]. Control CBF (resting, fasting, and sitting) was calculated and compared to values obtained during three standard and relatively undemanding mental tasks: Wisconsin Card Sort (WS); Delayed Alternation (DA); and Mental Arithmetic (MA). Noninvasive heart rate (HR), mean blood pressure (MBP), and cerebral vascular resistance (CVR=MBP/CBF), were also determined (mean/SD; with $p<0.05$ control vs intervention and male vs female).

	HR (bpm)		Mean BP (mmHg)		CBF (ml/min)		CVR (units)	
	Male	Female	Male	Female	Male	Female	Male	Female
Control 1	70/14	75/16	86/16	90/3	431/57	464/99	0.200/0.027	0.202/0.045
WS	75/10	81/17	96/9	96/6	497/67	474/84	0.186/0.036	0.188/0.040
Control 2	68/13	77/14	96/9	91/3	458/74	480/58	0.224/0.044	0.191/0.024
DA	75/14	87/15	96/9	96/13	536/85	491/52	0.195/0.037	0.197/0.030
Control 3	78/10	78/10	96/10	91/11	446/89	453/47	0.221/0.046	0.203/0.025
MA	95/29	89/13	102/12	94/7	515/108	497/59	0.203/0.042	0.190/0.022

Preliminary results suggest that there were no significant gender differences in human cerebral blood flow during mild visual and arithmetic mental tasks. Future studies with greater statistical power should include more demanding and rigorous mental tasks.

DETERMINATION OF ARSENIC CONTENT IN HOT SPRING WATER BY MONTEZUMA CASTLE IN LAS VEGAS

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The concentration of arsenic in hot springs water by a Montezuma Castle in Las Vegas, New Mexico, was determined with Graphite Furnace Atomic Absorption Spectrometer. The analysis was done for 78 water samples from hot springs and Gallinas River. Among 78 water samples 39 of them were total samples and rest of them were filtered samples. The maximum average concentration of Arsenic was 7.51 ppb in total water samples, 7.39 ppb in filtered water sample and all of them were far below 10 ppb adopted by Environmental protection Agency (EPA).Based on our result, it can be concluded that the hot springs water is harmless for hot water bathing and the water of Gallinas River is also safe for providing animals and for irrigation.

The Impact of the Invasive American Bullfrog (*Lithobates catesbeianus*) on Woodhouse Toad *(Anaxyrus woodhousii)* Demographics in the Rio Mora Wildlife Refuge in Northeastern NM

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The introduction of Bullfrogs (*Lithobates catesbeianus*) has a negative impact on native species by out competing them for food and habitat. Woodhouse toads *(Anaxyrus woodhousii)* are among the native species to the Rio Mora National Wildlife Refuge (RMNWR) that co-exists with Bullfrogs. Early on bullfrogs were eradicated from a 2,600 meter section of the Mora River to evaluate the impact of their eradication on the local fauna while a control site of the river was left untouched where bullfrog density did not change. A parallel study on the diet of the euthanized bullfrogs found the presence of Woodhouse toads in their diet. The goal of this project is to investigate the impact of bullfrogs on Woodhouse toads by using three methods to determine differences between the control and experimental sites: (1) Determine abundance via two methods: A) a mark-recapture study demographic parameters (rate of increase, survival, capture rate). Distance sampling using random or systematic transects in the study area; (2) comparison of demographic structure using the animals caught in both sites; and (3) radio telemetry to explore habitat use and mobility of the Woodhouse toad as well as how it is affected by the presence of Bullfrogs.

Acute effects of oral chewing tobacco on human arterial endothelial hormonal function

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Oral chewing tobacco contains substances (mainly nicotine and other additives) that affect the human cardiovascular system. The specific effects of these vasoactive agents on the inside lining (endothelium, a large paracrine organ) of the human major arteries are unknown. Hormones from the arterial endothelium affect arterial diameters and thus systemic blood pressure and blood flow to distal organs. We tested the hypothesis that oral chewing tobacco (Grizzly Pouch) decreases human endothelial hormonal function. In 5 healthy young adults (24±6 years, 0 female), moderate oral tobacco users we noninvasively measured (10 MHz, 2D ultrasound, 0.08 mm axial resolution) mean brachial artery lumen diameters (mm) before (control, LDC) and after (hyperemic, LDH) a 5 minute, proximal, arterial occlusion. This technique, flow mediated dilation (FMD), is a standard, well validated index of shear stress activation of endothelial paracrine release of systemic vasodilators (mainly nitric oxide). FMD (% change) is calculated as: (LDH-LDC)/(LDC) x 100. FMD is linearly related to increased endothelial function. A low FMD is a significant risk factor for systemic atherosclerosis, and FMD decreases with age. Resting, fasting, supine FMD (pre) was measured and compared to identical FMD measurements 10 minutes after (post) administration of 1 Grizzly tobacco pouch (2.31-2.67mg of Nicotine per gram). Noninvasive heart rate (HR) and mean blood pressure (BP) were measured (mean/SD; with * = $p<0.05$ Post versus Pre; # = $p<0.05$ LDH versus LDC).

Stimulant	BP (mmHg)	HR (bpm)	LDC (mm)	LDH (mm)	FMD (%)
Pre	93/5	67/13	4.72/0.60	5.11/0.73#	8.3/3.1
Post	101/6*	74/13*	4.62/0.81	4.87/0.59#	5.1/2.0*

Preliminary results suggest that acute intake of oral tobacco (nicotine) significantly decreases endothelial hormonal function and vasodilatation (as indexed by FMD) and thus may decrease blood flow. Chronic consumption may have physiological and pathophysiologic consequences.

Removal of Invasive Bullfrogs and Their Impact on Ecosystem Trophic Levels

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The Bullfrog (*Lithobates catesbeianus*) is an invasive species in many parts of North America that lacks natural predators creating an imbalance in the trophic levels of an ecosystem. Their introduction negatively affects native species via increased competition for habitat, resources and predation pressure. In a previous study Bullfrogs were eradicated from a section of the Mora River located in northeastern New Mexico, while leaving another section as a control where Bullfrog density was not altered. Stomach content of the removed Bullfrogs revealed that

Bullfrogs exert a great deal of predation pressure on the invasive Northern Crayfish *Orconectes virilis* We hypothesize to find measureable differences in Crayfish population abundance and structure between the experimental and control regions. Our independent variable was the presence or absence of the Bullfrogs, while our dependent variables were Crayfish abundance and structure. The results indicate that there are demographical and population differences in both control and experimental sites.

Computer and Mathematical Sciences

Novel Control Interface for Multicopter Unmanned Aircraft Vehicle and Monocular-based Stereovision Navigation Utilizing the Robotic Operating System

Miguel L.D. Maestas

Department of Computer and Mathematical Sciences/Media Arts & Computer Science Graduate Student

This research proposes a novel approach to robotic control using a gesture control interface and a monocular based stereovision system on a robotic Unmanned Aerial Vehicle (UAV) within the Robotic Operating System (ROS). Utilizing a Leap Motion Controller, a Parrot AR.Drone 2.0 quad-copter and a computer, a hybrid autonomous gesture control system is being developed within the ROS to communicate gesture based commands to the robotic platform, while the onboard 720p High Definition (HD) monocular video camera relays visual data to the laptop/PC which is then processed through the compiled software packages in the ROS to obtain the necessary 3-Dimensional (3D) visual data necessary for path finding purposes.

Traditional methods of robotic control rely on radio controllers, gamepad controllers, computer keyboards and more recently cellphone based applications. My approach is to control a robotic UAV using a gesture based control method. The recent release of new technology, the Leap Motion controller, has allowed me to implement a novel approach for a gesture based control interface. The gestural control interface recognizes hand gestures and communicates these in the form of commands through ROS to the UAV.

Obstacle or collision avoidance in UAVs is a fundamental requirement for the autonomy of robotic UAV systems. Navigation, obstacle detection and obstacle avoidance have typically been handled by sensors such as passive or active infrared, sonar or laser range finders. These types of sensors characteristically come with a higher cost, a lower versatility in uses, range and accuracy of readings when compared to a vision based system. The detection of obstacles utilizing vision as the primary sensor is a challenging task but also reduces the need for additional sensors. The reasoning behind my choice in navigation sensor is first, the UAV already comes equipped with the forward facing and downward facing cameras, two, the battery life of the platform is already limited and would be further limited by the addition of more

sensors without adding additional batteries, third, payload is a primary concern for UAVs and the addition of more sensors would greatly reduce the robots maneuverability. That being said, I have proposed a very simple method which can be altered and further developed in future works. Through feature detection and optical flow methods, the UAV will finally be equipped to navigate a static indoor environment while simultaneously being able to detect and avoid static obstacles

Environmental Geology

PALEOMAGNETICAND ANISOTROPY OF MAGNETIC SUSCEPTIBILITY, STUDY OF THE BUENA VISTA DIKE, NORTH-CENTRAL NEW MEXICO

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The 5 km-long Buena Vista dike, intrudes the Cretaceous Benton Group and outcrops on the eastern side of the Sangre de Cristo Mountains near the transition between the Rocky Mountains and the Great Plains. At the northernmost outcrop, at least three compositionally distinct intrusions are exposed ranging from augite porphyritic basalt, quartz diorite and diorite. We hypothesize that the Buena Vista dike may be sourced from or genetically related to the Ocate Volcanic field. Rock magnetic, paleomagnetic, and anisotropy of magnetic susceptibility analyses are being conducted on core samples taken from 13 sites. Preliminary rock magnetic tests reveal that the primary magnetic phase is a cubic, Fe-Ti oxide phase of a restricted magnetic grain size. The Curie point temperature ranged from 480 to 540 degrees Celsius indicating that the samples contain a titanomagnetite phase with low to moderate Ti substitution. We see little contribution to the AMS fabric from paramagnetic phases and conclude that the AMS fabric is carried by a ferromagnetic phase of psuedosingle domain to a multi-domain grain size. AMS data indicate that most sites are oblate. The shape factor T values for the sites range from 0.209 to 0.903. Further work, including geochronology, paleomagnetism, and petrographic analyses, is aimed at determining the origin and time of emplacement of the Buena Vista dike and understanding Cenozoic magmatism east of the Rio Grande Rift.

Magma Emplacement Mechanism of the Puy de Dôme based on Anisotropy of Magnetic Susceptibility, Paleomagnetic, Structural and Petrological Data.

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The Puy de Dôme is the largest lava dome in the Chaine des Puys, located within the Massif Central region of Auvergne, France. The purpose of this research is to document magma transport patterns and emplacement mechanisms associated with the growth of the Puy de Dôme volcano. Based on outcrop patterns, we hypothesize that the Puy de Dôme grew in two distinct phases. Phase 1 involved emplacement of viscous magma that forcefully domed the landscape vertically. Magma from the Phase 2 event intruded and deformed the earlier dome upwards and outwards causing sub-vertical fractures that were filled with magma forming radial dikes. In order to test this hypothesis, anisotropy of magnetic susceptibility (AMS) and paleomagnetic data will constrain magma flow directions and define the relative emplacement age and post-emplacement deformation, respectively. Thin section petrology will define the magma composition and reveal any evidence of alteration and deformation. Structural data (field mapping and macroscopic observations) will constrain the geometry of the volcano's plumbing system and provide insight into the eruptive dynamics. Preliminary AMS and Curie data from 11 sites obtained during the summer 2013, shows moderately aligned fabrics consisting of prolate shapes that are dominated by a titanoheamatite phase. Additional field work will continue over the course of summer 2014 where structural data will be obtained, a detailed geologic map of the region will be developed, and additional samples collected along Phase 1 and Phase 2 episodes. All magnetic and petrographic data is expected to be finished by spring 2014 and final results published May 2015.

EVIDENCE AND CONTEXT FOR 1.45 GA MAGMATISM IN THE LAS VEGAS RANGE, NEW MEXICO

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The 1.45 Ga Evergreen Valley Plutonic Complex (EVPC) is a bimodal layered plutonic complex exposed in the Las Vegas Range of the southern Sangre de Cristo Mountains of New Mexico. The complex is an east-west trending 2 km x 1 km elliptical body that cross-cuts a 1.7 Ga garnet tonalite and is in unconformable contact with Paleozoic sedimentary rocks at its north and south contact. The EVPC consists of two main units: a massive coarse subhedral granular granite that comprises the eastern two-thirds of the complex and a quartz monzogabbro unit that encompasses the western third. The granite contains major microcline, quartz, plagioclase, biotite and accessory magnetite, epidote, and zircon. The granite is homogeneous in mineralogy and isotropic in texture. The quartz monzogabbro contains major but variable amounts of plagioclase, hornblende, biotite, quartz, microcline, and epidote and accessory titanite and magnetite. The quartz monzogabbro is separated from the main granite by an ~ 30m zone of magma mingling. This commingling zone contains several 0.5-1.0-meter thick alternating southwest-dipping mafic and felsic layers. The complex also presents field relations such as silicic pipes and load ball structures, which are consistent with an origin as a mafic-silicic layered intrusion. Contacts between the mafic and felsic units are sharp but interdigitating indicating that the mafic-felsic units were comagmatic. While the EVPC demonstrates magmatic layering, it lacks an internal plutonic foliation and other features characteristic of circa 1.4 Ga synorogenic plutons in the U.S. southwest.

Developing a Refined Magnetostratigraphy for the White River and Ogallala Groups in Southwestern Kansas: Preliminary Results from the High Plains-Ogallala Drilling Project

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Seventy samples were collected from a 98 meter core (HP1A) of the High Plains aquifer in southwestern Kansas retrieved as part of the High Plains-Ogallala Drilling Program (HDODP). The drill cores were collected using Rotosonic (saturated zone) and Hollow-stem auger with split-spoon core barrel (unsaturated zone) drill rigs. The sampled horizons were identified by relatively high bulk magnetic susceptibility value (2.0-3.0 x 10^{-3}) relative to less magnetic parts of the core. Additional samples are being analyzed from intervals between these higher bulk susceptibility zones to develop as complete a magneostratigraphy as possible. Extraction methods did not allow the cores to be oriented, thus declination values are random. Samples, prepared into 1.5 cm^3 specimens, were subjected to AF demagnetization and yield one of four responses: normal polarity (positive, steep inclination), reverse polarity (negative, steep inclination), shallow positive/negative inclinations, and incoherent behavior. Samples analyzed for Curie point estimates and magnetic property measurement system (MPMS) experiments indicate that the magnetic mineralogy is almost entirely single domain to pseudosingle domain with a restricted composition of near pure to low-Ti titanomagnetite. Oxide petrology reveals very fine grained opaque grains that were likely transported into the basin by eolian processes, given their limited grain size. Large opaque grains are rare to non-existent, even in the coarsest grained horizons, suggesting that fluvial addition of magnetic grains was not a major input source. Based on optically stimulated luminescence (OSL) age determinations, the upper 12 meters of the core is Quaternary in age. Magnetic polarity data document at least three possible excursion or high amplitude secular variation events in the Quaternary portion of the core. One event is tentatively correlated to the Laschamp excursion at ~41 ka, although declination data are lacking and thus the VGP position is unknown. New preliminary age determinations from detrital zircon grains indicate that most, if not all, of the HP1A core, assumed to be Miocene Ogallala Formation, is substantially older and tentatively correlated with part of the Paleogene White River Group (Eocene-Oligocene).

Natural Resources Management

A GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING GEOHERITAGE INVESTIGATION OF THE UPPER PECOS RIVER VALLEY

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The purpose of this multidisciplinary study is to evaluate changes in land use practices pertaining to cultural development since early 1970s in the Upper Pecos Valley in Northern New Mexico, USA. The investigations will consider historic patterns in the progression of land management practices, political events, and agricultural development using Geographic Information System (GIS) and Remote Sensing techniques. A comparative investigation from a series of satellite imagery will be used to examine changes in the land use and conditions of the study sites over time. Landsat satellite images from the 1970s to present will provide multispectral measurements of vegetation coverage and vegetation health in both growing and non-growing sessions. Changes to the local environmental conditions in the area will also be evaluated using records of climate, participation, stream gage data, oral history, and historical records. The need to develop a further understanding of the Pecos River Valley in North Central New Mexico and its land use practices will aid in conservation efforts and development of this physical and cultural landscape. Study results will also be used to demonstrate the local community the value of modern science investigations in addressing local concerns. In addition, the results from this study will be integrated in to the Ribera Community Cultural Center and Pecos Historic Park.

Effects of Fire and Seasonal Change on Black-Tailed Prairie Dog Dynamics

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Fragmentation of the landscape from human settlement, in addition to other conditions, has precipitated the decline of Black-tailed prairie dog (*Cynomys ludovicianus*) populations and the occurrence of fire in shortgrass steppe of northeastern New Mexico. Black-tailed prairie dogs, a keystone species, and fire play vital roles in maintaining the integrity and diversity of grassland ecosystems. A lack of knowledge regarding the mechanisms for colony expansion has hindered the development of recovery plans that effectively manage for the persistence of prairie dog colonies. Previous studies have shown that manipulations of vegetation, through prescribed fire and brush removal, encourage and facilitate colony expansion. Through the use of GIS and Remote Sensing technology, we determine how Black-tailed prairie dogs have responded to

seasonal burns at different frequencies. Knowledge of prairie dog response to seasonality and frequency of fire may aid in the development of prescribed fire regimes that effectively manage Shortgrass ecosystems.

A Comparison of Dead Fuel Bulk Density in Masticated and Non-Masticated Chaparral Ecosystems in Prescott, AZ

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Mastication (chipping/mulching) is a relatively new hazardous fuel treatment that is expected to reduce wildland fire severity, intensity and spatial extent. The overarching purpose of this study is to understand if mastication decreases the amount of hazardous fuels on the ground surface. We have two study sites located on the Prescott National Forest near Prescott, AZ. Both sites are dominated by chaparral ecosystems, and are very similar in vegetation. One site had a mastication treatment applied 3 years ago (treatment), and the other site has been left untreated (control). We hypothesized that the dead fuel amount and density will be greater on the treatment site as compared to the control because mastication efforts have increased fuel loads on the ground surface by rearranging the vertical fuels. Using a quarter meter quadrat we collected 4 fuel bulk density samples (collected all dead and downed fuels in the quadrat) along an 80 meter transect at 10 plots at both sites. We also collected mastication depths at 8 points along the 80 meter transect to obtain an average fuel depth. All bulk density samples were then weighed and dried in a fuel oven until no change in weight was detected. Bulk density was calculated using standard protocol and averaged across each site. Preliminary results suggest that the treatment has significantly more dead bulk density than the control site. According to our study, mastication may or may not be an effective hazardous fuel treatment, as it seems to rearrange the fuels that were standing vertically to the ground surface. It remains to be seen how fire behaves in these two sites.

Deep Seed Corn Planting: Development of a Model System to Explore Extreme Drought Management Strategies in Agriculture

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Native American farmers have used a variety of strategies over their long history of agriculture in the Southwest to enhance the ability to produce crops in an extreme environment (Dominguez, 2005; Maxwell, 2000). Deep seed planting is one of these biocultural drought management strategies. During extreme drought periods, corn seeds can be planted as deep as 45 cm to take advantage of stored soil moisture. Deep seed planting has been demonstrated in the field but has not been replicated in a controlled environment. In this experiment, we test the ability to plant a native corn variety (Navajo Blue Corn) at depths of 7.5, 15, 22.5, 30, 37.5, 45, and 52.5 cm in a greenhouse environment. Successful

growth was achieved with seeds planted up to a depth of 37.5 cm (15 inches). Successful deep seed planting requires a combination of technique, appropriate soils and soil conditions and genetics. Now that these conditions and practices have been successfully replicated in a controlled environment, we can begin to explore the physiological and microbiological mechanisms that allow plants to successfully grow at depth. Successful deep seed planting in a controlled environment allows us to use the corn plant as a model system to explore extreme drought adaptation strategies in agriculture. The first two questions we are addressing are: 1. How is carbon utilized in plant growth from seed to first emergence and 2. What role does cell elongation play in mesocotyl development.

Understanding Soil Texture After Mastication In Chaparral And Ponderosa Pine Ecosystems

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Soil texture tells scientists a great deal about an ecological site. The aim of this project is to determine the soil texture for two unique study sites, and determine if soil texture changes after mastication (a hazardous fuel treatment commonly used by land management agencies to reduce the probability of negative effects from wildland fire). We have two study areas, one dominated by Chaparral vegetation near Prescott, AZ, and another dominated by Ponderosa Pine near Payson, AZ. Two sites were selected for comparison in each area, a control that is not masticated, and a treatment site that has been masticated. Within each site we identified 10 plots, and at each plot we took two soil samples with a sharpshooter shovel. Soil samples were collected, refrigerated and then processed using the bouyoucos soil texture method to determine the percent of sand, silt and clay. According to the percentages of these soil particles we are able to classify soil texture using the soil triangle. Our hypothesis is that our two study areas will have different soil texture classifications, and that mastication will not impact soil texture. Preliminary data show that the non-masticated chaparral ecosystem is made up of primarily sandy soils, with up to 85% sand and a ~2:1 ratio of silt and clays. We expect the masticated study site to have a similar texture classification to that of the control. This study is part of a larger project that examines fire effects from prescribed fire in masticated and non-masticated sites across several ecosystems.

Hydrology And Water Quality Monitoring Of The Mora River At Rio Mora National Wildlife Refuge

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To clearly understand the current status of the Mora River at Wind River Ranch a comprehensive water quantity and quality long-term monitoring study is being conducted. The goal of this project is to monitor several hydrology and water quality parameters to determine long-term changes and/or trends in the hydrology and quality of the Mora River at the Rio Mora National Wildlife Refuge. These parameters will be integrated into a question driven long-term monitoring project that will allow us to investigate specific issues as they are related to climate change and the activities occurring at the Rio Mora Refuge and within the Mora River

Watershed. Water quality sondes have been deployed at two sites and have been recording the physiochemical parameters continuously since July 2013. In addition water samples have been collected twice monthly at these sites for nutrient concentration determination. Preliminary data indicates that daily and seasonal fluctuations exist for all parameters measured.

HSP70 Gene Expression and Mentum Deformities in Larval Chironomidae as Indicators of Stress Response to Chronic Sediment-Copper Exposure

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The goal of this study is to investigate the impacts of sediment-copper pollution in Peterson Reservoir (Las Vegas, NM) using HSP70 gene expression and mentum deformities in natural chironomidae (midge) populations as indicators of chronic toxicity. To accomplish this, the following objectives will be completed: (1) determine concentrations of copper in the sediments from Peterson Reservoir; (2) determine if sediment-copper concentrations affect HSP70 gene expression and/or mentum deformities among midge larvae collected from Peterson Reservoir; and (3) determine if copper is accumulating in midge larvae collected from Peterson Reservoir. It is anticipated that midge larvae present within Peterson Reservoir will demonstrate elevated HSP70 gene expression and corroborating evidence of increases in mentum deformities relative to control larvae collected from Morphy Lake (Mora, NM; natural control) and a laboratory culture of *Chironomus riparius*. Collective screening for HSP70 gene expression and morphological deformities provide sensitive and efficient biomonitoring strategies for understanding and detecting the toxicological impacts of pollutants in aquatic systems.

Montane Riverine And Wetland Conditions Of The Gallinas Watershed Using The New Mexico Rapid Assessment Method

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The Gallinas Watershed supplies the local town of Las Vegas, NM with 90% of its drinking water making it a priority to study the conditions of the wetlands, rivers and streams within the watershed (Hermit's Peak Watershed Alliance, 2013). Wetlands play a crucial role within a watershed by storing water, filtering water, flood abatement and the support of large diversity of fish, wildlife and plant populations. Land use along the Gallinas River has been gravely altered by humans for agriculture, horticulture, urbanization and ranching. The purpose of this study was to determine the conditions of wetlands in and adjacent to the Gallinas River using the New Mexico Rapid Assessment Method (NMRAM). It was hypothesized that the land management in the watershed has had a negative effect on the health of the Gallinas Watershed. Following the NMRAM protocol wetlands within the canyon were initially identified using data bases from the following sources: Google aerial photographs; US Forest Service plant inventories and historical documentation; US Fish and Wildlife Service National Wetlands inventory; Endangered and threatened species inventory and the Natural Resources Conservation Service soil maps. Landscape characteristics were established from the geology, geo-hydrology,

climate, surface hydrology, water quality, soils, vegetation communities, wildlife habitat, land ownership and land use. The most altered channelized areas including urban interface were the experimental sites and the protected untouched areas were the control sites. Geomorphology measurements, plant species identification and buffer zones were calculated. Using measurements from these parameters a scoring ranging from 4.1-1.0 was calculated for each site and given a grade, A-D; A = Excellent, B = Good, C = Fair, and D = Poor.
Preliminary results indicate that heavily grazed and altered river morphology areas had low scores according to NMRAM. Specifically these areas had high concentrations of invasive species, entrenchment, and erosion.

Benthic Macroinvertebrate Assessment Of The Mora River At Rio Mora National Wildlife Refuge, Watrous New Mexico

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The Rio Mora National Wildlife Refuge in New Mexico has a long history of anthropogenic use including cattle and horse grazing along with other ranching activities. The goal of this study was to analyze physiochemical parameters, river habitat, and benthic macroinvertebrates to establish a background for future studies and provide a water quality assessment of the Mora River at the Rio Mora Refuge. To date four different sampling expeditions have been conducted during the fall and spring of 2011 through 2013. During these sampling dates physiochemical parameters were measured at five different sites using a water quality sonde. Aquatic invertebrates were also collected following EPA methods from the five sites. Based on the Family Biotic Index, bioassessment results indicate that the river water quality is *fair to good* and physiochemical parameters measured are as expected.

Social and Behavioral Science

How Stigma and Work environment affect Intimate Relationships: Perceptions of Exotic Dancers

Andrea Gonz, Dr. Erika Derkas
Department of Sociology

In this research paper I will report on the results of a study that was conducted for a masters thesis, which sought to better understand how exotic dancing affects personal and intimate relationships of dancers. More specifically the researcher asks, "how does the stigma around dancing affect relationships that exist outside the work environment, based on the perspective of those engaged in dancing?" Through the grounded theory coding process, seven categories were created based on the perceptions of those interviewed. One central theme that emerged was that the work of exotic dancing itself was viewed as problematic and impacted all aspects of the dancer's life. Current research on Strip clubs and exotic

dancers provides a much deeper understanding of the sex industry, however few studies consider the impact that exotic dance has on personal relationships outside the work environment. Therefore, exploring this aspect gives greater insight to this highly stigmatized profession.

Cultural Expression Through Food: Thanksgiving and Christmas in Northern New Mexico

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The purpose of this research is to explore the relationship between Hispano food practices and Hispano identity in northern New Mexico. A qualitative approach is utilized to further the understanding of the ways in which cultural heritage is expressed, maintained, and transformed through food-ways among Hispano women of northern New Mexico. This research explores how food practices are used as a tool in maintaining and preserving culture while simultaneously illustrating cultural erosion within the context of modernization. More specifically, this systematic comparative study of Thanksgiving and Christmas food-ways helps to broaden our understanding of North American cultural expression and preservation through an examination of cultural food practices. As expressed through food-ways, findings suggest that Thanksgiving and Christmas portray various differences in quality and symbolism in regards to culture. Within the context of modernization each holiday presents various opportunities for both cultural preservation and adaptation. They differ, in that symbolically, Christmas represents the preservation of various cultural values, specifically those that are related to food and northern New Mexican identity. While Thanksgiving also allows for cultural preservation of dominant Anglo culture, it is different in that it has less cultural symbolism attached to it. In contrast to this, Christmas is instrumental to the continuance of Hispano culture and their ability to maintain a sense of who they are as a distinct cultural group. It also represents a moment for resistance to modernization and the many challenges that emerge from it, as well as ties to the past within the context of constant change. Cultural maintenance is primarily expressed through the preparation and passing on of certain traditional foods and the reinforcement of family bonding during Christmas.

Validity of Standardized Norms of Standardized Field Sobriety Tests (SFSTs)

Chelsea Stoinski, Lyle Lucero, Andrew Garcia, Julia Jarvis
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This study focuses on how factors such as gender differences, anxiety, fatigue, and stress, which have not been taken into consideration by the SFSTs, affect an individual's performance. Monitoring the effects on performance in real time situations will be simulated via a police officer conducting SFSTs under real life circumstances.

Gaining the Youth's Perspective; Issues Youth Find Important and how they conceptualize/ understand these Issues

Raymond Varela, Dr. Erika Derkas
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Youth are faced with many issues that are difficult to deal with which may open a tunnel from school to the juvenile justice system. Once young adults become entangled with the juvenile justice system it is difficult for them to exit, and the labeling as a juvenile delinquent becomes a long lasting problem. Negative stereotypes of youth persist to justify a stricter response that has recently been challenged by more rehabilitative and positive approaches. However, many new approaches still miss considering the perspectives of youth to understand the issues they face. Few qualitative studies have been conducted that concentrate on the youth's perspective. The purpose of this study is to hear the voice of an often ignored youth population. An understanding on how young adult's view the current system and issues they face is important to gain knowledge on what can be done to assist them succeed in life. A "cookie cutter" technique in creating programs is problematic because not every child experiences life similarly. Therefore, gaining a better understanding of what youth feel as important will assist in improving or creating programs intended on helping the youth live a better life.

Social Work

The Correlation Between Community Distress and School Violence: A Proposed Intervention in the Espanola Public School District.

Barbara Salazar, Dr. Rey Martinez

This study consists of a community profile documenting social problems prevalent in Rio Arriba County, followed by a succinct review of the literature on school violence. The objective of this study is to identify solutions in existence in comparable school districts in the United States and to propose an intervention that might be appropriate in Espanola, New Mexico. This study will utilize a mixed-design approach. Demographic data will be analyzed quantitatively to identify the prevalence of social problems and to determine the existence of identifiable trends. Qualitative, content analysis methodologies will likewise be utilized. Content analysis is a methodology utilized in social work for studying the content of scholarly works such as research articles, book chapters, monographs, and laws.