TWENTY-FIRST ANNUAL UNDERGRADUATE RESEARCH & CREATIVE ARTS SYMPOSIUM

NEW MEXICO STATE UNIVERSITY
Corbett Center
April 29, 2016

SPONSORS:
Honors College
The College of Arts and Sciences Discovery Scholars Program (DSP)
New Mexico Alliance for Minority Participation (AMP)
Maximizing Access to Research Careers (MARc)
Office of the Vice President for Research, Graduate Studies and International Programs
Building Research Achievement in Neuroscience (BRAIN)
College Assistance Migrant Program (CAMP)
Howard Hughes Medical Institute Program (HHMI)
College of Business
College of Education
College of Engineering
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SCHEDULE OF EVENTS

REFRESHMENTS AND WELCOMING REMARKS
8:30 am
Dona Ana Room, Rm. 312
Dr. Daniel Howard
Provost and Executive Vice President

POSTER SESSION
9:00 am -12 noon
West Ballroom

PAPER SESSIONS

SESSION 1A
Contemporary Science
9:00am-10:00am
Rio Grande Room

SESSION 1B
Advances in Agriculture Research
9:00am - 10:00am
Socorro Room

SESSION 2A
Science: Ripped from the Headlines!
10:15am-11:15am
Rio Grande Room

SESSION 2B
Contemporary Research in Biochemistry and Genetics
10:15am-11:15am
Socorro Room

SESSION 2C
New Research in Medicine and Health
10:15am-11:15am
Senate Chambers

SESSION 2D
New Work in the Humanities
10:15am-11:15am
Senate Gallery

SESSION 3A
Advances in Chemistry and Physics
11:30am-12:30pm
Rio Grande Room

SESSION 3B
Understanding Animal Behavior
11:30am-12:30pm
Socorro Room

SESSION 3C
Current Issues in Health
11:30am-12:30pm
Senate Chambers

SESSION 3D
New Insights on Global Affairs
11:30am-12:30pm
Senate Gallery

LUNCHEON
12:30pm-1:30pm
East Ballroom

LUNCHEON ADDRESS:
“Move to Learn”
Dr. Debra Knapp and Paco Antonio
Professors of Dance and the NMSU Sol y Arena Dance Company
The Discovery Scholars Program (DSP) is a college wide interdisciplinary program which was created in Fall, 2014. DSP is a mentorship program where undergraduate students engage in research/creative activity with faculty mentors. The goal of the program is to support student research/creative activity and encourage students to apply for and successfully complete a Master’s degree, perhaps even a Ph.D. Through the program students are challenged to think through research questions and or creative activities, find solutions or ways to answer questions or implement creative activities, and then write up and present the outcome(s) of their work. The five components of the program are:

1) Research/creative activity with Faculty mentor
2) Write up, creation of, and presentation of research/creative activity
3) Professional development (applying for graduate programs, learning about careers in student’s discipline, and development of writing and presentation skills)
4) Service/Outreach project completion
5) Feedback on the program

The Honors College provides qualified undergraduate students with opportunities to broaden and enrich their academic programs. In small classes taught by master teachers, honors students engage in lively discussion and collaborative investigation of interdisciplinary topics. Through the Honors Thesis, students undertake original research in humanities, science, engineering, agriculture, business, education, and the arts under close supervision by faculty mentors. Many students prepare for their thesis by doing an internship in a scientific laboratory or undertake independent research under the supervision of a faculty mentor.

The NMSU College Assistance Migrant Program (CAMP) is a federally-funded program to help migrant or seasonal farm worker students attend college. Our program’s goal is to ensure that each CAMP student graduates from NMSU with a Bachelors degree. The program offers the first line of support for students to succeed in their first/freshmen year at NMSU and also provides many retention resources to help students persist to graduation. The program has been in existence since 2002 and will continue until 2017.
MAXIMIZING ACCESS TO RESEARCH CAREERS *(MARC)*

The MARC Program (formerly Minority Access to Research Careers) is sponsored by the National Institute of General Medical Sciences within the National Institutes of Health. The goals of the program are: to assist selected undergraduate students who demonstrate an interest in and the potential for research in the biomedical sciences to continue their education beyond the baccalaureate degree; to provide a research experience sufficient to result in presentation of research data at professional meetings; to facilitate an 8-10 week summer research experience off-campus; to improve academic performance; to provide funds for travel to professional meetings; and to assist students in entering graduate and professional programs. All past NMSU-MARC students have received bachelor’s degrees and more than 75% have gone on to graduate programs.

BUILDING RESEARCH ACHIEVEMENT IN NEUROSCIENCE *(BRAIN)*

The NMSU Building Research Achievement in Neuroscience (BRAiN) Program was founded in 2010 with a grant from the NIH BP-ENDURE initiative. The BRAiN partnership between UC Denver and NMSU faculty aspires to broaden participation among the doctoral (PhD) ranks of neuroscience and biobehavior scientists by providing research and professional development opportunities for undergraduate juniors and seniors. BRAiN Scholars participate in academic year research at NMSU and a summer internship at the UC Denver Medical Campus. Enhancement activities include a yearly Honors seminar experience and attendance at national conferences such as SFN and ABRCMS.

NEW MEXICO ALLIANCE FOR HOWARD HUGHES MEDICAL INSTITUTE PROGRAM AT NMSU *(HHMI)*

The NMSU Howard Hughes Medical Institute Program (HHMI) broadens access to science by providing students with opportunities to be successful in science through outreach to high schools in under-served communities, through the enhancement of undergraduate biology courses, by providing students with undergraduate research opportunities, and by providing the next generation of faculty with training in Scientific Teaching.

ALLIANCE FOR MINORITY PARTICIPATION *(AMP)*

The New Mexico Alliance for Minority Participation, funded by the National Science Foundation, is a partnership of New Mexico’s six four-year universities and twenty public two-year community colleges. The goal of the Alliance is to increase the state’s graduation rate of ethnic minority students with baccalaureate degrees in science, mathematics, engineering, and technology.

OFFICE OF THE VICE PRESIDENT FOR RESEARCH, GRADUATE STUDIES & INTERNATIONAL PROGRAMS, COLLEGE OF BUSINESS, COLLEGE OF EDUCATION, COLLEGE OF ENGINEERING
The Undergraduate Research and Creative Arts Symposium, now in its twenty-first year, is the longest-running student symposium at New Mexico State University. Since 1996, more than 1,500 students have presented their work at the symposium. Many of these students have gone on to graduate school, law school, and medical school, and a few have returned to NMSU as professors.

URCAS is intended to recognize outstanding undergraduate research and creative projects and the faculty who have mentored them. It is also meant to show off the work of creative undergraduate students to the university and the community. And, of course, presenting at the symposium gives our students valuable professional experience.

The symposium is an annual celebration of undergraduate creativity in all fields. Represented here are some of the most advanced and creative projects presently being undertaken at NMSU. Many of the students presenting today are completing Honors capstone projects, while others have worked with mentors in laboratories and other research and arts settings through the MARC, AMP, HMMI, BRAiN, CAMP, and other mentoring programs.

**Congratulations to these outstanding students and their faculty mentors!**

- Dr. Miriam Chaiken, Dean, Honors College
- Dr. Michael Johnson, Director, MARC Program
- Dr. Barbara Lyons, Director, BP-ENDURE (BRAiN) Program
- Dr. Steve Stochaj, Interim Dean, College of Engineering and Director, New Mexico Alliance for Minority Participation (AMP)
- Dr. Tim Wright, Howard Hughes Medical Institute Program at NMSU (HHMI)
- Dr. Cynthia Bejarano, College Assistance Migrant Program (CAMP)
- Dr. Anne Hubbell, Director, Discovery Scholars Program (DSP)
- Dr. Vimal Chaitanya, Vice President for Research
- Dr. Donald Pope-Davis, Dean, College of Education
- Dr. James Hoffman, Dean, College of Business
PROGRAM DESIGN

1ST PLACE: DAISY MARTINEZ, HECTOR SARELLANO JR., JESSICA LOPEZ, MIGUEL VALLE

2nd place: Matt Garza, Jacob Morales, Chris Shelton, Donovan Swann
3rd: Melissa Adame, Sara Beacher, Kathryn Mae-Eiland, Genesis Morales
4th: Katrina Chandler, Donald Gass, Min Tan, Jesus Zubia

The URCAS Team worked together throughout the development process to create the unique URCAS 2016 brand design.

The logo branding design was created by Miguel Valle. He is a senior, pursuing his Bachelor of Arts degree in Studio Art (Graphic Design), and graduating this Spring, 2016. He was assisted by Jessica Lopez who is a senior graduating this Spring also, and pursuing a BFA in Graphic Design. Hector Sarellano Jr, who generated the powerpoint design, is a sophomore pursuing his Bachelor of Arts degree in Photography. Daisy Martinez, a senior graduating with a Bachelor of Arts degree in Studio Art with an emphasis in Photography and Graphic Design, created the poster design. Kathryn-Mae Eiland is a senior, graduating in the Fall with a Bachelor's Degree in Individualized Studies and a Minor in Business Administration. She designed the booklet layout, icon elements used in the powerpoints, and the nametags. She was assisted with the background texture by Donovan Swann who is also a junior pursuing her Bachelor of Arts degree in Photography and Graphic Design, graduating in spring 2017. Melissa Adame is a sophomore pursuing her Bachelor of Fine Arts degree in Graphic Design. Jesus Zubia who is a junior Pursuing his Bachelor of Fine Arts degree in Graphic Design applied creative input throughout the progression of the design. Nicholas Ostella also provided creative input and designed the booklet's cover through collaboration with a few others. He is a senior pursuing his Bachelor of Fine Arts Degree in the field of Graphic Design.
Ann Gavit and I have been researching how to increase literacy skills and student engagement by implementing a kinesthetic component to the elementary literacy curriculum. I will share with you our findings and provide a short participatory discussion about how the body can inform cognition.

Dr. Debra Knapp is a Professor and the Director of Dance at New Mexico State University. She has also been a keynote speaker at conferences and festivals both in the USA, China and in Mexico. Debra has been an Artist-in-Education since 1977 as a dance/movement specialist. Her creative endeavors in education has included researching and implementing movement programs that enhance the curriculum for the kinesthetic learner for grades pre-school, elementary and middle school students.

Mr. Gilpin also known as Paco Antonio teaches flamenco, classical spanish and world dance. Paco is currently College Associate Professor of Dance at NMSU and along with his wife and dance partner Lucilene de Geus co-directs Sol y Arena the dance programs performance ensemble specializing in Flamenco and Classical Spanish Dance. Paco was dance faculty at UNM from 1986-1998 during which time he was a soloist with Ritmo Flamenco, Dance España, and a frequent performer in Festival Flamenco Internacional.
### Previous Symposium Speakers

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Title and Department</th>
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<tbody>
<tr>
<td>2015</td>
<td>Dr. William Eamon</td>
<td>Emeritus Professor of History</td>
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<tr>
<td>2014</td>
<td>Dr. Sean Rogers</td>
<td>Department of Management</td>
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<tr>
<td>2013</td>
<td>Dr. Collin Payne</td>
<td>Assistant Professor of Marketing</td>
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<tr>
<td>2012</td>
<td>Dr. Paul Bosland</td>
<td>Regents Professor of Horticulture and Director of the Chile Pepper Institute</td>
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<tr>
<td>2011</td>
<td>Dr. Kenny Stevens</td>
<td>Associate Professor of Engineering Technology</td>
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<tr>
<td>2010</td>
<td>Dr. Kenneth Hammond</td>
<td>Professor of History</td>
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<tr>
<td>2009</td>
<td>Dr. Connie Falk</td>
<td>Professor, Agricultural Economics and Business</td>
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<tr>
<td>2008</td>
<td>Salim Bawazir, Ph.D.</td>
<td>Associate Professor, Department of Civil Engineering</td>
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<td>2007</td>
<td>Dr. Elba Serrano</td>
<td>Regents Professor of Biology</td>
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<tr>
<td>2006</td>
<td>Dr. Mary O’Connell</td>
<td>Regents Professor, Department of Plant and Environmental Sciences</td>
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<tr>
<td>2005</td>
<td>Prof. David Taylor</td>
<td>Department of Art</td>
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<tr>
<td>2004</td>
<td>Dr. Robert Armstrong</td>
<td>Regents Professor of Physics</td>
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<tr>
<td>2003</td>
<td>Dr. Ann Hales</td>
<td>Department of Nursing</td>
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<tr>
<td>2002</td>
<td>Dr. Steve Stochaj</td>
<td>Associate Professor, Klipsch School of Electrical and Computer Engineering</td>
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<tr>
<td>2001</td>
<td>Robert Marquez</td>
<td>Doctoral Student, Chemistry</td>
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<tr>
<td>2000</td>
<td>Dr. Reta Beebe</td>
<td>Professor, Department of Astronomy</td>
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<tr>
<td>1999</td>
<td>Dr. Rudolfo Chavez Chavez</td>
<td>Regents Professor, Department of Curriculum and Instruction</td>
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<tr>
<td>1998</td>
<td>Dr. Kathleene West</td>
<td>Professor, Department of English</td>
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<tr>
<td>1997</td>
<td>Dr. Cookie White</td>
<td>Professor, Department of Sociology</td>
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<tr>
<td>1996</td>
<td>Dr. Champa Sengupta-Gopalan</td>
<td>Professor, Department of Agronomy and Horticulture</td>
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POSTER SESSION

WEST BALLROOM
9:00am – 12:00 noon

SAMANTHA ALAMOS
“The Application of Gel Electrophoresis and the Applied Characterization to Glandless Cotton Seed Meal Protein”
Major: Human Nutrition & Dietetics
Faculty Advisor: Dr. Efren Delgado,
Food Science and Technology
Family and Consumer Science

ANGELIQUE AMADO
“Properties and synthetic methods concerning Co(II) derivatives and CO2 activation”
Major: B.S. Chemistry
Faculty Advisor: Dr. Feifei Li,
Chemistry and Biochemistry

YASMIN ANCHONDO
“Therapeutic targets for Doxorubicin resistant breast cancer”
Major: Animal Science
Faculty Advisor: Dr. Amanda Ashley,
Chemistry and Biochemistry

JESUS AU
“Polymerization-Induced Phase Separation”
Major: Chemical Engineering
and Engineering Physics
Faculty Advisor: Dr. Reza Foudazi,
Chemical and Materials Engineering

NOLAN BUNKER, LEIF BENITEZ, CHARLES FLOREZ, JOSEPH MORENO, CHRISTIAN VAZQUEZ, AND MOHAMMAD ALBOSARI
“Innovative Approach to Increase Cottonseed Oil Yield for Future Commercialization”
Major: Mechanical Engineering
Faculty Advisor: Dr. Young Ho Park,
Mechanical and Aerospace Engineering

CYNTHIA BURACZYK
Major: Biology
Faculty Advisor: Dr. Kathryn Hanley, Biology

MIRANDA BUTLER-VALVERDE
“Examining for sexual dimorphism in brown hyenas using skeletons collected in southwestern Namibia”
Major: Wildlife Science
Faculty Advisor: Dr. Gary Roemer, FWCE
Southwest Natural Resource Career Tract Program (SWNRCT)

ALEXANDER CHAIDEZ
“Predicted targets of differentially expressed microRNAs in skeletal muscle and the muscle-derived electric organ of the electric fish Sternopygus macrurus”
Major: Microbiology
Faculty Advisor: Dr. Graciela Unguez, Biology

HHMI

USDA I-DISCOVER Program

LEADERS
ASHLEY CHATTERTON  
“Branching Methods for Complex Burger’s Equation”  
Major: Mathematics  
Faculty Advisor: Dr. Nicholas Michalowski, Mathematical Sciences  
MARC

MELISSA CHAVEZ  
“DNA Ligase IV Contribution in Nonhomologous End-joining”  
Major: Biology  
Faculty Advisor: Dr. Amanda Ashley, Chemistry and Biochemistry  
AMP

KAYLA DEVOGEL  
“The Colors of Saturn”  
Major: Physics  
Faculty Advisor: Dr. Nancy Chanover, Astronomy  
DSP

KENDRA EFIRD, MOHAMMAD ALSHAMMARI, LULWA AL-YAHYA, SALEM MARSEL, AND DEREK UMPHRES  
“Shrimp Feeder: A Low Maintenance Automatic Feeding Design”  
Major: Mechanical Engineering  
Faculty Advisor: Dr. Delia Valles-Rosales, Industrial Engineering  
USDA I-DISCOVER Program

AMANDA ERLANDSON  
“Role of a Novel Protein in Cell Pole Morphogenesis in Caulobacter crescentus”  
Major: Genetics, Biology  
Faculty Advisor: Dr. Paola Mera, Biochemistry  
DSP

TIFFANY FOWLER  
“Heavy Metal Abatement in Animas River Samples Using Montmorillonite”  
Major: Animal Science  
Faculty Advisor: Dr. Antonio Lara, Chemistry

ADRIAN GANDARA  
“Synthesis of a Chiral Citrate Derivative via Enzymatic Hydrolysis”  
Major: Chemistry and Government  
Faculty Advisor: Prof. Aravamudan Gopalan, Chemistry  
MARC

R. MATTHEW GONZALES  
“Estimating Evapotranspiration Using Remote Sensed Data for the Lower 48 States”  
Major: Plant and Environmental Science  
Faculty Advisor: Dr. Blair Stringam, PES  
MARC
CLARA HANSEN
“Call similarity and strength of social behaviors in Budgerigars (Melopsittacus undulatus)”
Major: Biology
Faculty Advisor: Dr. Timothy Wright, Biology

FRANK HERNANDEZ
“Medicinal Plants of the Southwest”
Major: HRTM
Faculty Advisor: Miss Sarah Gallegos, CAMP

ILIANA HERNANDEZ
“Expression of electric fish myogenic regulatory factor, MyoD, in mammalian non-muscle fibroblast cell line”
Major: Biology
Faculty Advisor: Dr. Graciela Unguez, Biology

GRACE HOOKS
“DNA-PKcs in the Replication Stress Response”
Major: Animal Science
Faculty Advisor: Dr. Amanda Ashley, Chemistry and Biochemistry

MARVIN JOJOL
“Production of Allelopathic Chemical Under Different Temperatures”
Major: Wildlife Science
Faculty Advisor: Dr. Wiebke Boeing, FWCE

SARA KELLEY, KEVIN PEREZ
“Biodiversity of Arachnids in the Nutt Grasslands of New Mexico”
Major: Agricultural Biology
Faculty Advisor: Dr. Martha Desmond, Fish, Wildlife and Conservation Ecology

JACQUELINE KIELTYKA, MICHELLE SILBER, AND ALEJANDRA ENRIQUEZ
“Sustainable Fishing: How Fish Can be Friends and Food”
Major: Genetics/Biochemistry; Communication Disorders/Linguistics; Biology
Faculty Advisor: Dr. Michele Nishiguchi, Biology
Sundt Seminar

APPLEHELEN KIRBY, KELCIE GERRY, AND SYDNEY JANE SALAS
“Ohana means family, no corals left behind”
Major: Microbiology and Biology
Faculty Advisor: Dr. Michele Nishiguchi, Biology
Sundt Seminar

VICTOR LARA
“Valorization of Agricultural Residuals through Biophysical Transformation”
Major: Civil Engineering
Faculty Advisor: Dr. Zohrab Samani, Civil Engineering

TRAVIS LEDOUX
“Hydrothermal Liquefaction of Various Algae in Batch and Continuous Flow Reactors”
Major: Chemical Engineering
Faculty Advisor: Dr. Catherine Brewer, Chemical Engineering

ALEJANDRA LERMA
“Progestin Signaling in Triple Negative Breast Epithelial Cells”
Major: Animal Science and Biology
Faculty Advisor: Dr. Ryan Ashley, Animal and Range Sciences
HHMI
ALEXIS LOPEZ
“Find one fast, or find them all slow: Do collaborative visual searchers search more quickly or more thoroughly?”
Major: Psychology
Faculty Advisor: Dr. Michael Hout, Psychology

LORENZO MARTINEZ
“Scale Effects on the Compression Strength of Adobe Blocks”
Major: Civil Engineering
Faculty Advisor: Dr. Paola Bandini, Civil Engineering

YVONNE LUCERO
“A transgenic approach to confer resistance in chile to the pathogen, Phytophthora capsici”
Major: Genetics
Faculty Advisor: Dr. Champa Gopalan, Plant and Environmental Sciences

JOSE MELENDEZ
“Ionospheric Content Neutron Detector (INCA) Nano-Satellite Project”
Major: Mechanical Engineering
Faculty Advisor: Dr. Steve Stochaj, Electrical Engineering

EMMA MARTIN
“American Indian disparities: An examination of race/ethnicity on sentencing outcomes for federal drug offenses”
Major: Criminal Justice, Psychology
Faculty Advisor: Dr. Mercedes Valadez, Criminal Justice

KELSEY MONTOYA
“An effort to enhance nitrogen use efficiency in alfalfa by manipulating crucial steps in Nitrogen and Carbon metabolism.”
Major: Biochemistry
Faculty Advisor: Dr. Champa Gopalan, Plant and Environmental sciences

EMILY MOORE
“Role of the Microtubule-binding protein PRC1 in orchestrating the final events of cytokinesis”
Major: Biochemistry/Biology
Faculty Advisor: Dr. Charles Shuster, Biology
Shuster Lab

KENNETH MARTIN, ISMAEL TORRES, AND RYAN KIRBY
“Facilitating Conservancy Efforts of Hawaii’s Coral Reefs Through Socioeconomic Valuation Methods”
Major: Geography
Faculty Advisor: Dr. Michelle Nishiguchi, Biology
Sundt Seminar
TAYLOR NUNN
"Mining open source RNASeq data uncovers the brain metastatic potential of breast cancer cell lines."
Major: Genetics/Biology
Faculty Advisor: Dr. Elba Serrano, Biology

FRANCHESCA ORTEGA
"Genetic barcoding using molecular analysis for identification and taxonomic clarification of Capsicum chinense using the Internal Transcribed Spacer Region"
Major: Genetics and Biotechnology
Faculty Advisor: Dr. Paul Bosland, Plant and Environmental Sciences

JAYA PAUDEL
"Utilization of the TPM ligand in preparing its metallic complex with transition metals mainly Iron, Manganese, and Molybdenum."
Major: Chemistry
Faculty Advisor: Dr. Feifei Li, Chemistry and Biochemistry

FERNANDO PEREZ, FARIS ALHAYDAR, MAHDI ALHAYDAR, JORGE BANDA, MATTHEW SIMPSON, KEVIN LARKIN, AND CASEY GROEN
"Developing a Self-Powered Solar Kiln for Fritting Clay Pellets"
Major: Industrial Engineering
Faculty Advisor: Dr. Young Ho Park, Mechanical Engineering

LAUREN RATH
"Mammalian hormones associated with stress impact microbial fermentation of rumen fluid in vitro"
Major: Animal Science
Faculty Advisor: Dr. Clint Loest, Animal and Range Sciences

OSCAR ROBLES, AND HOLLIE K. JACOBS
"Development of a new class of hydroxypyridinone chelators for hard metal ions"
Major: Chemistry and Biochemistry
Faculty Advisor: Dr. Aravamudan Gopalan, Biochemisty & Chemistry

FELICIA RODRIGUEZ
"Characterization of Redox Active Tetrazine Ligand with Zinc Center"
Major: Chemical Engineering
Faculty Advisor: Dr. Feifei Li, Chemistry

AARON RODRIGUEZ
"Factors Influencing Spindle Orientation During Early Development"
Major: Biology
Faculty Advisor: Dr. Charles Shuster, Biology

DAVID RODRIGUEZ HERRERA
"Effectiveness of Catnip(Nepeta cataria L.) Essential Oil in Reducing Onion Thrips (Thrips tabaci L.) On Onion (Allium cepa L.)"
Major: Genetics
Faculty Advisor: Dr. Chris Cramer, Plant and Environmental Science
ANDREW RODRIQUEZ
“Solar Powered Plane”
Major: Mechanical Engineering
Faculty Advisor: Mr. Andreas Gross, Mechanical & Aerospace Engineering
Sundt Seminar

TOREY SALGADO
“Contractile Ring Assembly in Animal Cells”
Major: Biology
Faculty Advisor: Dr. C. Brad Shuster, Biology

GRISELDA SAUCEDO
Major: Mechanical Engineering
Faculty Advisor: Dr. Delia Valles-Rosales, Industrial Engineering
AMP, USDA I-DISCOVER Program

MONCIA SCOTT
“Increased fat storage in Drosophila Neprilysin 1 Mutants via insulin like peptides pathway”
Major: Biochemistry
Faculty Advisor: Dr. Jennifer Curtiss, Biology
DSP

ANAHI SOTO
“Effect of pretreatment of iron modified zeolites on removal of cadmium from water”
Major: Civil Engineering
Faculty Advisor: Dr. Lambis Papelis, Civil Engineering
AMP

MARY STOFAN
“Selective Diels-Alder Reactions Using Dialkynes”
Major: Chemistry
Faculty Advisor: Dr. James Herndon, Chemistry and Biochemistry
MARC

ZOE SULLENGER
“An exploration of temporal social network stabilization in the budgerigar (Melopsittacus undulatus)”
Major: Biology
Faculty Advisor: Mrs. Angela Medina-Garcia, Biology
Wright Lab

MARTIN TERAN
“Synergism of pyrethroid with enzymatic inhibitors in resistant bed bugs”
Major: Wildlife Management
Faculty Advisor: Dr. Alvaro Romero, Entomology, Plant Pathology and Weed Science
AMP
ISMAEL TORRES  
“Regional Immigrant Rights and Services Manual”  
**Major:** Economics/Government  
**Faculty Advisor:** Dr. Neil Harvey, Government  
**DSP**

AMADEO TRUJILLO  
“Iron-Modified Zeolite Permeable Reactive Barrier”  
**Major:** Civil Engineering  
**Faculty Advisor:** Dr. Lambis Papelis, Civil Engineering  
**AMP**

ANNELIESE TRUJILLO  
“Developing a Transformation and Regeneration Model for Chile Pepper (Capsicum annuum)”  
**Major:** Chemical Engineering  
**Faculty Advisor:** Dr. Champa Sengupta-Gopalan, Plant and Environmental Sciences  
**AMP**

KIRA TURNHAM, ALLISON DAWE, AND JACOB BENNETT  
“Ahapua’a: Hawai’i’s commitment to sustainability”  
**Major:** Biology  
**Faculty Advisor:** Dr. Michele Nishiguchi, Biology  
**Sundt Seminar**

KIRA TURNHAM  
“Phylogeography of Euprymna and their Vibrio symbionts: the genetic architecture of a symbiotic system”  
**Major:** Biology  
**Faculty Advisor:** Dr. Michele Nishiguchi, Biology  
**Honors Thesis**

TAYLOR USELMAN, AND SAHAR QAVI  
“Development of Instructional Materials for a Rheology Laboratory Workshop”  
**Major:** Engineering Physics - Mechanical Engineering  
**Faculty Advisor:** Dr. Reza Foudazi, Chemical and Materials Engineering  
**BP-ENDURE (BRAIN)**

CARLOS VIGIL  
“Engineering Properties of Foam Glass and Soil-Foam Glass Gravel Mixtures”  
**Major:** Civil Engineering  
**Faculty Advisor:** Dr. Paola Bandini, Civil Engineering  
**AMP**

CHRISTIAN WONG  
“Mineral Dissolution in Polymer-coated Soils”  
**Major:** Civil Engineering  
**Faculty Advisor:** Dr. Douglas Cortes, Civil Engineering  
**AMP**
PAPER SESSIONS
PAPER SESSIONS

SESSION 1: 9:00am – 10:00am

1. A: CONTEMPORARY SCIENCE -- RIO GRANDE ROOM (218)
Moderator: Paco Antonio, Human Dance and Performance

CYRENA RIDGEWAY
“Engineered Thermo Conductivity; Shape and Connectivity”
Major: Civil Engineering
Faculty Advisor: Dr. Douglas Cortes, Civil Engineering Department

RACHEL RIDGEWAY
“Developing Methodologies for the Quantization of Atmospheric Gasses in Water via Raman Spectroscopy”
Major: Physics
Faculty Advisor: Dr. Jacob Urquidi, Physics

ADAM SANCHEZ
“Recycled Concrete Aggregates for Structural Applications”
Major: Civil Engineering
Faculty Advisor: Dr. Brad Weldon, Civil

LUIS BARRERA
“Controlling Tethered Heterogeneous Autonomous Unmanned Vehicles in GPS-Denied Environments”
Major: Physics and Engineering Physics-Aerospace Engineering
Faculty Advisor: Dr. Liang Sun, Mechanical and Aerospace Engineering

1. B: ADVANCES IN AGRICULTURAL RESEARCH -- SOCORRO ROOM (218)
Moderator: Richard Pratt, Plant and Environmental Sciences

KAREN ACOSTA
“Identification of a gene involved in flowering in alfalfa using a random T DNA mutant obtained in an Agrobacterium tumefaciens mediated transformation”
Major: Biochemistry
Faculty Advisor: Dr. Champa Gopalan, Plant and Environmental Sciences

ANGIE MESTAS
“Beet Curly Top Virus in Alternative Weed Hosts”
Major: Agricultural Biology
Faculty Advisor: Dr. Rebecca Creamer, EPPWS

SATIVA CRUZ
“Utopiense: Experiential Learning in Colombian Agroforestry System Encourages Teamwork”
Major: Environmental Science
Faculty Advisor: Dr. Kenneth Carroll, Plant and Environmental Sciences

ALEXANDRA VALDEZ
“Analysis of Agave parryi subs. neomexicana as a New Source of Inulin and a Potential Manufacturing Route for its Extraction”
Major: Chemical Engineering
Faculty Advisor: Dr. William Maio, Chemistry and Biochemistry

Honors Thesis, MARC, NRCT
SESSION 2: 10:15am – 11:15am

Moderator: Miriam Chaiken, Honors College

MAGGIE SABIK
“Rare Targets Induce Less “Perceptual Readiness:” Evidence from Pupillometry”
Major: Psychology
Faculty Advisor: Dr. Michael Hout, Psychology
BP-ENDURE (BRAiN)

JOHN AGNEW
“Analysis of Locomotor Activity of Bed Bugs in the Presence of Aggregation Factors”
Major: Biology
Faculty Advisor: Dr. Alvaro Romero, Entomology, Plant Pathology and Weed Science
NMSU Urban Entomology Research Center

RACHEAL HEADLEY
“Age-length Relationships of the White Sands Pupfish from Different Environments as Determined by Otolith Microstructure”
Major: Biology
Faculty Advisor: Dr. Colleen Caldwell, FWCE, White Sands Missile Range

SHOSHAUNA FARNSWORTH-PINKERTON
“Correlation of detrital tourmalines from the Picuris Mountains with provenance using laser-induced breakdown spectroscopy.”
Major: Geology
Faculty Advisor: Dr. Nancy McMillan, Geology
Discovery Scholars

2. B: UNDERSTANDING ANIMAL BEHAVIOR – SOCORRO ROOM (218)
Moderator: Claude Fouillade, Languages and Linguistics

ADAM BACA
“Does Environmental Stochasticity Drive Reproductive Strategy among Pupfish?”
Major: Wildlife Ecology
Faculty Advisor: Dr. Colleen Caldwell

ALEXA MARTINEZ
“Genetic Variability in Captive and Wild Populations of the Critically Endangered Blue-throated Macaw (Ara glaucogularis)”
Major: Wildlife Science
Faculty Advisor: Dr. Tim Wright, Biology

ALDO RAMIREZ
“Comparing Intraspecific Aggression and Genetic Similarity between Urban and Rural Pogonomyrmex Ant Colonies.”
Major: Biology
Faculty Advisor: Dr. Timothy Wright, Biology

JUSTIN APODACA
“Effects of Corticosterone-Induced Stress on Vocal Learning in the Budgerigar”
Major: Biology
Faculty Advisor: Dr. Timothy Wright, Biology

NSF
OSCAR SANTANA, MARÍA JIMENA, AND RENTARÍA ORTEGA
“Ergonomic study at a USDA certified slaughter and processing facility”
Major: Industrial Engineering
Faculty Advisor: Dr. Efren Delgado, Food Science and Technology

GARRETT OVERCAST
“Identification of C3-like proteins within the snail Biomphalaria glabrata”
Major: Biochemistry
Faculty Advisor: Dr. Maria Castillo, Biology

EMILIO RIVERA
“Uranium Abatement From Drinking Water By Natural Clays”
Major: Biochemistry
Faculty Advisor: Dr. Antonio Lara, Chemistry and Biochemistry

ADRIANA ALIRE
“Activation of Downstream Signaling via CXCL12/CXCR4 Signaling Axis in Triple Negative Breast Cancer.”
Major: Animal Science
Faculty Advisor: Dr. Ryan Ashley, Animal and Range Sciences

KATIE DEAVEN
“Shortcomings in Shoemaker’s Defense: The Unresolved Korsgaard-Parfit Debate”
Major: Philosophy/Mathematics
Faculty Advisor: Dr. Jean-Paul Vessel, Philosophy

ANDREA GUTIERREZ
“Care of the self with video games”
Major: English
Faculty Advisor: Dr. Brian Rourke, English

ELIZABETH BRUG
“Anne Sexton’s Transformations: The Fairytale of Mental Illness”
Major: English and Spanish
Faculty Advisor: Dr. Ryan Cull, English

Moderator: Kelly Jenks, Anthropology

Moderator: Julie Fitzsimmons, Art Department
3. A: ADVANCES IN CHEMISTRY AND PHYSICS – RIO GRANDE ROOM (228)
Moderator: William Eamon, Emeritus Professor of History

JAIME MOYA
“Optical Constants of Ni and Ni:V alloys”
Major: Engineering Physics
Faculty Advisor: Dr. Stefan Zollner, Physics
AMP

CHINTELLE JAMES, TAI PHAN,
CHRISTOPHER D. COOK,
AND HOLLIE K. JACOBS
“Synthesis of Novel Sulfonyl-linked HOPO Chelators for Hard Metal Ions”
Major: Biology and Chemistry
Faculty Advisor: Dr. Aravamudan Gopalan, Biochemistry & Chemistry
MARC

JOSS CATANACH
“Synthesis of Iron Oxide-Carbon Composite Nanostructures for Lithium-Ion Battery Applications”
Major: Chemical Engineering
Faculty Advisor: Dr. Hongmei Luo, Chemical Engineering
AMP

ELIJAH WADE
“Polymerized high internal phase emulsions for 3-dimensional cell scaffolding applications”
Major: Chemical Engineering
Faculty Advisor: Mr. Reza Foudazi, Chemical Engineering
MARC

3. B: CONTEMPT RESEARCH IN BIOCHEMISTRY & GENETICS – SOCORRO ROOM (228)
Moderator: Elba Serrano, Regents Professor of Biology

OTTO MOSSBERG
“In Vivo Assays to Determine RecN Epistasis Group Participation”
Major: Genetics
Faculty Advisor: Dr. Shelley Lusetti, Chemistry and Biochemistry
MARC

SEALTIEL ORTEGA-RODRIGUEZ
“Reference Seed Iterative Long Reads Assembler”
Major: Biology
Faculty Advisor: Dr. C. Donovan Bailey, Biology
MARC
3. C: CURRENT ISSUES IN HEALTH – SENATE CHAMBERS (302)

Moderator: Mary Alice Scott, Anthropology

VICTOR CARRASCO

“Integrative Care for Mental Health Patients in a Family Residency Clinic”
Major: Psychology
Faculty Advisor: Dr. Mary Alice Scott, Anthropology
BP-ENDURE (BRAIN)

JARED VAN NATTA

“The Culture of Medicine: Hidden Curriculum and its Effect on Patient Safety”
Major: Anthropology
Faculty Advisor: Dr. Mary Alice Scott, Anthropology

ELIZABETH LEATHERMAN

“Serving Culturally and Linguistically Diverse Populations with Augmentative and Alternative Communication Needs”
Major: Communication Disorders
Faculty Advisor: Dr. Amelia Rau, Communication Disorders
Honors Thesis

JESSIE VELASCO

“Do Oral Contraceptives Have Psychoactive Effects?”
Major: Nursing
Faculty Advisor: Dr. Elba Serrano, Biology
Honors Thesis

ZACHARY ROMERO

“Investigation of the Deinococcus Radiodurans RecN R452A Mutant”
Major: Biochemistry
Faculty Advisor: Dr. Shelley Lusetti, Chemistry and Biochemistry

HRIDINDU ROYCHOWDHURY

“AztD, a periplasmic zinc metallochaperone to an ABC transporter system in Paracoccus denitrificans”
Major: Biochemistry and Physics
Faculty Advisor: Dr. Erik Yukl, Chemistry and Biochemistry

3. D: NEW INSIGHTS ON GLOBAL AFFAIRS – SENATE GALLERY (304)

Moderator: Miriam Chaiken, Honors College

JOSHUA COPE

“A Review of the Correlation between Energy Security, National Security and Cultural Perspectives Influencing This Interaction.”
Major: CE & BAS with emphasis on renewable energy and sustainability
Faculty Advisor: Dr. Miriam Chaiken, Honors College

CHRISTOPHER MOLINA

“The Role of Ideology in Administrative Court Proceedings”
Major: Government
Faculty Advisor: Mr. Daniel Chand, Government

MICAELA DE LA ROSA

“Painting an Era: How the Dutch Golden Age Crafted Fine Dutch Art”
Major: Government
Faculty Advisor: Prof. Julie Fitzsimmons, Department of Art

DPR
KAREN ACOSTA
“Identification of a gene involved in flowering in alfalfa using a random T DNA mutant obtained in an Agrobacterium tumefaciens mediated transformation”
Major: Biochemistry
Faculty Advisor: Dr. Champa Gopalan, Plant and Environmental Sciences

We have introduced a key gene in sucrose synthesis, sucrose phosphate synthase (SPS) in alfalfa plants utilizing an Agrobacterium tumefaciens mediated transformation. Sucrose acts as a regulatory and signaling molecule in plant metabolism. Additionally, sucrose provides an energy source and carbon skeletons for the synthesis of other biomolecules. Of 20 independent transformants, only one (#7) exhibited unique phenotypic characteristics – including the absence of flowering – but showed the same level of transgene product. We propose that these differences are attributed to the location of the transgene insert within the plant genome. We seek to identify the interrupted gene using genome walking.

JOHN AGNEW
“Analysis of Locomotor Activity of Bed Bugs in the Presence of Aggregation Factors”
Major: Biology
Faculty Advisor: Dr. Alvaro Romero, Entomology, Plant Pathology and Weed Science

The bed bug is a major urban pest that have resurged globally. This blood sucking insect is extremely difficult to control. Management of bed bugs requires a better understanding of their behavior in natural habitats. This study was conducted to observe patterns in movement of bed bugs in the presence of paper strips impregnated with methanol extracts of feces and body secretions, using a high-throughput video-recording system. Results showed that bed bugs were more active, made more visits, and spent more time in the impregnated paper strip zone indicating that fecal extracts have biological compounds that induce bed bug aggregation.

SAMANTHA ALAMOS
“The Application of Gel Electrophoresis and the applied characterization to Glandless cotton seed meal protein.”
Major: Human Nutrition & Dietetics
Faculty Advisor: Dr. Efren Delgado, Food Science and Technology

A byproduct that remains after glandless cotton is ginned and oil is extracted is called Cotton Seed Meal (CSM), which can provide an efficient source of protein. A method that is used for characterization of proteins based on their size and electrical charge is called gel electrophoresis. Sodium dodecyl sulfate- polyacrylamide gel electrophoresis, is the most commonly practiced gel electrophoresis technique used for denatured or native proteins. The basic SDS Page procedure is described and the objective is to understand the technique and to identify the molecular weight of glandless CSM.

ADRIANA ALIRE
“Activation of Downstream Signaling via CXCL12/ CXCR4 Signaling Axis in Triple Negative Breast Cancer.”
Major: Animal Science
Faculty Advisor: Dr. Ryan Ashley, Animal and Range Sciences

Honors Thesis, MARC

Triple negative breast cancer (TNBC) is an aggressive subtype with high incidences of reoccurrence, metastasis, and poor survival rates. CXCR4 is the most highly expressed chemokine receptor in TNBC, but we do not have a complete understanding of how chemokine signaling
contributes to TNBC biology. We hypothesize that activation of CXCR4 by its ligand, CXCL12, activates key pathways to induce TNBC cell proliferation. Cells were treated with CXCL12α to determine changes in cell proliferation and signaling pathways. Cell proliferation and activation of MAPK pathways increased significantly with CXCL12α treatment. Our results advance the understanding of how CXCL12/CXCR4 signaling influences TNBC.

ANGELIQUE AMADO

“Properties and synthetic methods concerning Co(II) derivatives and CO2 activation”

Major: B.S. Chemistry
Faculty Advisor: Dr. Feifei Li, Chemistry and Biochemistry

Macrocyclic ligands such as 5,7,7,12,14,14-hexamethyl-1,4,8-,tetraazacyclotetradeca-4,11-diene) or (HMD), binding to metal centers, such as copper or cobalt (I) and (II), have been a point of focus proving to act as catalysts for CO2 activation processes. Concentration has been directed toward three main derivatives of the Co(II)[HMD] complex synthesized using literature methodology with newfound modifications. The derivatives acting as points of focus include these differing counter-ions: cobalt tetrachloride, perchlorate, and triflate attached to the inorganic [Co(II)(HMD)]2+ complex. Interest lies in determining the factors that mark the effectiveness of this catalyst in the CO2 activation process using counter-ions as possible sources of variance. Spectroscopic X-ray emission analysis will become a frontier for these types of macrocyclic inorganic compounds in the future, and hopefully will lead to a coherent understanding of the factors attributing to catalytic properties and mechanisms.

YASMIN ANCHONDO

“Therapeutic targets for Doxorubicin resistant breast cancer”

Major: Animal Science
Faculty Advisor: Dr. Amanda Ashley, Chemistry and Biochemistry

LEADERS

Doxorubicin is a common chemotherapy drug used in triple negative breast cancer (TNBC), but development of resistance is common. We identified genes that may promote doxorubicin-mediated cell death in TNBC lines harboring mutations in tumor suppressor p53. We hypothesize targeting these doxorubicin survival genes will lead to p53 independent cell death, and will sensitize breast tumors to doxorubicin. We confirmed knockdown of ROCK1, RAF1, ERBB3, and EPHB4 in BT20 cells. We generated doxorubicin survival curves: cells were transfected with siRNA, then treated with (DOSES) doxorubicin and viability was assessed. Overall, we will identify new drug targets for doxorubicin resistant TNBC.

JUSTIN APODACA

“Effects of Corticosterone-Induced Stress on Vocal Learning in the Budgerigar”

Major: Biology
Faculty Advisor: Dr. Timothy Wright, Biology

NSF

Budgerigars, Melopsittacus undulatus, are able to modify their calls to match those of other birds in their flock. We examined changes in this ability under induced stress from elevated corticosterone. Osmotic pumps containing corticosterone were surgically placed in nine male birds with three
different treatments: high and low corticosterone levels, and a saline control. Male budgies were then paired with females and placed in recording chambers for habituation and call recording. We predict that high levels of induced stress will result in reduced vocal learning as measured by slower and less accurate matching of female calls by males in the high corticosterone treatment.

**JESUS AU**

“Polymerization-Induced Phase Separation”

**Major:** Chemical Engineering and Engineering Physics

**Faculty Advisor:** Dr. Reza Foudazi, Chemical and Materials Engineering

AMP

There is always a growing demand for better technologies. High energy density batteries are necessary to continue technological progress and improve reliability in portable electronics and electric vehicles. Lithium ion batteries have allowed us to store more energy, yielding smaller more powerful devices. However, due to dendrite formation in the electrolyte, these devices fail to reach their full potential, even making them dangerous. A solution to this has been proposed which consists of substituting the liquid electrolyte commonly used with a high modulus solid polymer electrolyte, preventing dendrite formation and eliminating the hazard of pressure build due to volatile components.

**ADAM BACA**

“Does Environmental Stochasticity Drive Reproductive Strategy among Pupfish?”

**Major:** Wildlife Ecology

**Faculty Advisor:** Dr. Colleen Caldwell

DOD

The interplay between mate choice and reproductive signaling is a fundamental relationship in the evolution of mating systems. Reproductive signals such as bright coloration, body size and territoriality can influence mate choice; however, these signals are not perfect indicators of potential reproductive success. When reproductive signals fail, animals will adopt a reproductive ‘bet-hedging’ strategy where reproductive investments are distributed according to reliability of the reproductive cue. We tested the hypothesis that variation in reproductive bet-hedging behavior can be explained by variation in survival to stochastic changes in the environment of a small desert fish (White Sands pupfish Cyprinodon tularosa).

**LUIS BARRERA**

“Controlling Tethered Heterogeneous Autonomous Unmanned Vehicles in GPS-Denied Environments”

**Major:** Physics and Engineering Physics-Aerospace Engineering

**Faculty Advisor:** Dr. Liang Sun, Mechanical and Aerospace Engineering

AMP

This research project aims to develop a tethered autonomous system to facilitate localization capability of an unmanned aerial vehicle (UAV) in a GPS-denied environment. We first derive the dynamic model for the tethered system using Gauss’s Principle and test our control scheme for different cable-controlling strategies in MATLAB/Simulink simulation. We then develop a cable
angle sensor to provide the 3-dimensional cable orientation information needed to assist in the localization of the UAV. Hardware experimental results will show the effectiveness of the proposed system and control approaches.

ALEJANDRA BONILLA ROMERO
“Molecular Dynamic Simulation of Lithium-ion Battery”
Major: Aerospace and Mechanical Engineering
Faculty Advisor: Dr. Young Ho Park, Mechanical and Aerospace Engineering
AMP
The lithium-ion battery is a secondary battery mostly used for portable electronic devices due to the high-energy density, low maintenance, long cycling life and greatest electrochemical potential. The main focus of this research is on interactions of electrolyte with anode to establish a theoretical understanding. In this study, interfacial phenomena are obtained by the molecular modeling of a cyclic electrolyte made of lithium hexafluorophosphate (LiPF6) combined with propylene carbonate (PC) and anode composed of graphene layers. The Materials Studio software will be used to conduct modeling and simulation of the battery system. A better understanding of physicochemical properties of the electrolyte helps to enhance battery performance.

ELIZABETH BRUG
“Anne Sexton’s Transformations: The Fairytale of Mental Illness”
Major: English and Spanish
Faculty Advisor: Dr. Ryan Cull, English
Honors Thesis
In a study of Anne Sexton’s collection of poems, Transformations, the aesthetic of confessional poetics meets the genre of fairytale to convey the problematic treatment of the mentally ill. Acquainted with mental institutions through her own experiences, Sexton describes how the patients are turned into cherished objects. She weaves these observations and herself into the fairytales in order to pass down her truth and her witness along with the cultural truth built into the stories.

NOLAN BUNKER, LEIF BENITEZ, CHARLES FLOREZ, JOSEPH MORENO, CHRISTIAN VAZQUEZ, AND MOHAMMAD ALBOSARI
“Innovative Approach to Increase Cottonseed Oil Yield for Future Commercialization”
Major: Mechanical Engineering
Faculty Advisor: Dr. Young Ho Park, Mechanical and Aerospace Engineering
USDA I-DISCOVER Program
With the development of the glandless Acala-GLS cottonseed the uses for cottonseeds have risen. With these cottonseeds being included into more commercialized processes, new processes were researched for dehulling and oil extraction, two dehulling proposal and one oil extraction proposal. The dehulling proposals consisted of a mechanical roller system and a high pressure water cutter. The oil extraction proposal dealt with different temperature exposures on the cottonseeds for greater oil yield during extraction. Initial tests determined that a pressure of 100N cracks the hull of the seeds and that 165g of oil was collected from 500g of cottonseed that had not heat treatment.
Dengue virus, a mosquito-borne virus primarily transmitted by Aedes aegypti, is the cause of dengue disease in humans, which ranges from dengue fever to the more severe dengue hemorrhagic fever (DHF). Every year there are approximately 390 million infections worldwide, of which 96 million are symptomatic. Dengue virus is comprised of four distinct serotypes. Each serotype contains multiple genotypes and within genotypes are multiple strains. Strains differ in their virulence and more virulent strains generally tend to competitively displace less virulent strains. The work presented here focuses on two sequential competitive displacement events among strains of dengue virus serotype 3 in Sri Lanka. In 1989, the post-DHF strain displaced the pre-DHF strain and in 2001 the ultra-DHF strain displaced the post-DHF strain. Each dengue virus strain replacement was correlated with a significant increase in the levels of dengue hemorrhagic fever in Sri Lanka. We have previously shown that the post-DHF strain is more infectious for Aedes aegypti than the pre-DHF that it displaced, however the ultra-DHF strain is less infectious for Aedes aegypti than the post-DHF that it displaced (Hanley et al. 2008). I am currently investigating the genetic basis for these differences in mosquito infectivity and for the patterns of displacement by sequencing the whole genomes of 3-5 virus isolates of each of the three dengue virus strains. To date I have generated complete sequences of the structural protein genes for all of these strains. The ratio of nonsynonymous to synonymous mutations in these genes is extremely low (1:23), demonstrating the action of purifying selection on these viruses. Indeed, I have detected only one nonsynonymous mutation that is consistently different among the three strains, a serine to proline shift between the pre-DHF and post/ultra DHF strains at position 1210 in the envelope protein. Thus my results are consistent with previous studies that suggest that vector infectivity in flaviviruses is determined by the sequence of the non-structural proteins.

We investigated whether sexual dimorphism occurs in brown hyenas using skeletons of known sex. A total of 37 skeletal features were measured from a sample of 25 adult skeletons (11 female, 14 male). Intersexual differences in the maximum lengths of the ulna, femur, palate, and scapula were statistically detectable and were larger in males, implying that males are taller and have longer rostrums than females. This suggests the presence of sexually dimorphic characteristics in brown hyenas and the possibility of intrasexual selection in males, perhaps reflecting their nomadic mate-searching tactics or male-male conflict for mates.

In the United States, patients experiencing psychological distress are more likely to live in poverty, alone, and in rural areas than those who do not. Within primary care, physicians recognize these social determinants of health as important, but may lack confidence in addressing them.
This mixed-methods study examines integrated behavioral health care in a family medicine residency, through interviews, surveys, and direct observation. Results demonstrate how physicians address the social needs of patients expressing mental health concerns. We argue that integrated behavioral care is not sufficient to address the complex needs of these patients. Instead, focused inter-professional training is necessary.

JOSH CATANACH
“Synthesis of Iron Oxide-Carbon Composite Nanostructures for Lithium-Ion Battery Applications”
Major: Chemical Engineering
Faculty Advisor: Dr. Hongmei Luo, Chemical Engineering

The fast growing demands of portable electronic devices and electric vehicles have spontaneously stimulated the rapid development of lithium-ion batteries (LIBs) with high energy and power densities. Currently, graphite is the most commonly used commercial anode in LIBs with a relatively low theoretical capacity (372 mAh g⁻¹) which is a major barrier to its further application in high performance LIBs. Various species of iron oxides have received much attention for their application as anodic material in LIBs for their high theoretical capacities, low cost, ease of fabrication and environmental friendliness. However, the iron oxides generally suffer from poor conductivity, large volume expansion, and poor structural integrity during electrochemical cycling. One solution to these problems is to form composites with carbon species or conductive polymer with high conductivity and increased structural integrity. Herein we present novel approaches for synthesizing these unique iron oxides based nanostructures to develop high performance LIBs.

ALEXANDER CHAIDEZ
“Predicted targets of differentially expressed microRNAs in skeletal muscle and the muscle-derived electric organ of the electric fish Sternopygus macrurus”
Major: Microbiology
Faculty Advisor: Dr. Graciela Unguez, Biology

Extreme plasticity of the muscle phenotype is observed in the weakly electric fish Sternopygus macrurus wherein a population of muscle cells transdifferentiate into the non-contractile current producing cells called electrocytes. Recent findings demonstrate that both muscle and EO show similar levels of contractile protein transcripts despite little to no protein being found in electrocytes (Gallant et al., 2014). We hypothesize that the electrocyte phenotype is maintained via microRNA-dependent post-transcriptional regulation. To test this, we performed deep RNA sequencing (n=1) of miRNAs in both tissues and, using computational tools, identified conserved targets of these miRNAs across two species.
ASHLEY CHATTERTON
"Branching Methods for Complex Burger’s Equation"
Major: Mathematics
Faculty Advisor: Dr. Nicholas Michalowski, Mathematical Sciences

We will explore techniques to understand the Viscous Burger’s equation,
\[ U_t = \lambda U_{xx} - U_xU, \]
on the circle. We start by recalling how to use Fourier Series techniques to solve inhomogeneous heat equations. These ideas do not directly apply to Burger’s Equation because the \(U_xU\) terms make the problem non-linear. Therefore we are using Picard Iteration to solve Burger’s Equation.

MELISSA CHAVEZ
“DNA ligase IV in DNA replication stress”
Major: Biology
Faculty Advisor: Dr. Amanda Ashley, Chemistry and Biochemistry

DNA Ligase IV (LigIV) is responsible for religating breaks in the DNA double strand break repair pathway nonhomologous end-joining. Via siRNA, LigIV was knocked down to observe if it facilitates replication fork function. LigIV knock down in HT1080 cells was confirmed by qPCR and immunoblot analyses. Results of DNA fiber analysis indicate LigIV does not directly alter replication fork function. To determine LigIV expression in breast cells, we conducted a LigIV Western blot using nine breast cell lines, including triple negative breast cancer (BT20, BT549, MB231, MB468, HCC70, HCC1187), luminal breast cancer (MCF7), and non-tumorigenic breast (MCF10A, MCF12A) cells.

JOSHUA COPE
Major: CE & BAS with emphasis on renewable energy and sustainability
Faculty Advisor: Dr. Miriam Chaiken, Honors College

National security has many interlocking facets. One of these facets is found in the energy needs of a nation. With an ever increasingly interconnected global world the cultural perspectives found in the peoples that comprise our nations merit more consideration when nations communicate with each other. However cultural considerations have been historically overlooked. A review of national interaction and crisis shows that past and present actions of a nation show that culture influences both internal and external policy with regards to energy. This review shows that differences in approaches to energy security can be traced to cultural viewpoints and values.

SATIVA CRUZ
“Utopiense: Experiential Learning in Colombian Agroforestry System Encourages Teamwork”
Major: Environmental Science
Faculty Advisor: Dr. Kenneth Carroll, Plant and Environmental Sciences

Honors Thesis, MARC, NRCT

Universidad De La Salle’s Utopia campus for rural education in Cassanare, Colombia, empowers young leaders for positive social change through a rigorous agricultural engineering curriculum. Utopia is a proposal for a new model of education where students develop technical skills necessary to tackle environmental challenges, such as water management in a changing climate. This research summarizes a project which includes design and implementation of a drip irrigation system for Theobroma cacao in the university
agroforestry system. This crop is known to be negatively affected by water scarcity, which is intensified during the region’s dry season, irrigation efficacy will be measured.

MICAELA DE LA ROSA
“Painting an Era: How the Dutch Golden Age Crafted Fine Dutch Art”
Major: Government
Faculty Advisor: Prof. Julie Fitzsimmons, Department of Art
Honors College
During the signing of the 1965 Arts and Humanities Bill, US President Lyndon B. Johnson declared that art “is a nation’s most prestigious heritage…for it is in our works of art that we reveal to ourselves, and to others, the inner vision which guides us as a Nation.” The Dutch Republic of the 17th century clearly embodied this relationship. The social and economic situation in the Dutch Republic during their 17th century Golden Age (i.e. economic, religious, etc.) created an environment conducive to art production and development, and fostered a painting culture that provides a snapshot of the era.

KATIE DEAVEN
“Shortcomings in Shoemaker’s Defense: The Unresolved Korsgaard-Parfit Debate”
Major: Philosophy/Mathematics
Faculty Advisor: Dr. Jean-Paul Vessel, Philosophy
Honors Thesis
Derek Parfit’s personal identity theory is based on a psychological criterion. Parfit is a reductionist and explains a person’s identity as a brain, body, and series of both mental and physical states. Christine Korsgaard rejects this account and claims that agency is an essential feature of a person’s identity. Korsgaard explicates agency in terms of authorial connectedness. She claims that Parfit’s theory cannot privilege these connections over non-authorial connections and, thus, Parfit’s theory is incomplete. However, David Shoemaker defends Parfit’s view by claiming that with the notions of successive selves and (non)identification, Parfit’s view does incorporate agency. After elucidating this argument, Shoemaker claims that Parfit’s theory explains the notion of authorial connectedness better than Korsgaard’s own view. I argue that Shoemaker’s argument is not convincing since his analysis of authorial connectedness is unsatisfactory, and he appeals to a past-oriented context as opposed to the future-oriented context of Korsgaard’s view.

KAYLA DEVOGEL
“The Colors of Saturn”
Major: Physics
Faculty Advisor: Dr. Nancy Chanover, Astronomy
DSP
Very little is known about the coloring agents, or chromophores, that color the clouds of Saturn’s belts and zones. To further our understanding of chromophores in Saturn’s atmosphere, we analyzed two data sets: those from Cassini’s
Imaging Science Subsystem (ISS), and Wide Field Planetary Camera 2 images taken with the Hubble Space Telescope (HST). The HST and ISS data are used to create low resolution spectra for six latitude regions on Saturn. We compare these low resolution spectra to Saturn's full-disk spectrum (Karkoschka, E., 1994, Icarus 111, 174) to examine colors of discrete latitudes versus the full-disk spectrum of Saturn.

KENDRA EFIRD, MOHAMMAD ALSHAMMARI, SALEM MARSEL, LULWA AL-YAHYA, AND DEREK UMPHRES

“Shrimp Feeder: A Low Maintenance Automatic Feeding Design”
Major: Mechanical Engineering
Faculty Advisor: Dr. Delia Valles-Rosales, Industrial Engineering
USDA I-DISCOVER Program

Aquaculture for cultivating shrimp is a growing demand worldwide. The New Mexico Shrimp Co. operates to farm and harvest shrimp that is sold to the local stores and restaurants. Their current cultivating method includes manually refilling their commercial spring and conveyer belt design feeders daily. An automatic shrimp feeder has been designed to be low maintenance, user-friendly, inexpensive and less time consuming than current methods for aquaculture feeders. The proposed design runs a clock motor synchronized to an Arduino board to run an auger/hopper design. Resulted design seems to be a more efficient and environmentally friendly system for shrimp production.

AMANDA ERLANDSON

“Role of a Novel Protein in Cell Pole Morphogenesis in Caulobacter crescentus”
Major: Genetics, Biology
Faculty Advisor: Dr. Paola Mera, Biochemistry DSP

Although bacteria exhibit diverse shapes and sizes, we are still far from understanding the production of cellular geometries. We use the bacterium Caulobacter crescentus as a model organism to study cell morphology. Caulobacter possesses a novel gene predicted to play a role in cell polarity. I genetically engineered Caulobacter mutants to test the effects from the deletion and overexpression of this gene. Both mutants were analyzed for changes in cell morphology. Results showed atypical filamentous morphology in the deletion strain and premature cell death in the overexpressed cells.

SHOSHAUNA FARNSWORTH-PINKERTON

“Correlation of detrital tourmalines from the Picuris Mountains with provenance using laser-induced breakdown spectroscopy.”
Major: Geology
Faculty Advisor: Dr. Nancy McMillan, Geology DSP

Detrital tourmaline core composition can be useful in correlation of provenance, even in metasedimentary conditions. Analyses of detrital zircon shows that Piedre Lumbre provenance differs from the underlying Rinconada Schist. This study will use laser-induced breakdown spectroscopy (LIBS) to correlate detrital tourmaline cores with provenance in four samples from the Piedre Lumbre and Rinconada Schist in Copper Hill anticline. Using the multivariate technique partial least squares regression (PLSR) and a model to determine chemistry of environment of formation developed at New Mexico State University, a comparison will be made with detrital zircon data.
TIFFANY FOWLER
“Heavy Metal Abatement in Animas River Samples Using Montmorillonite”
Major: Animal Science
Faculty Advisor: Dr. Antonio Lara, Chemistry
Dr. Antonio Lara
On August 5, 2015, Approximately 3 Million gallons of mine waste containing various heavy metals was released into the Animas River from the Gold King Mine in Silverton, Colorado. This spill severely impacted the four corners area. Samples from Farmington, NM, and Silverton, CO, were analyzed for Uranium, Mercury, and Cadmium using ICP-MS both before and after being exposed to montmorillonite clay. Results showed that after being exposed to clay pellets and powder, heavy metals were abated.

ADRIAN GANDARA
“Synthesis of a Chiral Citrate Derivative via Enzymatic Hydrolysis”
Major: Chemistry and Government
Faculty Advisor: Prof. Aravamudan Gopalan, Chemistry

R. MATTHEW GONZALES
“Estimating Evapotranspiration Using Remote Sensed Data for the Lower 48 States”
Major: Environmental Science
Faculty Advisor: Dr. Blair Stringam, PES

MARC
Petrobactin, PB, is a siderophore secreted by Bacillus Anthracis that obtains iron from its host by coordination of iron with a citrate and two unusual 3,4-catechol moieties. It is a “stealth” siderophore because it is able to evade the human immune system; however, it is unknown how it is able to do so. Our goal is to study the biological activity of PB using hydroxypyridinone/citrate analogs, which can be synthesized via coupling of a chiral citrate with the desired hydroxypyridinone amine. The synthesis of the key citrate derivative, in excellent optical purity using selective enzyme-catalyzed hydrolysis, will be reported.

ANDREA GUTIERREZ
“Care of the self with video games”
Major: English
Faculty Advisor: Dr. Brian Rourke, English

Honors Thesis
The most fundamental thing that sets games apart from other artistic media—books, films, etc.—is that games demand a physical interaction between the text and the player. Using the works
of French philosopher Michel Foucault about “care of the self” and Capcom’s newest iteration of fighting game Street Fighter V, my intention is to prove that video games are more than a hobby. They are worthy of scholarship even though different in its own way. Competitive fighting games are a matter of basic literacy in which can help to improve pedagogy as well.

CLARA HANSEN
“Call similarity and strength of social behaviors in Budgerigars (Melopsittacus undulatus)”
Major: Biology
Faculty Advisor: Dr. Timothy Wright, Biology
Budgerigars are small parrots who, along with humans, are among a few species of animals capable of vocal learning and sound imitation as adults. One hypothesis for the evolution of this ability is that shared vocalizations facilitate social interactions in adult budgerigars. Here we test the possible correlation between similarity of contact calls and strength of social associations within a group of five captive female budgerigars observed for four weeks.
We predicted that pairs of birds with strong affiliative associations would have more shared contact calls than pairs with weak associations.

RACHEAL HEADLEY
“Age-length Relationships of the White Sands Pupfish from Different Environments as Determined by Otolith Microstructure”
Major: Biology
Faculty Advisor: Dr. Colleen Caldwell, FWCE
Otoliths are calcium carbonate structures found behind the brain in bony fishes that can be used to evaluate age structure in fish populations. Much like tree-rings, otolith deposition rate can be used to make inferences about growth patterns.
Validation of otolith deposition was conducted in laboratory-reared White Sands pupfish (Cyprinodon tularosa) to determine the reliability of using otoliths to determine age and growth in wild populations that inhabit contrasting environments (Salt Creek and Malpais Springs) in the Tularosa basin, New Mexico. This research is the first to validate age and growth patterns in juvenile (less than 60 days old) cyprinodontid species.

FRANK HERNANDEZ
“Medicinal Plants of the Southwest”
Major: HRTM
Faculty Advisor: Miss Sarah Gallegos, CAMP
CAMP
The Medicinal Plants of the Southwest (MPSW) program, is funded by the National Institute of Health as part of the Research Initiative for Scientific Enhancement (RISE) Program at NMSU. The goal of the MBRS RISE program is to increase the number of minority students pursuing and obtaining advanced degrees in the biomedical sciences.

ILIANA HERNANDEZ
“Expression of electric fish myogenic regulatory factor, MyoD, in mammalian non-muscle fibroblast cell line”
Major: Biology
Faculty Advisor: Dr. Graciela Unguez, Biology
MARC
Electrocytes are multinucleated current producing cells that make up an electric fish’s electric organ. They originate from the fusion of muscle fibers and down regulation of the muscle system, yet they retain muscle specific proteins such as, MyoD, a muscle regulator. An alignment of the MyoD coding sequence from three different electric fish species: Sternopygus macrurus, Eigenmannia virescens, and Electrophorus electricus shows the gene being conserved
in all four domains. In this study we tested MyoD’s functional conservation ability to induce the muscle system in a mouse fibroblast cell culture through transient transfection.

GRACE HOOKS

“DNA-PKcs in the Replication Stress Response”
Major: Animal Science
Faculty Advisor: Dr. Amanda Ashley, Chemistry and Biochemistry

Prolonged stalling of replication forks can result in double strand breaks causing genome instability. DNA-PKcs functions in nonhomologous end joining DNA double strand break repair. Our aim is to elucidate the role of DNA-PKcs in replication fork restart using three CHO cell lines that express wild type, null, or kinase-dead DNA-PKcs. Replication stress induced cell death was evaluated in each cell line following exposure to hydroxyurea, camptothecin, and etoposide. The LD50 values were similar for each drug and cell line. Phosphorylation of RPA32 following stress was also examined in each line following pretreatment with DNA-PKcs, ATM, or ATR inhibitors.

CHINTELLE JAMES, TAI PHAN, CHRISTOPHER D. COOK, HOLLIE K. JACOBS, AND ARAVAMUDAN GOPALAN

“Synthesis of Novel Sulfonyl-linked HOPO Chelators for Hard Metal Ions”
Major: Biology and Chemistry
Faculty Advisor: Dr. Aravamudan Gopalan, Biochemistry & Chemistry

Chelators containing the 3-hydroxypyridin-2-one (3,2-HOPO) ligand have therapeutic and diagnostic appeal because of their ability to form strong complexes with hard metal ions such as iron (III) and gadolinium (III). The purpose of this study is to develop methods to tether the HOPO ligand to a variety of molecular scaffolds such as amines, alcohols, and amino acids via sulfonyl linkages. HOPO sulfonamides and HOPO sulfonyl azides have been prepared using a sulfonyl chloride in the key coupling step. Both the strategy and applications to the synthesis of HOPO sulfonyl linked compounds will be presented.

MARVIN JOJOLA

“Production of Allelopathic Chemical Under Different Temperatures”
Major: Wildlife Science
Faculty Advisor: Dr. Wiebke Boeing, FWCE

Much effort is being put into algal biofuel research. However, we have to better understand interactions between algae to reduce cultivation risk. We noticed a takeover in outdoor raceways, where invasive Coelastrella sp. outcompeted desired Chlorella sorokiniana. We conducted experiments and grew Coelastrella sp. with three different strains of C. sorokiniana at three different temperatures (18, 25, 32 °C). We found that all mixtures between the strains produced
the allelopathic chemical but only one of the Chlorella strains responded with strong growth inhibition to the allelopathic chemical. Future experiments will focus on C. sorokiniana 1412 using additional temperature treatments.

SARA KELLEY, KEVIN PEREZ
“Biodiversity of Arachnids in the Nutt Grasslands of New Mexico”
Major: Agricultural Biology
Faculty Advisor: Dr. Martha Desmond, Fish, Wildlife and Conservation Ecology

SWNCTP
Solar facilities have potential to negatively impact surrounding biodiversity. Spiders and related Arachnids are an important component of terrestrial ecosystems and are often quite diverse. The biodiversity of ground-dwelling arachnids was compared outside and within the solar facility in the Nutt Grasslands near Hatch, New Mexico. Pitfall trap samples were taken from plots arranged in rings at various distances within and around the facility. Plots were compared to observe diversity between the farthest rings to the closest. Analyses, currently in process, are based off the Shannon Weiner index. Biodiversity is expected to decrease at closer distances to the solar facility.

JACQUELINE KIELTYKA, MICHELLE SILBER, AND ALEJANDRA ENRIQUEZ
“Sustainable Fishing: How Fish Can be Friends and Food”
Major: Genetics/Biochemistry
Faculty Advisor: Dr. Michele Nishiguchi, Biology

Climate change has direct biological effects on Hawaiian coral reefs. Our study focused on: human impacts, subsequent coral bleaching, and susceptibility of the bleached corals to disease and macroalgal invasion. Direct human contributions with sunscreen use and indirect contributions with acidification, and rising temperature were found to have an effect on Hawaiian reef systems. Due to environmental stressors corals lose symbiotic zooxanthellae leading to coral bleaching. Bleaching can leave corals susceptible to disease and macroalgae invasion and death affecting the reef environment for other species. In order to preserve the Hawaiian coral reef environment people must make lifestyle changes in order to favorably combat climate change.

APPLEHELEN KIRBY, KELCIE GERRY, AND SYDNEY JANE SALAS
“Ohana means family, no corals left behind”
Major: Microbiology and Biology
Faculty Advisor: Prof. Michele Nishiguchi, Biology

Climate change has direct biological effects on Hawaiian coral reefs. Our study focused on: human impacts, subsequent coral bleaching, and susceptibility of the bleached corals to disease and macroalgal invasion. Direct human contributions with sunscreen use and indirect contributions with acidification, and rising temperature were found to have an effect on Hawaiian reef systems. Due to environmental stressors corals lose symbiotic zooxanthellae leading to coral bleaching. Bleaching can leave corals susceptible to disease and macroalgae invasion and death affecting the reef environment for other species. In order to preserve the Hawaiian coral reef environment people must make lifestyle changes in order to favorably combat climate change.
ABSTRACTS

continued

VICTOR LARA
“Valorization of Agricultural Residuals through Biophysical Transformation”
Major: Civil Engineering
Faculty Advisor: Dr. Zohrab Samani, Civil Engineering
AMP
The extensive exploitation of non-renewable resources such as hydrocarbon and soil is a serious threat to food security. On the other hand, the environmental degradation due to uncontrolled decomposition of organic waste is a serious threat for sustainability. This research addresses these issues by developing the conversion process of agricultural residuals into a nutrient-rich organic solution that can be used for crop production and can be easily applied to soil through direct application or irrigation water. The production process consists of a temperature-enhanced biological reactor equipped with a leachate re-circulator. Examples of the agricultural residuals that can be used for this process include grass clippings, rain-damaged alfalfa crops and byproducts of legume crops. The resulting product is a low-pH, high-nutrient liquid organic solution, containing the elements essential for development of plant cell structure.

ELIZABETH LEATHERMAN
“Serving Culturally and Linguistically Diverse Populations with Augmentative and Alternative Communication Needs”
Major: Communication Disorders
Faculty Advisor: Dr. Amelia Rau, Communication Disorders
Honors Thesis
About 1% of people with speech disorders experience communication impairments severe enough to need augmentative and alternative communication (AAC) to supplement existing speech. There’s also a growing number of Americans that speak a language other than English in the home. At the intersection of these two topics, we see a limited amount of research available, and thus inadequate resources available for both the clinician and client. This session will outline available research, identify social and cultural influences and stigmas for culturally and linguistically diverse (CLD) populations using AAC devices, discuss the impact these have on the services provided by speech-language pathologists (SLPs), and compile guidelines for best practices.

TRAVIS LEDOUX
“Hydrothermal Liquefaction of Various Algae in Batch and Continuous Flow Reactors”
Major: Chemical Engineering
Faculty Advisor: Dr. Catherine Brewer, Chemical Engineering
AMP
Algae-based biofuels have attracted attention due to their advantages of not competing with land for food production, fewer environmental limitations, higher growth rates, and strong CO2-mitigation abilities. In recent years, there is a surge in research on hydrothermal liquefaction of algae since the feedstock does not need to be dried for processing. Hydrothermal liquefaction uses high temperatures
(270 to 300°C) and high pressures (80-100 bar) to produce relatively high yields of bio-oil from algae. This study focuses on hydrothermal liquefaction of various algae under different temperature and pressure conditions in a bench-scale batch reactor and a pilot-scale continuous flow reactor.

ALEJANDRA LERMA
“Progestin Signaling in Triple Negative Breast Epithelial Cells”
Major: Animal Science and Biology
Faculty Advisor: Dr. Ryan Ashley, Animal and Range Sciences
HHMI
Women receiving HRT containing estrogens and progestins have increased risk for breast cancer development compared to women receiving estrogens alone, highlighting the role of progestins in breast cancer biology. Triple negative breast epithelial (TNBC) cells lack nuclear progesterone receptors, yet respond to progestins. Therefore, progestins may function through membrane progesterone receptors (MPRs). We hypothesized progestin-induced activation of MPRs stimulates cell proliferation through MAPK signaling. TNBC cells were treated with progestins and cell proliferation and signaling cascades investigated. Progestins activated MAPK pathways and stimulated cell proliferation dependent on cell type. Our results underscore the importance of MPRs in breast cancer biology.

ALEXIS LOPEZ
“Find one fast, or find them all slow: Do collaborative visual searchers search more quickly or more thoroughly?”
Major: Psychology
Faculty Advisor: Dr. Michael Hout, Psychology
DSP
In the current study, we sought to mimic the challenges faced by real-world searchers (e.g. TSA baggage screeners) to better understand collaborative search behavior. Participants memorized target categories, and were assigned to one of four conditions: a solo-search condition or one of 3 collaborative dyad conditions, each with a specific search strategy. Our findings suggest that working in a team creates certain benefits to performance; team searchers tend to have higher accuracy and commit fewer false-alarms under time pressure, but not are faster in search. Ongoing research is further exploring the effectiveness of collaborative search strategies.

YVONNE LUCERO
“A transgenic approach to confer resistance in chile to the pathogen, Phytophthora capsici.”
Major: Genetics
Faculty Advisor: Dr. Champa Gopalan, Plant and Environmental Sciences
MARC
Plant disease resistance genes protect plants from pathogens by infection-induced production of many defense molecules including antimicrobial compounds like phytoalexins. Phytophthora capsici is among the most destructive pathogen for chile. A disease resistance gene (RB) from wild potato that confers resistance to other species of Phytophthora has been introduced into susceptible chile leaves for transient expression. The transformed leaves exhibited resistance to P. capsici and the RB gene showed higher expression
level in the infected leaves compared to the noninfected tissues, suggesting induction of the defense response. Experiments are in progress to analyze for expression of the genes involved in phytoalexin synthesis in infected tissues.

EMMA MARTIN

“American Indian disparities: An examination of race/ethnicity on sentencing outcomes for federal drug offenses”
Major: Criminal Justice, Psychology
Faculty Advisor: Dr. Mercedes Valadez, Criminal Justice

The relationship between race/ethnicity and sentencing has historically been concentrated on outcomes for white and black offenders while others including Hispanics, Asians, and American Indians have been generally overlooked in the sentencing literature. The current study extends prior research on race and ethnic based sentencing disparities by testing the relationship between race/ethnicity and sentencing outcomes for American Indian, Asian, black, Hispanic, and white offenders. We also investigate the moderating effects of age, race/ethnicity and gender. Using data from the United States Sentencing Commission for fiscal years 2011-2013, we examine sentencing outcomes for federal drug offenses.

KENNETH MARTIN, ISMAEL TORRES, RYAN KIRBY

“Facilitating Conservancy Efforts of Hawaii’s Coral Reefs Through Socioeconomic Valuation Methods”
Major: Geography
Faculty Advisor: Dr. Michelle Nishiguchi, Biology

Sundt Seminar

Climate change is a complex phenomenon that influences both the environment and global economy. The economic value of coral reefs in Hawaii is estimated at more than $10 billion; therefore, it is imperative that local governance understands the impact of climate change to this important natural resource. Coral reefs provide economic benefits, social value, and natural beauty to the local Hawaiian culture and people. By conducting a case study investigation on the Hawaiian management of coral reef endangerment, we have evaluated the effectiveness in implementing environmental public policy, and developed an extrapolated recommendation for strategies in Hawaii and areas with sensitive natural habitats (e.g. New Mexico). Our findings demonstrate the usefulness of natural resource accounting methods such as Genuine Progress Indicators in crafting environmental policy.

ALEXA MARTINEZ

“Genetic Variability in Captive and Wild Populations of the Critically Endangered Blue-throated Macaw (Ara glaucogularis)”
Major: Wildlife Science
Faculty Advisor: Dr. Tim Wright, Biology

The blue-throated macaw, Ara glaucogularis, is the most threatened macaw species. The World Parrot Trust estimated the wild population to be ~150-200 in Bolivia and nearly 1000 birds in captivity. To date, no genetic variability studies
have been conducted in either population. We will use microsatellites and mitochondrial DNA sequences to assess genetic variability within and among populations. We are testing primers for other Neotropical parrots to develop a library of 10-12 microsatellite loci. Genotype data will provide critical data for managing captive breeding and reintroductions.

LORENZO MARTINEZ
“Scale Effects on the Compression Strength of Adobe Blocks”
Major: Civil Engineering
Faculty Advisor: Dr. Paola Bandini, Civil Engineering
AMP
In the Southwestern region of the United States, adobe masonry is a traditional building method. A problem associated with using adobe in construction is that there is a limited number of codes that specify procedures and requirements for material testing of adobe. The goal of this project is to study how different mixing procedures, curing procedures, and testing methods influence the strength of the adobe blocks. Some parameters that may affect the strength is specimen size, water content at mixing, and water content at breaking. This study aims to provide information that can be used to develop a reliable and consistent methods to determine the strength characteristics of adobe blocks.

JOSE MELENDEZ
“Ionospheric Content Neutron Detector (INCA) Nano-Satellite Project”
Major: Mechanical Engineering
Faculty Advisor: Dr. Steve Stochaj, Electrical Engineering
AMP
The purpose of INCA’s Nano-Satellite project is to create a small 3U cube satellite that will measure the flux of neutrons in the low Earth Orbit using a newly developed neutron detector. Measuring this flux and knowledge of it is an important element in improving our understanding of the near-earth radiation elements and how our environment is affected by solar radiation. With this knowledge we will have a better understanding of how low earth orbit radiation can affect humans living in the low earth atmosphere as well as how radiation can affect bigger space projects.

ANGIE MESTAS
“Beet Curly Top Virus in Alternative Weed Hosts”
Major: Agricultural Biology
Faculty Advisor: Dr. Rebecca Creamer, EPPWS
MARC
Kochia scoparia, a common weed in New Mexico chile fields, harbors the insect vector of Beet Curly Top Virus, a damaging disease of chile. Interestingly, the alternative weed hosts of this agricultural insect pest are asymptomatic of expected disease symptoms. With the possibility of the alternative weed hosts being affected in unseen ways, Kochia scoparia samples will be grown in the lab, inoculated via infected leafhoppers and assessed for morphological and physiological responses. This will help to measure the impact of the virus on alternative hosts and provide insight to the ecological relationships between the viral host, virus and vector.
CHRISTOPHER MOLINA
“The Role of Ideology in Administrative Court Proceedings”
Major: Government
Faculty Advisor: Mr. Daniel Chand, Government DSP

Many scholars have studied whether ideology affects judges’ decisions. However, does ideology influence the decisions of administrative judges, who serve within government agencies? To answer this question, I propose to examine the responses to surveys mailed to 667 administrative judges serving in the Office of the Chief Immigration Judge in the Department of Justice and in the Social Security Administration. Using difference in means tests, I intend to test whether judges who self-identify as Democrat or Republican will be more likely to side with the public or the parties in the dispute, as opposed with the government agency. Based on prior literature, I anticipate that the law is indeed under constant threat of being influenced by the judge’s political bias (Siltala, 2003, p. 125).

ABSTRACTS

KELSEY MONTOYA
“An effort to enhance nitrogen use efficiency in alfalfa by manipulating crucial steps in Nitrogen and Carbon metabolism.”
Major: Biochemistry
Faculty Advisor: Prof. Champa Gopalan, Plant and Environment sciences

MARC
Carbon and nitrogen metabolism in plants are highly interconnected and modulation of the key genes involved in their pathways could potentially contribute to the improvement of plants’ performance. We have selected two key enzymes, sucrose phosphate synthase (SPS) and glutamine synthetase (GS) to represent the C and N metabolic pathways, respectively. Two sets of alfalfa transformants have been produced, one set overexpressing SPS and the other GS. Both classes of transformants exhibit increased growth suggesting that both SPS and GS may be limiting for maximal growth. The goal of our project is to characterize the two classes of transformants.

EMILY MOORE
“Role of the Microtubule-binding protein PRC1 in orchestrating the final events of cytokinesis”
Major: Biochemistry/Biology
Faculty Advisor: Dr. Charles Shuster, Biology Shuster Lab

The mitotic spindle is the central organizing structure in the dividing cell, mediating both chromosome segregation and defining the cleavage plane during cytokinesis. Protein Regulator of Cytokinesis 1 (PRC1) is a microtubule bundling protein that organizes the microtubule cytoskeleton during cytokinesis. While PRC1 is essential for cytokinesis, cells lacking PRC1 furrow normally. We hypothesize that PRC1 is essential for organizing the factors that will ultimately
separate the daughter cells. Loss of PRC1 had profound effects on the midbody, which normally assembles between the daughter cells. Current efforts are focused on determining the role of PRC1 in midbody formation and stability.

**OTTO MOSSBERG**  
*“In Vivo Assays to Determine RecN Epistasis Group Participation”*  
**Major:** Genetics  
**Faculty Advisor:** Dr. Shelley Lusetti, Chemistry and Biochemistry

We seek to understand the mechanisms through which RecN assists in recombination to repair DNA double-strand breaks. We construct E. coli strains with various multi-gene knockouts for the recombination-associated proteins RecN, RecB, RecO. Strains are plated onto LB agar, DNA damage is induced by UV radiation or by inclusion of antibiotics in the agar, and percent survival allows inference of genetic interaction. We hypothesize that these genes define three epistasis groups and predict the triple mutant is recombination-deficient. Preliminary results showing that RecN/RecO and RecN/RecB double mutants have a highly reduced repair capacity indicate that RecN is not exclusive to either previously established epistasis group.

**JAIME MOYA**  
*“Optical Constants of Ni and Ni:V alloys”*  
**Major:** Engineering Physics  
**Faculty Advisor:** Dr. Stefan Zollner, Physics

Using FTIR ellipsometry in the infrared spectrum and spectroscopic ellipsometry from the near infrared to near ultraviolet spectrum, the ellipsometric angles were measured as a function of photon energy from 0.03 to 6.6 eV of Ni with varying thickness and growth techniques along with Ni:V alloy films deposited on thermal oxides. Dielectric functions and optical conductivities of our films were determined using Drude-Lorentz fitting. We used two Drude terms in our model to describe the two different free carriers which have different scattering times. There are absorption peaks near 1.3 eV and 4.8 eV due to interband optical transitions.

**TAYLOR NUNN**  
*“Mining open source RNASeq data uncovers the brain metastatic potential of breast cancer cell lines.”*  
**Major:** Genetics/Biology  
**Faculty Advisor:** Dr. Elba Serrano, Biology

Breast cancer metastasis to the brain is of major concern in neural cancer treatment and prevention. Recent studies have shown that nine genes (IL-6R: GSTA5, BCL31, TWIST, Hexokinase 2, HER2, integrin αvβ3 complex; EGFR) play critical roles in the brain metastasis of breast cancer cell lines. Analysis of an open source GEO Dataset comprised of RNASeq data from 77 breast cancer cell lines permitted evaluation of the brain metastatic potential of each cell line on the basis of expression of these nine genes. Outcomes from analysis of cell line expression metadata can inform research into the targeted treatment and prevention of brain cancer.
FRANCHESCA ORTEGA

“Genetic barcoding using molecular analysis for identification and taxonomic clarification of Capsicum chinense using the Internal Transcribed Spacer Region”

Major: Genetics and Biotechnology

Faculty Advisor: Dr. Paul Bosland, Plant and Environmental Sciences

HHMI

The goal of DNA barcoding is to establish a shared resource of DNA sequences that can be used for organismal identification and taxonomic clarification. In this project, we aim to distinguish different cultivars within the chile pepper species, C. chinense, using the Internal Transcribed Spacer (ITS) region of nuclear ribosomal DNA (nrDNA). With seven cultivars of C. chinense and one cultivar of C. annuum, DNA was extracted and the ITS1-5.8S-ITS2 region amplified and sequenced. Tentative sequencing results showed minimal distinction between cultivars of C. chinense, but several SNPs that distinguished between species were identified. We plan to continue our search for the best DNA candidate regions for distinguishing within a species.

SEALTIEL ORTEGA-RODRIGUEZ

“Reference Seed Iterative Long Reads Assembler”

Major: Biology

Faculty Advisor: Dr. C. Donovan Bailey, Biology

MARC

Highly complex genomes have proved difficult to assemble through conventional assembly methods. Long read datasets have helped resolve the complexities caused by large repeats, structural recombination, and genome duplication. Though helpful, there are still many challenges in assembling long read datasets, especially since not all the reads in a dataset may belong in a particular assembly. Reference Seeded Iterative Long Reads Assembler is a program that allows for quick and simple assemblies of complex genomes. RSILRA employs novel methods that allow users to target specific aspects of a dataset, allowing for a rapid and efficient assembly.

GARRETT OVERCAST

“Identification of C3-like proteins within the snail Biomphalaria glabrata”

Major: Biochemistry

Faculty Advisor: Dr. Maria Castillo, Biology

MARC

The parasite Schistosoma mansoni, which is one of the causative agents of schistosomiasis, uses Biomphalaria glabrata as an intermediary host. We have identified several sequences containing complement-like domains within the B. glabrata genome. The complement system is an important component of the innate immune response, and it is involved in key immune responses such as recruitment of immune cells, direct cell lysis, pathogen opsonization, and tissue inflammation. Complement proteins are good targets to study immune interactions between B. glabrata and S. mansoni and may help develop new strategies to stop the spread of schistosomiasis.
JAYA PAUDEL

“Utilization of the TPM ligand in preparing its metallic complex with transition metals mainly Iron, Manganese and Molybdenum.”

Major: Chemistry
Faculty Advisor: Dr. Feifei Li, Chemistry and Biochemistry

Department of Chemistry
Tris(3,5-dimethyl pyrazolyl) methane ligand is the neutral tridentate ligand which consists of three pyrazole rings with methyl groups at 3 and 5 positions and in connection with carbon through one nitrogen in each 3 pyrazoles. TPM ligand mimics the fragment of histidine which is the major component of oxygen binding proteins. The purpose of the project is to prepare TPM metal complexes and to understand the variations in their electronic properties when varying the co-ordinating components around the metals. The metallic complexes of TPM with Iron, Manganese and Molybdenum are prepared and their spectral properties were analysed.

FERNANDO PEREZ, FARIS ALHAYDAR, MAHDI ALHAYDAR, JORGE BANDA, MATTHEW SIMPSON, KEVIN LARKIN, AND CASEY GROEN

“Developing a Self-Powered Solar Kiln for Fritting Clay Pellets”

Major: Industrial Engineering
Faculty Advisor: Dr. Young Ho Park, Mechanical Engineering

USDA/Engineering Capstone

Uranium [U(VI)] contamination of groundwater is recognized as a health threat to rural residents, such as those in the Navajo Nation, relying on home wells for their drinking water. It has been proven that fritted clay pellets can remove U(VI) from contaminated water. A cost-effective heat source that does not require electricity was also needed. In this experiment, sunlight concentrated by a Fresnel lens in combination with a solar tracker was used as the heat source. The oven is expected to maintain a temperature near 650 Celsius for at least 5 hours to frit the clay pellets.

ALDO RAMIREZ

“Comparing intraspecific aggression and genetic similarity between urban and rural Pogonomyrmex ant colonies.”

Major: Biology
Faculty Advisor: Dr. Timothy Wright, Biology

HHMI

Ant species are some of the most successful and widespread urban invaders. Rough harvester ants (Pogonomyrmex rugosus) are found throughout urban habitats in the southwest, perhaps as a result of invasion. Founder effects following urban invasion are expected to increase genetic similarity between colonies and, consequently, lower intraspecific aggression. We conducted 350 trials comparing inter-colony aggression within and between urban and rural settings. Rural colonies displayed higher aggression towards neighboring colonies. We are assessing genetic similarity among colonies using multiple microsatellite markers. Preliminary results for one marker and one colony per setting indicate that urban colonies may exhibit less genetic diversity.
LAUREN RATH

“Mammalian hormones associated with stress impact microbial fermentation of rumen fluid in vitro”

Major: Animal Science
Faculty Advisor: Dr. Clint Loest, Animal and Range Sciences
Honors Thesis, HHMI

Stress hormones impact bacteria in the digestive tract. This study evaluated effects of epinephrine, norepinephrine, and cortisol on rumen fermentation and gas production. Treatments were no hormones (CON), epinephrine (EPI), norepinephrine (NOR), cortisol (CORT), and a combination of EPI, NOR, & CORT (ALL). Acetate and isovalerate (mol/100 mol) were lower (P < 0.01) for EPI and NOR than CON, CORT, and ALL, butyrate was greater (P = 0.03) for EPI and NOR than CON, and intermediate for CORT and ALL. A treatment x h interaction (P < 0.01) for gas production indicates that fermentation is altered by treatments.

CYRENA RIDGEWAY

“Engineered Thermo Conductivity; Shape and Connectivity”

Major: Civil Engineering
Faculty Advisor: Dr. Douglas Cortes, Civil Engineering Department

AMP

The majority of energy consumed by households in the U.S. is used for heating and cooling. Low temperature geothermal energy harvests the heat stored in soils and can offer significant improvements in energy efficiency compared conventional to heating and cooling systems. However, the typically low thermal conductivities of soils require significantly large heat exchangers for the system to accommodate for a household demand. Improving the thermal conductivity of soils can lead to reductions in the size of the geothermal heat exchanger and cut substantially the capital investment in geothermal heat pumps. This research documents the results of a laboratory experimental study that explores the effects of introducing metallic particles of various shapes to a uniformly graded sand. Thermal conductivity measurements are reported for cylindrical and spherical metallic intrusions.

RACHEL RIDGEWAY

“Developing Methodologies for the Quantization of Atmospheric Gasses in Water via Raman Spectroscopy”

Major: Physics
Faculty Advisor: Dr. Jacob Urquidi, Physics

AMP

Data from previous experiments has suggested that the absence of dissolved atmospheric gases may play a role in the formation of surfactant free aqueous emulsions. Dissolved gas concentrations were quantified after each step of an iterative degassing process using Raman spectroscopy. Discussed are the sensitivity requirements for the detection of dissolved atmospheric gasses; N2, O2, and CO2 as well as a description of the functionality of the Raman system developed.
EMILIO RIVERA

“Uranium Abatement From Drinking Water By Natural Clays”

Major: Biochemistry

Faculty Advisor: Dr. Antonio Lara, Chemistry and Biochemistry

Dr. Antonio Lara Research Group

Following World War II, the race for nuclear weapons led to a spike in uranium mining in the Four Corners Area. Due to crude mining practices, tailings and mine shafts were abandoned and left to wreak havoc on the environment. In particular, uranium has leached into the water table that many Navajo rely on for drinking and irrigation. In an effort to help this economically limited people, our research group developed natural clay sorbents, and conducted a series of studies which showed that sorbents made from five different types of clay were capable of removing uranium.

OSCAR ROBLES, HOLLIE K. JACOBS

“Development of a new class of hydroxypyridinone chelators for hard metal ions”

Major: Chemistry and Biochemistry

Faculty Advisor: Dr. Aravamudan Gopalan, Biochemistry & Chemistry

DSP

Hydroxypyridinones, HOPOs, are powerful chelating groups for hard metal ions including iron(III), lanthanide(III) and the actinide(IV) ions. As therapeutic agents, the 3,4-HOPO, deferiprone, is used for the treatment of iron overload diseases. As diagnostic agents, HOPO chelators of gadolinium have been evaluated as MRI contrast agents while HOPO chelators of zirconium-89 have been studied for oncological imaging using positron emission tomography (PET). Here we present a synthetic route to prepare a new class of 3,2-HOPO chelators that uses a Mannich reaction to provide a unique attachment of the HOPO through the 4-carbon of the HOPO ring onto amine backbones.

AARON RODRIGUEZ

“Factors Influencing Spindle Orientation During Early Development”

Major: Biology

Faculty Advisor: Dr. Charles Shuster, Biology

HHMI

Following fertilization, the embryo undergoes precisely patterned cleavages that differentially partitions factors that influence cell fate. In sea urchins, the spatial patterning of the early divisions is critical to establishing the embryonic axis, but little is known about how this process is regulated. We hypothesize that the PAR complex recruits dynein to the cell cortex, which then influences the orientation of the mitotic spindle. Using timelapse microscopy, we observed that PAR inhibition results in abnormal cleavage patterns, and that dynein inhibition affected nuclear migration during the fourth division. Current efforts are focused developing new reagents to validate these results.
FELICIA RODRIGUEZ
“Characterization of Redox Active Tetrazine Ligand with Zinc Center”
Major: Chemical Engineering
Faculty Advisor: Ms. Feifei Li, Chemistry

Undergraduate Research
Redox active ligands with metal centers can be used to activate smaller molecules, such as O2, CO2 and others. By characterizing how the 3,6-bis(2-pyridyl)-1,2,4,5-tetrazine ligand interacts with various Zinc compounds, the overall oxidation state stability and capability this ligand has can be further characterized. So far, the Zn-tetrazine compound has been synthesized using zinc nitrate and zinc chloride at various different ratios of zinc compound per ligand. Through various different spectroscopies, the structure and reactive nature of these compounds can be determined.

DAVID RODRIGUEZ HERRERA
“Effectiveness of Catnip (Nepeta cataria L.) Essential Oil in Reducing Onion Thrips (Thrips tabaci L.) on Onion (Allium cepa L.)”
Major: Genetics
Faculty Advisor: Dr. Chris Cramer, Plant and Environmental Science
HHMI
Nepetalactone is known mostly for the response it induces in felines; however, it has also been shown to be significantly more effective than equal parts of DEET at repelling the German cockroach (Blattella germanica L.). Onion thrips (Thrips tabaci L.), small insects that reside on the inner leaves of onion plants, is a damaging pest worldwide. They transmit Iris yellow spot virus and cause leaf tissue damage, both of which cause a significant loss in yield, up to 100%. In this experiment, we wanted to determine the effect of steam distilled catnip (Nepeta cataria L.) leaves, nepetalactone being the major constituent, had on the number of onion thrips feeding on onion leaves. Dried catnip plant material was steam distilled. The resulting chemical constituents were analyzed and determined through gas chromatography mass spectrometry (GS-MS). In a greenhouse experiment, a catnip distillate-based solution was created and then applied to young onion plants; a similar solution lacking nepetalactone was applied to our control onion plants. Thrips counts were taken at 0, 3, 24, 48 and 96 hr time intervals. The mean number of thrips per onion leaf and the analysis of variance for this trait were determined using SAS statistical software. GC-MS analysis determined that nepetalactone was present in the distillate, more specifically as two isomers, trans-cis and cis-trans nepetalactone. Essential oil from catnip leaves was not effective at reducing thrips in the first three hours after chemical application, nor in subsequent time intervals. After the 48 hr mark, the essential oil did not prevent thrips densities from increasing.

ANDREW RODRIGUEZ
“Solar Powered Plane”
Major: Mechanical Engineering
Faculty Advisor: Mr. Andreas Gross, Mechanical & Aerospace Engineering

Sundt Seminar
My research this semester has consisted of helping design and build an unmanned aerial vehicle previously built by my mentor and other research students. The solar plane we are designing now is going to be twice the scale of the original plane built. This semester we finished the original solar
plane, had a successful flight with the original solar plane, started modeling and designing the upscale solar plane, and started building the upscale plane. As we build the plane we have to be very accurate and precise with it. As we build many parts require testing of some sort.

**ZACHARY ROMERO**

*“Investigation of the Deinococcus Radiodurans RecN R452A Mutant”*

**Major:** Biochemistry  
**Faculty Advisor:** Dr. Shelley Lusetti, Chemistry and Biochemistry

Chromosome maintenance and repair is a critical aspect for all living cells. In order to combat the endogenous and exogenous factors that cause DNA damage, cells have developed intricate mechanisms to repair their DNA when damaged. My project focuses on the Deinococcus Radiodurans protein RecN that belongs to the SMC family of proteins. Our lab has previously shown that RecN has a cohesive function to tether DNA together during DNA double strand break repair. I now look to investigate the function of a mutant RecN protein R452A, and how mutating the highly conserved arginine affects the function compared to the wild-type.

**HRIDINDU ROYCHOWDHURY**

*“AztD, a periplasmic zinc metallochaperone to an ABC transporter system in Paracoccus denitrificans”*

**Major:** Biochemistry and Physics  
**Faculty Advisor:** Dr. Erik Yukl, Chemistry and Biochemistry

Bacterial ATP binding cassette (ABC) transporters of transition metals are essential for metal acquisition in often extremely scarce environments. Many gram-negative bacteria have a fourth conserved gene of unknown function adjacent to the canonical permease, ATPase, and solute binding protein (SBP) of the Azt ABC Zn Transporter. To study the function of this proposed accessory factor (AztD) from Paracoccus denitrificans, we analyzed its metal affinity and interaction with the SBP (AztC). Size exclusion chromatography and fluorescence assays were used to demonstrate that AztD quantitatively transfers Zn to apo-AztC directly without loss to the solvent. We hope to elucidate the mechanism of transfer through crystallography.

**MAGGIE SABIK**

*“Rare Targets Induce Less “Perceptual Readiness:” Evidence from Pupillometry”*

**Major:** Psychology  
**Faculty Advisor:** Dr. Michael Hout, Psychology

In visual search, targets that appear infrequently are missed disproportionately often. This “low-prevalence effect” has societal consequences and is challenging to alleviate. Our experiment investigated low-prevalence misses using pupillometry. Participants searched for two target categories amid streams of rapidly presented pictures. We tracked pupil dilation (a marker of memory strength/specificity) and observed a pupillary prevalence effect, wherein high-prevalence targets elicited greater pupil dilation. These findings suggest that high-prevalence targets resonate more strongly with mental representations of target templates used during search, and provide further evidence that low-prevalence targets are missed, in part, due to weaker templates and reduced perceptual readiness.
ABSTRACTS

continued

TOREY SALGADO
“Contractile Ring Assembly in Animal Cells”  
Major: Biology  
Faculty Advisor: Mr. C. Brad Shuster, Biology

Cytokinesis is the process where a dividing cell physically partitions into two daughter cells. This is accomplished by the actomyosin contractile ring, which assembles at the cell equator to split the cell in two. However, the assembly of the ring is poorly understood. We hypothesize that ring components initially assemble as small nodes that coalesce into a contractile ring. Toward these ends, we are examining ring components under conditions that prevent full ring assembly. Additionally, we are using a photo-labile inhibitor to image these nodes in living cells. From these efforts, we hope to better understand this fundamental biological process.

ADAM SANCHEZ
“Recycled Concrete Aggregates for Structural Applications”  
Major: Civil Engineering  
Faculty Advisor: Dr. Brad Weldon, Civil

The use of recycled concrete aggregates (RCAs) was investigated as an aggregate source for structural applications, particularly focusing on ultra high performance concrete. The results of this investigation aid in the development of performance based RCA qualification requirements, mixture proportion guidelines, specifications to achieve acceptable behavior of RCA concretes as well as creating more sustainable concrete practices through the use of recycled materials. The RCA incrementally replaced traditional aggregates to identify the effect of the introduction of RCAs. Various batches were mixed, cast, cured, and tested for strengths using different RCA sources from the Southwest region of the United States.

OSCAR SANTANA DÍAZ, MARÍA JIMENA RENTARÍA ORTEGA
“Ergonomic study at a USDA certified slaughter and processing facility”  
Major: Industrial Engineering  
Faculty Advisor: Dr. Efren Delgado, Food Science and Technology

Ergonomics is defined as the applied science of equipment design, as for the workplace, intended to maximize productivity by reducing operator fatigue and discomfort. The meat slaughtering and processing facility has many challenges regarding ergonomics, since employees work under USDA inspection for human handling and sometimes at room temperatures below 50°F. All these problems can be attacked with Cognitive Ergonomics and Occupational Ergonomics. Adapting the work stations correctly to the employee and with the proper studies and ergonomic equipment. By doing this, the employee’s performance is going to increase because their body and their mind won’t get tired.
GRISELDA SAUCEDO  
Major: Mechanical Engineering  
Faculty Advisor: Dr. Delia Valles-Rosales, Industrial Engineering  
AMP, USDA I-DISCOVER Program  
The market for Wood Plastic Composites (WPC) is increasing drastically, this is the fastest sector of plastic industry now days. Current fabrication methods include injection molding processes providing excellent dimensional accuracy however, alternative methods have been investigated to reduce mold design costs. Rapid prototyping systems provide an alternative solution however, several analysis and adjustments need to done to manufacture the ASTM specimens with high dimensional accuracy and ready to be used for mechanical testing. This project proposes an alternative solution to use a 3D laser printer. Results show that specimens can be fabricated meeting the required standards.

MONCIA SCOTT  
“Increased fat storage in Drosophila Nepriysin 1 Mutants via insulin like peptides pathway”  
Major: Biochemistry  
Faculty Advisor: Dr. Jennifer Curtiss, Biology  
DSP  
The Drosophila Nep1 gene encodes an ortholog of mammalian nepriysins, metallopeptidases that have been linked to obesity and diabetes, but the mechanisms are unclear. We hypothesized that Nep1 loss-of-function mutants would affect expression of Drosophila Insulin Like Peptides. In Drosophila Insulin Like Peptide 2 (ILP2) promotes lipid and carbohydrate storage by the fat body, while Insulin Like Peptide 6 (ILP6) inhibits secretion of ILP2. We have used qPCR to demonstrate that ILP2 transcript levels are decreased and that ILP6 transcript levels are increased in Nep1 mutants. These results suggest that Nep1 regulates ILP2 and ILP6 expression, either directly or indirectly.

ANAHI SOTO  
“Effect of pretreatment of iron modified zeolites on removal of cadmium from water.”  
Major: Civil Engineering  
Faculty Advisor: Dr. Lambis Papelis, Civil Engineering  
AMP  
Elevated metal ion concentrations in the water is a major health concern in many parts of the world, including the US Southwest. This research involves developing of an inexpensive treatment process for the removal of toxic metal cations and metalloids (anions) from water. The relevant research question is determining the dependence of sorption properties of the material used as a function of pre-treatment and solution composition. The proposed metal and metalloid removal technology involves sorption of metals or metalloids on zeolites. The general ability of iron-coated zeolites to remove metals and metalloids from water has already been demonstrated based on previously conducted experiments. In this phase, the effect of sorbent pre-treatment and solution composition on the removal efficiency of a toxic metal, cadmium, was explored. The sorption of cadmium on four different sorbents was studied: untreated zeolites, zeolites treated with a high concentration sodium chloride solution, untreated zeolites coated with iron, and iron-coated zeolites treated with a high concentration sodium chloride solution. Experiments were conducted as a function of pH, cadmium concentration, and solution composition. These experiments provide insight into the behavior of toxic metal ions as a function of geochemical conditions and can lead to more efficient, simple water purification systems.
MARY STOFAN
"Selective Diels-Alder Reactions Using Dialkynes"
Major: Chemistry
Faculty Advisor: Dr. James Herndon, Chemistry and Biochemistry

MARC
Eyne carbonyls are useful in a variety of novel ring forming processes that have been developed in the Herndon research group. To synthesize, more elaborate molecules containing this structure more flexible methods were needed. Selective Diels-Alder reactions on unsymmetrical dialkynes can produce the desired product in one step. First the investigation and optimization of the unsymmetrical Glaser coupling using the electron-rich alkyne 1-hexyne and the electron-deficient alkyne ethyl propiolate was carried out. However, subsequent Diels-Alder reactions did not proceed cleanly using furan or 2,3-dimethyl-1,3-butadiene. Presently, the idea of using doubly activated dialkynes to run mono Diels-Alder reactions is being tested.

ZOE SULLENGER
“An exploration of temporal social network stabilization in the budgerigar (Melopsittacus undulatus)”
Major: Biology
Faculty Advisor: Mrs. Angela Medina-Garcia, Biology

Wright Lab
Social network structure and temporal dynamics in avian species, particularly in Psittaciformes, are poorly understood. Previously, social networks in captive monk parakeets, Myiopsitta monachus, were shown to stabilize quickly and remain stable for over a month. We examined social networks in another parrot, the budgerigar, Melopsittacus undulatus. Groups of six males and three females were observed using focal animal sampling. We used social interaction data to generate social networks every 3-4 days, and calculated correlations between social interaction matrices at ten time points. Preliminary results suggest budgerigar social networks do not stabilize, and instead remain variable for weeks to months.

MARTIN TERAN
“Synergism of pyrethroid with enzymatic inhibitors in resistant bed bugs”
Major: Wildlife Management
Faculty Advisor: Dr. Alvaro Romero, Entomology, plant pathology and weed science

AMP
An understanding of the mechanisms of insecticide resistance in the bed bug has the potential to lead to new approaches for the control of resistant populations. I used the cytochrome P450 monooxygenase (P450) inhibitor piperonyl butoxide (PBO), esterase inhibitor S,S,S-tributyl phosphorotrithioate (DEF), Glutathione S-transferase (GST) inhibitor diethyl maleate (DEM) and the Carboxyesterase (CarE) inhibitor triphenyl phosphate (TPP) to assess the role of detoxifying enzymes in pyrethroid resistance in a resistant bed bug strain. Synergism of deltamethrin was observed with the addition of DEF and TPP indicating that esterases and carboxyesterase are involved as resistance mechanisms in pyrethroid resistant bed bugs.
ISMAEL TORRES
“Regional Immigrant Rights and Services Manual”
Major: Economics/Government
Faculty Advisor: Dr. Neil Harvey, Government

Immigrant families are integrated into our community. Research to update a previous bilingual immigrants’ rights manual created by Dr. Harvey and his students in 2009-11 was conducted. The research and subsequent manual is designed to assist families of mixed immigration status to understand the immigration system and find resources available to them in southern New Mexico. Information new to the manual includes health care, identification laws, Deferred Action Programs and legal protections for immigrants with disabilities. Interviews with nonprofit organizations, service providers, and community leaders were conducted to enhance the content and measure its effectiveness.

ANNELIESE TRUJILLO
“Developing a Transformation and Regeneration Model for Chile Pepper (Capsicum annuum)”
Major: Chemical Engineering
Faculty Advisor: Dr. Champa Sengupta-Gopalan, Plant and Environmental Sciences

Chile pepper is an important cash crop for farmers. Chile pepper contains an extensive list of plant derived chemical compounds that are known to have disease preventing and health promoting properties. Chile peppers are susceptible to many pathogens that can cause considerable losses in yield and quality. Genetic engineering could be an important approach in accelerating chile pepper performance. The successful application of genetic engineering strategies to improve chile pepper requires an efficient and reproducible regeneration and transformation system (introduction of transgene). We will present our data on the development of an efficient transformation protocol for chile transformation.

AMADEO TRUJILLO
“Iron-Modified Zeolite Permeable Reactive Barrier”
Major: Civil Engineering
Faculty Advisor: Dr. Lambis Papelis, Civil Engineering

Environmental quality is one of the major concerns of society moving forward into the future, and of these concerns, contamination from trace metals and metalloids is among the most important. Contaminants particularly detrimental to the health of humans as well as having adverse effects on aquatic environments, in general, include oxyanions of arsenic and selenium. Zeolites, abundant minerals found throughout New Mexico and many other parts of the world, are particularly suitable for the remediation of contaminated sites for the following reasons. Zeolites are porous and have large surface area, thereby can be used as molecular-scale filters that can remove metals from groundwaters. In order to make them even more versatile, zeolites will be coated with iron oxides in order to produce a permeable reactive barrier that can be used to remove oxyanions of arsenic and selenium from contaminated groundwaters and protect drinking water sources. In the first phase, the purpose of this research is to develop an understanding of the sorption behavior of arsenic and selenium on iron-modified zeolites as a function of solution composition, while in the second phase the impact of microbial activity will also be assessed. This research will fill a significant gap in our knowledge of microbial interactions with permeable reactive barriers for the remediation of contaminated sites and source water protection.
KIRA TURNHAM, ALLISON DAWE, AND JACOB BENNETT

“Ahapua’a: Hawai‘i’s commitment to sustainability”

Major: Biology

Faculty Advisor: Dr. Michele Nishiguchi, Biology

Sundt Seminar

The coral reefs of the Hawaiian archipelago provide a source of income for both business and tourism industries. Climate change can result in loss of biodiversity in tropical ecosystems, and thus negatively affect industry profits. In order to address the loss of revenue, businesses are implementing sustainable practices to combat climate change. We investigated Hawaiian business practice to explore the current measures being implemented. Examples such as the National Oceanic and Atmospheric Administration (NOAA), as well as the popular tourist destination Hanauma Bay serve as models for both natural and man-made management strategies. These cases highlight the integration of business, tourism, and their interconnection with protecting the environment.

KIRA TURNHAM

“Phylogeography of Euprymna and their Vibrio symbionts: the genetic architecture of a symbiotic system.”

Major: Biology

Faculty Advisor: Dr. Michele Nishiguchi, Biology

Honors Thesis

Patterns of distribution for mutualist partners in the marine environment can be an indication of factors that influence their life history and ecology. Hosts and their communal partners show differences in distribution patterns when factors other than host specificity drive that distribution. Squids of the genus Euprymna (Cephalopoda: Sepiolidae) form an environmentally transmitted association with the marine bioluminescent bacterium Vibrio fischeri (γ-Proteobacteria). These bacteria are housed in an organ within the host that allows for use of bacterial produced light for counterillumination behavior. At dawn each day, 95% of the bacteria is released from the light organ into the oceanic environment. Subsequently, free-living V. fischeri are exposed to a variety of abiotic conditions, such as temperature, salinity, or currents, which may affect their ability to colonize subsequent new hosts. In order to determine whether V. fischeri populations are transient among host populations, we constructed haplotype networks and used nested clade analysis to compare host-symbiont assemblages. Squid populations exhibited no genetic connection across the Sulu Sea that would link populations of the main islands of the Philippines to those from Palawan. Conversely, symbiotic Vibrios showed genetic connectivity between populations. Thus, the distribution of symbiotic Vibrios in the Philippines indicates environmental influences, not host specificity, shape this mutualistic association.

TAYLOR USELMAN, SAHAR QAVI

“Development of Instructional Materials for a Rheology Laboratory Workshop”

Major: Engineering Physics - Mechanical Engineering

Faculty Advisor: Dr. Reza Foudazi, Chemical and Materials Engineering

BP-ENDURE (BRAiN)

Rheology is about the deformation and flow of materials. Focused rheology workshops afford the opportunity to impart the technical skills and concepts of rheometry to students working in a range of STEM fields. To this end we have designed an experimental protocol for analyzing mechanical behaviors of a range of materials using the DHR-3 Rheometer (TA Instruments).
recently purchased through an NSF-CBET grant. The laboratory protocol enables students to examine multiple mechanical properties (storage modulus, loss modulus, viscosity, et.) under varying conditions, learn the fundamentals of data analysis, and to incorporate rheometry into the experimental design of their research projects.

ALEXANDRA VALDEZ

“Analysis of Agave parryi subs. neomexicana as a New Source of Inulin and a Potential Manufacturing Route for its Extraction”

Major: Chemical Engineering
Faculty Advisor: Dr. William Maio, Chemistry and Biochemistry

AMP

Agave nectar has gained popularity as a natural, non-caloric sweetener. This is due to the body’s inability to process the beta(2,1)–linkages found in the fructan polymers extracted from agave. Inulin is extracted from the plant, via thermal processing that causes natural enzymes within the plant to hydrolyze and release its sugar storages as an assortment of polymers. We are currently engaged in the modification of a published extraction method, specific to A. tequilana. This extract will be studied and analyzed by chemical means and will then be correlated with the known profile of inulin derived from A. tequilana.

JARED VAN NATTA

“The Culture of Medicine: Hidden Curriculum and its Effect on Patient Safety”

Major: Anthropology
Faculty Advisor: Dr. Mary Alice Scott, Anthropology

DSP

The culture of western biomedicine contains a complex system of rules and values. These systems have a profound effect on the training and education of medical residents. Often the methods of teaching medical residents formally emphasize patient safety, but informally push residents to see as many patients as possible often in lieu of safety. This paper describes the informal teaching methods and cultural atmosphere within a Southwestern Family Medicine residency program that pushes high patient volume and exposure to various procedures. Using participant observation, semi structured interviews, and survey data I gained insight into the training of medical residents, and the teaching methods of faculty. My findings reveal the possible consequences of a pervasive aspect of medical culture that potentially puts patients at risk due to an emphasis on “numbers” and administrative tactics.

JESSIE VELASCO

“Do Oral Contraceptives Have Psychoactive Effects?”

Major: Nursing
Faculty Advisor: Dr. Elba Serrano, Biology

Honors Thesis

Women have been taking oral contraceptives throughout the last five decades, and although these pills have been wildly popular, until recently, we have not known of their effects beyond the reproductive system. In this presentation, I explore three major neurological effects of oral contraceptives: the influences they have on mood, the ways they alter partner preferences, and the structural changes they cause in the brain. Findings suggest that because of these effects, oral contraceptives should be classified as psychoactive drugs. I also discuss the ethical implications of oral contraceptives and their psychoactive effects within our society.
CARLOS VIGIL
“Engineering Properties of Foam Glass and Soil-Foam Glass Gravel Mixtures”
Major: Civil Engineering
Faculty Advisor: Dr. Paola Bandini, Civil Engineering
AMP
This research is aimed at producing a foam glass soil mixture that can replace ordinary soil as a backfill for bridges. The idea is that the replacement of some soil with foam glass will decrease the overall weight of the backfill, giving less stress on the retaining walls of bridges. Various tests from specific gravity to permeability to freeze-thaw properties and direct shear must be obtained in order to meet backfill specifications. The research I am involved in tests the foam glass and soil separately in order to get the properties of the material. The foam glass soil mixtures were tested in various aspects to find if the properties are suitable for the intended purpose.

ELIJAH WADE
“Polymerized high internal phase emulsions for 3-dimensional cell scaffolding applications”
Major: Chemical Engineering
Faculty Advisor: Mr. Reza Foudazi, Chemical Engineering
BP-ENDURE (BRAIN)
The mechanical microenvironment plays a crucial role in the development and growth of cells and tissues. This project focuses on the synthesis of polymeric cell scaffolds using High Internal Phase Emulsion (HIPE) templating to produce highly porous structures with tunable modulus and pore size. Poly[2-hydroxyethyl methacrylate-co-methylenebis(acrylamide)] porous polymers were synthesized using oil-in-water HIPEs. Current focus areas include tuning the modulus with cross-linker length and manipulating pore size by varying mixing time. Scaffold biocompatibility will be evaluated in vitro with a Xenopus A6 kidney cell line.

CHRISTIAN WONG
“Mineral Dissolution in Polymer-coated Soils”
Major: Civil Engineering
Faculty Advisor: Dr. Douglas Cortes, Civil Engineering
AMP
The mechanical properties of soils that exhibit high stability in mildly acidic environments (pH=4) tend to degrade over time, rendering such soils unstable and incapable of accommodating the demands of civil engineering infrastructure. This research project explores the ability of polymer coatings to prevent mineral dissolution and associated changes in mechanical properties of granular materials (i.e. silica sand and calcium carbonate sand). Performance is measured by strain gauges and a linear variable displacement transducer that collect data on the mechanical response of the polymer-bonded soil specimens in the form of lateral stresses induced by the load and flushing.