19th Annual URCAS
Undergraduate Research and Creative Arts Symposium

Friday April 25, 2014
8:30 am - 12:30 pm
NMSU Corbett Center

Sponsors
Honors College • New Mexico Alliance for Minority Participation (AMP) • Minority Access to Research Careers (MARC) • Building Research Achievement in Neuroscience (BRAIN) • Howard Hughes Medical Institute (HHMI) • College Assistance Migrant Programs (CAMP)

College of Business • College of Education • College of Engineering • Office of the Vice President for Research, Graduate Studies and International Programs
Honors College

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.

New Mexico 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.

Minority Access to Research Careers (MARC)

The MARC Program 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.

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.

College Assistance Migrant Program (CAMP)

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 Bachelor’s 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.
Preface

The Undergraduate Research and Creative Arts Symposium, now in its nineteenth 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 Thesis 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. William Eamon, Dean, Honors College

Dr. Michael Johnson, Director, MARC Program

Dr. Elba Serrano, Director, BP-ENDURE (BRAiN) Program

Dr. Ricardo Jacquez, 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 Bejerano, College Assistance Migrant Program (CAMP)

Dr. Vimal Chaitanya, Vice President for Research

Dr. Michael Morehead, Dean, College of Education

Dr. Kathy Brook, Interim Dean, College of Business
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2014 Symposium Speaker

Dr. Sean Rogers
Assistant Professor
Department of Management
“Paid and Unpaid Internships: Implications for College Students”

Every year, U.S. organizations employ an estimated 2 million college students as interns. About half work for at least minimum wage, while the rest work for free as volunteers. Most scholarship on college internships focuses on paid internships. Perspectives about unpaid internships, almost always negative, tend to come from popular press opinion pieces and the like, and rarely use little more than anecdotal evidence to support any claims. Analyzing data from nearly 200 paid and unpaid college student interns at 2 flagship research universities, this study attempts to answer several questions: Do paid and unpaid internships differ in terms of the social networking and career development benefits they create for students? Do paid interns learn more about themselves and their career aspirations from their internship experiences than unpaid interns? Who tends to be more satisfied with their internships – students who are paid, or students who volunteer? The answers to these questions have important practical implications for college students.

Dr. Sean Rogers joined the Department of Management in 2013. Before coming to NMSU, Dr. Rogers was on the faculty of the Anderson School of Management at University of New Mexico, and prior to that worked as a Research Fellow at the U.S. Army Research Institute for the Behavioral and Social Sciences. Dr. Rogers has over 15 years of combined corporate and military work experience. Professor Rogers’s research interests include contingent work and workers (especially volunteers), workplace diversity, and labor and employment relations. His teaching experience and interests include human resource management, organizational behavior, diversity, and employment relations.
Previous Symposium Speakers

2013

**Dr. Collin Payne**  
Assistant Professor of Marketing

2012

**Dr. Paul Bosland**  
Regents Professor of Horticulture and Director of the Chile Pepper Institute

2011

**Dr. Kenny Stevens**  
Associate Professor of Engineering Technology

2010

**Dr. Kenneth Hammond**  
Professor of History

2009

**Dr. Connie Falk**  
Professor, Agricultural Economics and Business

2008

**Salim Bawazir, Ph.D.**  
Associate Professor, Department of Civil Engineering

2007

**Dr. Elba Serrano**  
Regents Professor of Biology

2006

**Dr. Mary O’Connell**  
Regents Professor, Department of Plant and Environmental Sciences

2005

**Prof. David Taylor**  
Department of Art

2004

**Dr. Robert Armstrong**  
Regents Professor of Physics

2003

**Dr. Ann Hales**  
Professor, Department of Nursing

2002

**Dr. Steve Stochaj**  
Associate Professor, Klipsch School of Electrical and Computer Engineering

2001

**Robert Marquez**  
Doctoral Student, Chemistry

2000

**Dr. Reta Beebe**  
Professor, Department of Astronomy

1999

**Dr. Rudolfo Chávez Chávez**  
Regents Professor, Department of Curriculum and Instruction

1998

**Dr. Kathleene West**  
Professor, Department of English

1997

**Dr. Cookie White Stephan**  
Professor, Department of Sociology

1996

**Dr. Champa Sengupta-Gopalan**  
Professor, Department of Agronomy and Horticulture
Schedule of Events

Refreshments and Welcoming Remarks
8:30 am
Dona Aña Room

Dr. Dan Howard
Interim Exec. Vice President and Provost

Poster Session
9:00am - 12:00pm
Second Floor Art Gallery

Paper Sessions

Session 1A
9:00am-10:00am
Rio Grande Room

Session 1B
9:00am-10:00am
Socorro room

Session 1C
9:00am-10:00am
New Mexico Room

Session 1D
9:00am-10:00am
Colfax Room

Session 2A
10:15am-11:15am
Rio Grande Room

Session 2B
10:15am-11:15am
Socorro room

Session 2C
10:15am-11:15am
New Mexico Room

Session 2D
10:15am-11:15am
Colfax Room

Session 3A
11:30am-12:30pm
Rio Grande Room

Session 3B
11:30am-12:30pm
Socorro room

Session 3C
11:30am-12:30pm
New Mexico Room

Session 3D
11:30am-12:30pm
Colfax Room

Luncheon
12:30pm - 1:30pm
Corbett Center West Ballroom

Luncheon Address

Dr. Sean Rogers
Assistant Professor, Dept. of Management

“Paid and Unpaid Internships: Implications for College Students”
Poster and Program Design

This year’s designs were created by the students in Professor Gatis Cirulis’s Type & Layout ART 355. The logo/branding design and poster was created by Abby Ortegon of Santa Teresa, NM. Luis Chavez of Las Cruces, NM designed the t-shirt and website branding, he is pursuing a Bachelors Degree of Fine Arts and will be graduating in December 2014. The program layout was done by senior graphic design major Amberly Sisneros of Espanola, NM and incorporates the Poster and Branding designs contributed by Abby and Luis. Abby Ortegon and Amberly Sisneros are Seniors graduating in May 2014 with a Bachelors of Fine Arts degree in Graphic Design. This year’s poster and program were type set in Helvetica Neue and Helvetica Neue Bold Condensed, and were produced on an iMac and Macbook Pro using Adobe Illustrator CS5 and Adobe Indesign. The poster and program were printed by the NMSU Print Portal.

Poster Exhibition

In addition to our first place winner, an exhibit of all of this year’s designs submitted by Type & Layout students will be on display at Corbett Center Second Floor Lobby from 9am to 12 pm. The following students’ work will be exhibited:

1st place: Team 4: Amberly Sisneros, Abby Ortegon, Luis Chavez

2nd place: Team 2: Terran Trotter, Kimberly Hanson, Katelyn Tuning, Juan Tellez

3rd place: Team 3: Miguel Valle, Zackary Markham, Garson Lamb, Erynn MicConnell

Honorable Mention: Team 1: Amanda O’Brien, Heriberto Bajo, Fatima Goenaga

ART 355 Special Topics in Design: Type & Layout

Special semester long focus includes conceptual development, professional practices, advanced typography, portfolio development and client-based projects.
Poster Session

Second Floor Lobby Balcony
9:00am-12:00 noon

Heriberto Alvarado
“Study Abroad”
Major: Animation and Visual Effects
Faculty Advisor: Dr. Cynthia Bejarano, Arts and Sciences CAMP

Rosie Baum
“Yucatan’s Apparel and Sustainability”
Major: Psychology
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Vanessa Carrillo
“A Look into How Tourism Impacts Ancient Maya Archaeological Sites”
Major: Anthropology with a focus in archaeology
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Danielle Ceballes
“Marketable Resilience”
Major: Management
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Maria Chavez
“Differential responses of two ecologically similar species to variation in temperature and resources”
Major: Conservation Ecology
Faculty Advisor: Dr. Karen Mabry, Biology
MARC

Sativa Cruz
“Cooperation in Celestun builds Resilient Communities in Coastal Regions of Yucatan”
Major: Environmental Science
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Richard De La Rosa
“Examination of G protein antagonism during cytokinesis”
Major: Biology
Faculty Advisor: Dr. Charles Shuster, Biology
MARC

Crisandra Diaz
“Taxonomic Composition of Cyanobacteria in the Gut Ecosystem of Malaria Mosquito Anopheles gambiae”
Major: Biology
Faculty Advisor: Dr. Jiannong Xu, Biology
MARC

Stephanie Doyal
“Environmental Risk Assessment of Cenotes Located Near Popular Mayan Tourist Sites”
Major: Civil Engineering
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar
Luis Duarte
“Evaluating changes in the catabolic profile of soil microbial communities from riparian areas of the Rio Grande as a result of Salt Cedar encroachment”
Major: Civil Engineering
Faculty Advisor: Dr. Heather Throop, Biology
AMP

Gayani Ekanayake
“Analysis of chile plants transformed with a chile gene encoding 5-Enolpyruvylshikimate-3-phosphate synthase”
Major: Biochemistry
Faculty Advisor: Prof. Champa Gopalan, Plant and Environmental Science
MARC

Larisa Estrada
“Important Resilient Animals in the Mayan Society”
Major: Animal Science
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Jessica Gomez
“Improved Leg Exoskeleton Design for Gravity Offloading”
Major: Mechanical Engineering
Faculty Advisor: Prof. Ken Ruble, Mechanical and Aerospace Engineering
AMP

Marisa Griego
“Identifying the Role of Abams in Drosophila melanogaster Wing Development”
Major: Genetics
Faculty Advisor: Dr. Jennifer Curtiss, Biology
MARC

Andrea Gutierrez
“In The Step of Alice Dixon”
Major: English
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Iliana Hernandez
“Expression of myogenic regulatory factors in the non-contractile electric organs of three electric fish species”
Major: Microbiology/Biology
Faculty Advisor: Dr. Graciela Unguez, Biology
RISE/NIH SCORE

Nathan Jenkins
“2,5 Substituents of Thiophene”
Major: Chemistry
Faculty Advisor: Dr. James Herndon, Chemistry
MARC

Alexandra Juarez
“The effects of environmental health on societal resilience”
Major: Environmental Science
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Heather Lanksbury
“Gene Expression Profiles Linked to Different Activation Profiles of Myogenic Cells in the Electric Fish Sternopygus macrurus”
Major: Biology
Faculty Advisor: Dr. Graciela Unguez, Biology
HHMI
Reanna Messer
“Synthesis of Fluorinated Carvone Derivatives”
Major: Biology
Faculty Advisor: Prof. Bill Maio, Chemistry
BP-ENDURE (BRAiN)

Danielle Miyagishima
“Design and synthesis of a new class of selective estrogen receptor antagonist”
Major: Biochemistry
Faculty Advisor: Dr. Jeffrey Arterburn, Chemistry and Biochemistry
MARC

Emily Moore
“Tourism Impact on Biodiversity of Birds”
Major: Biology
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Ruben Moreno
“CYP2S1 influences Banoxantrone-induced genotoxicity in human bronchial epithelial cells”
Major: Biochemistry
Faculty Advisor: Dr. Aaron Rowland, Biochemistry
MARC

Jose Munoz, Erik Garcia
“Providing Access to Clean Water”
Major: Chemical Engineer
Faculty Advisor: Dr. Cynthia Bejarano, Criminal Justice
CAMP

Stephanie Newell
“Expression of Membrane Progesterone Receptors Beta and Gamma in Breast Cancer Cells”
Major: Animal Science
Faculty Advisor: Dr. Ryan Ashley, Animal & Range Sciences
MARC

Lauren Lujan Pincomb
“Design and Synthesis of Selective GTPase Probes”
Major: B.S. Biochemistry/B.A. Chemistry
Faculty Advisor: Dr. Jeffrey Arterburn, Biochemistry & Chemistry
MARC, NSF REU

Casey Rede
“Mayan Honey”
Major: English
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

Emilio Rivera
“Abatement of Uranium from Water Using Clay”
Major: Biochemistry
Faculty Advisor: Dr. Antonio Lara Chemistry and Biochemistry

Elisa Sanchez
“Identification of two galectin transcripts in Euprymna species”
Major: Biology
Faculty Advisor: Dr. Maria Castillo, Biology
MARC
Kathryn Sanchez

“Neurosensory systems in Xenopus laevis larvae can be identified using luxol fast blue and neutral red”

Major: Biology and Government

Faculty Advisor: Dr. Elba Serrano, Biology

BP-ENDURE (BRAIN)

Calvin Silas

“Design of 3D Spacecraft Ground Simulator for Attitude Control using Variable Speed Control Moment Gyroscope”

Major: Mechanical Engineering

Faculty Advisor: Dr. Amit Sanyal, Mechanical & Aerospace Engineering

AMP

Arthur Tillbrook

“The Yucatan Peninsula: Capturing Culture Through Poetry”

Major: English

Faculty Advisor: Dr. Rani Alexander, Anthropology

Sundt Honors Seminar

Leticia Varela

“How surface to volume ratios affect pellicle formation and growth of the wrinkly spreader phenotype in Vibrio Fischeri”

Major: Pre-Nursing

Faculty Advisor: Dr. Michele Nishiguchi, Biology

HHMI

Thomas Vigil

“Growth dynamics of Williopsis saturnus related to exopolysaccharide production”

Major: Biology

Faculty Advisor: Dr. Geoffrey Smith, Geoffrey Smith

MARC

Connor Wagner

“Flavor Volatiles and Aroma Profiles of the Jalapeño Pepper”

Major: Genetics

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

HHMI

Justin Waters

“Creating oxazole compounds using Suzuki coupling and boronic esters and creating 1,3 carbonyl compounds from sulfoxides”

Major: Biology

Faculty Advisor: Dr. William Maio, Chemistry

MARC

Kobi Weaver

“Using Chemical Analysis to Determine Activity Patterns of a Elite Residence of Chum Balam-Nal in Blue Creek, Belize”

Major: Anthropology

Faculty Advisor: Dr. Rani Alexander, Anthropology

Honors Thesis

Chiann-Ling Yeh

“Determining the process of sarcomere disassembly by immunofluorescent detection of muscle proteins in Sternopygus macrurus regenerated two-week tails”

Major: Genetics

Faculty Advisor: Dr. Graciela Unguez, Biology

HHMI,
Paper Session 1  9:00am-10:00am

1.A: Rio Grande Room (228)

**Moderator:**
Dr. Yosef Lapid,
Department of Government

**Esteban Lucero**
“The Influence of Social Environment on FoxP2 Expression in Open Ended Vocal Learners”

**Major:** Biology

**Faculty Advisor:** Dr. Tim Wright, Biology

**BP-ENDURE (BRAiN)**

**Justin Provo**
“Do TRP Channels Form Heteromultimers?”

**Major:** Biology

**Faculty Advisor:** Dr. Elba Serrano, Biology

**BP-ENDURE (BRAiN), Undergraduate Research for Prospective Physician-Scientists at Indiana University School of Medicine Graduate Division**

**Miriam Favela, Justin Provo**
“Can capsaicin exposure affect glioblastoma cell morphology and survival through multiple cell death pathways?”

**Major:** Biochemistry

**Faculty Advisor:** Dr. Elba Serrano, Biology

**BP-ENDURE (BRAiN)**

**Diego Gomez**
“A restored fluorescence lifetime-based flow cytometer”

**Major:** Chemical Engineering

**Faculty Advisor:** Dr. Jessica Houston, Chemical Engineering

**BP-ENDURE (BRAiN)**

1.B: Socorro Room (218)

**Moderator:** Dr. Stuart Munson-McGee,
Department of Family and Consumer Science

**Michael Carlock**
“Wood Chile Peppers Stalks-Plastic Composite Production: An Innovative Alternative for New Mexico Chile Growers”

**Major:** Industrial Engineering

**Faculty Advisor:** Dr. Delia Valles, Industrial Engineering

**AMP**

**Rime Elatlassi, Mario Gonzales, Dr. Delia Valles, Sarah Lopez, Fernando Perez**
“Rapid Prototyping Consulting Group”

**Major:** Industrial Engineering

**Faculty Advisor:** Dr. Delia Valles, Industrial Engineering Department

**AMP**

**Fernando Perez, Rime Elatlassi, Mario Gonzales, Sarah Lopez**
“Experiential Learning in the Development of a Rapid Prototyping Consultation Group”

**Major:** Industrial Engineering

**Faculty Advisor:** Dr. Delia Valles, Industrial Engineering

**AMP**

**Javier Garcia-Mendoza**
“Intersection Traffic Safety: Red Light Violation Analysis”

**Major:** Industrial Engineering

**Faculty Advisor:** Dr. Hansuk Sohn, Industrial Engineering

**AMP**
1.C: New Mexico Room (324)

**Nicholas Ragazzone**
“Purification of Acetate Kinase for the Development of an Acetate Concentration Assay”
**Major:** Biochemistry
**Faculty Advisor:** Dr. Kevin Houston, Biochemistry
**MARC, Purdue Biochemistry REU**

1.D: Colfax Room (210)

**Moderator:**
Dr. Liz Horodowich,
Department of History

**Reading and Performance Session**

**Devin Galligan**
“When and There”
**Major:** Digital Film Making and Marketing
**Faculty Advisor:** Prof. Amy Lanasa, Creative Media Institute
**Honors Thesis**

**Claire Koleske**
“‘Frailty Thy Name is Woman’: Hamlet and the Feminist Coming of Age”
**Major:** English/Theatre Arts
**Faculty Advisor:** Prof. Josh Chenard, Theatre Arts
**Honors Thesis**

**Janette Torres**
“The Non-Parametric Data Analyses for Observational Before-and-After Studies of the Speeding Violations Data”
**Major:** Industrial Engineering
**Faculty Advisor:** Dr. Hansuk Sohn, Industrial Engineering
**AMP**

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**Moderator:**
Dr. Bernard McNamara,
Department of Astronomy
Paper Session 2  10:15am-11:15am

2.A: Rio Grande Room (228)

**Moderator:**
Daniel Ramirez Gordillo,
Graduate Student, Biology

**Jemima Perez**

“Neural expression patterns of FoxP2 and FoxP1 in adult open-ended vocal learners, budgerigar (Melopsittacus undulatus)”

**Major:** Biology

**Faculty Advisors:** Dr. Timothy Wright, Dr. Avis James

**HMMI**

**Kelsey McBeain**

“A study of how surface to volume ratios affects pellicle formation and the growth of the Wrinkly Spreader phenotype”

**Major:** Biology

**Faculty Advisor:** Dr. Michele Nishiguchi, Biology

**MARC**

**Mahdika Johnson**

“Regulation of Cell Adhesion in the Early Embryo”

**Major:** Biology

**Faculty Advisor:** Dr. Charles Shuster, Biology

**MARC**


2.B: Socorro Room (218)

**Moderator:**
Dr. Richard Rundell,
Professor Emeritus of Languages and Linguistics

**Presentations from the Sundt Honors Seminar**

**Mariana Ortega**

“The Culture of Cacao”

**Major:** Digital Filmmaking

**Faculty Advisor:** Dr. Rani Alexander, Anthropology

**Sundt Honors Scholar**

**Meagan Baker**

“Mexico: Sustaining or Harming the Preservation of Cultural Sites through Government Policy?”

**Major:** Government and German

**Faculty Advisor:** Dr. Rani Alexander, Anthropology

**Sundt Honors Scholar**

**Kobi Weaver**

“The Commercialism of Maya Identity in Merida, Mexico”

**Major:** Anthropology

**Faculty Advisor:** Dr. Rani Alexander, Anthropology

**Sundt Honors Scholar**
2.C: New Mexico Room (324)

**Moderator:**
Professor Julie Fitzsimmons, Department of Art

**Shannon Ellison**
“Adapting the Novel to Film”
**Major:** Digital Film Making
**Faculty Advisor:** Prof. Ilana Lapid, Creative Media Institute
**Honors Thesis**

**Jessie Libicer**
“Impressionism and Expressionism on Canvas and Staves: Monet & Debussy, Nolde & Hindemith”
**Major:** Music: Instrumental Performance
**Faculty Advisor:** Prof. Julie Fitzsimmons, Art
**Honors College**

**Ashley McGuire**
“Yellowism: Appropriation Taken Too Far?”
**Major:** English
**Faculty Advisor:** Prof. Julie Fitzsimmons, Art
**Honors College**

**Cole Tobin**
“Surrealism: Exploration of the Irrational Mind”
**Major:** Anthropology and Biology
**Faculty Advisor:** Prof. Julie Fitzsimmons, Art
**Honors College**

2.D: Colfax Room (210)

**Moderator:**
Professor Frank Gilpin (Paco Antonio), Department of Human Performance and Dance

**Amber Medina**
“Challenging galaxy formation theory via direct observational analysis”
**Major:** Physics
**Faculty Advisor:** Dr. Christopher Churchill, Astronomy
**AMP**

**Hannah Rich**
“Gasoline Engines in the Context of Climate Change”
**Major:** Physics
**Faculty Advisor:** Dr. Boris Kiefer, Physics

**Fred Smalley**
“Monte-Carlo Simulations to Optimize Particle Detector Design”
**Major:** Physics
**Faculty Advisor:** Dr. Vasilli Papavassiliou, Physics
**AMP**

**Joshua Catanach**
“Binary Metal Oxide Nanowire Arrays”
**Major:** Chemical Engineering
**Faculty Advisor:** Dr. Hongmei Luo, Chemical Engineering
**AMP**
Paper Session 2  11:30am-12:30pm

3.A: Rio Grande Room (228)

Moderator:
Dr. Tim Ketelaar, Psychology

Shelby Van Arnam
“Rates and Changes of Forest Fragmentation Occurring From the Development of Snow Recreation: A Case Study of Eldora Mountain Resort, Colorado, U.S.A.”
Major: Geography
Faculty Advisor: Dr. Michaela Buenemann, Geography
Honors Thesis

Xenia Lopez
“The Experiences of Individuals With Cardiovascular Disease and The Reduction Effect in Las Cruces, New Mexico”
Major: Anthropology & Criminal Justice
Faculty Advisor: Dr. Mary Alice Scott, Anthropology
Honors Thesis

Meagan Baker
“Language Policy in the United States: English-only or the Right to Multilingualism?”
Major: Government and German
Faculty Advisor: Dr. Neil Harvey, Government
Honors Thesis

3.B: Socorro Room (218)

Moderator:
Dr. Mark Andersen, Fishery and Wildlife Sciences

Gabriela Anguiano-Molina
“Design of a Passive, Gravity Offloading Leg Exoskeleton for Rehabilitation.”
Major: Mechanical Engineering
Faculty Advisor: Dr. Ou Ma, Mechanical and Aerospace AMP, URA

Jessica Salazar
“Durability Assessment of Ultra High Performance Concrete”
Major: Civil Engineering
Faculty Advisor: Dr. Brad Weldon, Civil Engineering AMP

Alyssa Trujillo
“Freezing and Thawing Durability of Ultra High Performance Concrete”
Major: Civil Engineering
Faculty Advisor: Dr. Craig Newton, Civil Engineering AMP

Cristina Villa
“Properties of Plastic-Cellulosic Composite Through Simulation Techniques using Accelrys Materials Studio 6.1”
Major: Industrial Engineering
Faculty Advisor: Dr. Delia Valles-Rosales, Industrial Engineering AMP
Maryann Castillo, Tom B. Schaffer, and Seth S. Margolis
“A Regulator of Synapse Development is Controlled via Crucial Elements in its N-terminus”
Major: Biochemistry & Biology
Faculty Advisor: Dr. Seth S. Margolis, Biological Chemistry; Dr. Kevin D. Houston, Chemistry & Biochemistry
MARC, JHUSOM-SIP (The Johns Hopkins University School of Medicine- Summer Internship Program)

Chelsea Rodriguez
“Effect of Knockdown of Odorant Receptor Co-receptor in Bedbugs”
Major: Biology
Faculty Advisor: Dr. Immo Hansen, Biology
AMP

Joshua Trujillo
“Use of Flow Cytometry to Determine Comparative Genome Size among Species within the genus Leucaena (Leguminosae)”
Major: Genetics & Biology
Faculty Advisor: Dr. Donovan Bailey, Biology
MARC

Tawni Voyles
“Differential FoxP2 and FoxP1 developmental expression in a vocal learning nucleus of the budgerigar.”
Major: Biology/Psychology
Faculty Advisor: Dr. Timothy Wright, Biology
HHMI
Abstracts
Heriberto Alvarado

Major: Animation and Visual Effects

Faculty Advisor: Dr. Cynthia Bejarano, Arts and Sciences

CAMP

Gabriela Anguiano-Molina

Major: Mechanical Engineering

Faculty Advisor: Dr. Ou Ma, Mechanical and Aerospace

AMP, URA

“Study Abroad”

I will report on my experience abroad in Urca. I went to Luleå Sweden last Spring (2013). Being on my own for 6 months in a frigid country, I want to promote Studying Abroad to students who are interested or might be nervous in entering another country. I will answer questions and provide feedback.

“Design of a Passive, Gravity Offloading Leg Exoskeleton for Rehabilitation.”

Robotic devices have been increasingly used to assist rehabilitation for resuming partial locomotion capability of patients with neurological impairment caused by stroke, spinal cord disorder or other diseases. However, these active/controlled devices are usually very complicated and expensive and, thus inaccessible by many patients. The healthcare sector is in great need for innovative and affordable new technologies. Researchers at New Mexico State University have been developing gravity offloading technology that utilizes springs to provide gravity offloading function for training astronauts to work in a reduced-gravity environment such as Moon or Mars. The research investigates innovative leg exoskeleton design that acts as a gravity-offload mechanism for the lower limbs. Based on robotics and passive gravity compensation technologies, the leg exoskeleton could offload any amount (from 0% to 100%) of the leg weight of a person such that the person will feel weightless or little weight while walking with the device. The idea was born after critical ergonomics analysis of the human body (using software Jack 7.0) for the Reduced-Gravity system intended for astronaut training. Analysis revealed that the lower limbs account for 40% of the total weight of the body and thus, offloading of the leg weight is necessary. We envision that this technology can also assist locomotion rehabilitation. Patients with neurological impairment usually are unable to support their own weight due to weakening of the muscles which makes locomotive rehabilitation more challenging. Our weight offloading exoskeleton can solve this problem. We have designed and prototyped a first version of the skeleton. Testing with an artificial mannequin’s leg showed that the prototype can offload the weight of an artificial leg as expected. However, it also showed some technical issues which require further research to address. We are currently working on an improved design of the device and will produce a new version of the device for the planned human testing. The design and developmental process has helped student team understand the complexity of the human body and its mechanical principles (biomechanics) as well as ergonomics, which are the essential building blocks for human-centered product design. The lab environment gives the team the tools necessary to implement and test their design ideas.
“The Impact of CYP2S1 Single Nucleotide Polymorphisms on the Metabolic Activation of the Anticancer Prodrug, AQ4N”

Cytochrome P450 2S1 (CYP2S1) is one of the most recent additions to the P450 superfamily of enzymes. CYP2S1 is predominantly expressed in extra-hepatic epithelial cells. Its expression is elevated in cancer and catalyzes the metabolic activation of the anticancer prodrug, AQ4N, under hypoxic conditions. Under these conditions, AQ4N is reduced to the active topoisomerase II inhibitor, AQ4. The main objective of our current study is to determine whether individual variability in CYP2S1 alters sensitivity of human lung cells (BEAS2B) to AQ4N and AQ4-mediated DNA damage and cytotoxicity. Five CYP2S1 allelic variants have been published: CYP2S1*2 (R380C), CYP2S1*3 (P466L), CYP2S1*4 (S61N), CYP2S1*5 (L230R). According to NCBI, two additional non-synonymous variants have been identified in cancer (A205T and L189F) and L189F is restricted to African American populations. Using site-directed mutagenesis, we constructed each of the polymorphisms in the pcDNA mammalian expression vector. Each variant was transfected into BEAS2B. To date we have generated stable lines, including CYP2S1*1 (2-1, 2-3, 2-4); CYP2S1*2 (3-4); CYP2S1*4 (6-1); and CYP2S1 (L89F) (10-2 and 10-7). Elevated CYP2S1 expression was confirmed using western analysis. Effects of polymorphic variants on AQ4N metabolism and cellular consequences was determined using: i) HPLC identification of metabolites from S9 fractions; ii) AQ4-mediated DNA damage assessed using the COMET assay, and iii) cell viability using Alamar Blue. Examination of these assays have yielded subtle changes among the polymorphic variants.

“Language Policy in the United States: English-only or the Right to Multilingualism?”

The English language is the majority language spoken in the United States and is the language the federal government uses to conduct legislation and governmental affairs. Although the United States has no official language, English dominates American society as many Americans believe the United States to be an English-only speaking country. A historical shift in demographics in the last 50 years has led to the fear that non-English speakers will outnumber those who are monolingual English speakers. Using the argument that immigrants and non-English speakers will not assimilate into American society, several English-only policies have been proposed to the federal government and over 20 states have official English-only amendments. What is the future of language policy in the United States? My thesis will address the historical and culture significance of multilingualism in the United States, why individuals have the right to speak the language of their choice, how bilingualism benefits American culture and how English can be sustained while promoting bilingualism, the arguments for and the negative implications of English-only policies and examples of successful multilingual societies such as Quebec, Switzerland, and New Mexico.
“Mexico: Sustaining or Harming the Preservation of Cultural Sites through Government Policy?”

The Mexican government plays an important and influential role in promoting sustainability throughout cultural sites. Mayans and other indigenous groups within Mexico often face discrimination and limited societal opportunities from the government and mainstream Mexican society. Indigenous groups that protest or disagree with government policy on cultural and sovereignty issues may not receive adequate funding or care for their cultural sites and regions. Through research and a trip to the Yucatan I will explore these four questions: 1. What has been the historical role with the Mexican government’s involvement with indigenous populations? 2. How does the Mexican government help promote the sustainability of Mayan cultural sites today? 3. What are the differences between the maintenance of cultural sites throughout the Yucatan region? 4. What can the Mexican government do to promote sustainability and prevent “collapse” in the Yucatan region? Politics in Mexico will continue to play a role in whether or not sustainability and resilience can be achieved throughout the Yucatan and Mexico.

“Yucatan’s Apparel and Sustainability”

In this paper, I will examine the sustainability of local clothing production and clothing imports and their role in the local economy. My observances will be based on the markets I visit during the Sundt Honors Seminar trip to Merida, Mexico during Spring Break, March 21-30. In Mexico, there are more free-trade deals than any other country. It has kept high tariffs on clothing and shoes and when China joined the World Trade Organization in 2001, Mexico imposed up to 1000% on duties on Chinese goods to protect domestic clothes makers. Although Mexico has apparel made cheaply in its country, for example Levi’s jeans, there are still items that are imported. Some of the clothes that Mexico’s street markets sell are clothes that are imported from China and India. By imposing higher duties on imports from other countries, it has allowed Mexican clothing makers a chance to sell their own products to its people. In return, this created a sustainable dependency on its own country. The time and energy spent exporting and importing goods from a different country rather than using its own means of producing and selling its own products has a great environmental impact. The apparel that is made within the country instead of being imported saves time and energy on the shipment and deliverance of apparel from another country. The profit is not only monetarily rewarding because of the savings made on the tariffs but also aids in the countrys own local businesses and people. By being environmental sustainable, a country does not have to worry about when a country may stop exports into their own country.
“Wood Chile Peppers Stalks-Plastic Composite Production: An Innovative Alternative for New Mexico Chile Growers”

Wood plastic composites (WPC) have advantages over plastics and wood. WPCs are environmentally friendly and can be made out of recycle material as well. They resist decay, and insect attack, and their weathering capabilities are better than wood. They are dimensionally stable, which results in little to no splintering, cracking, or warping. Finally, WPC’s can be produced in engineered profiles by any thermosets or thermoplastic processing techniques, i.e., injection molding processing or compression molding processing. The stems and leaves can be re-dried and combined with polyethylene to use as a composite material. Chile pepper is a major crop in New Mexico, West Texas, and East Arizona, and wood fibers represent 40% to 60% of an average size chile plant, which represent approximately 51% of chile wood fibers after drying (Funk and Walker, 2009; Bledzki and Faruk, 2006). When processing WPCs, we determined the compatibility process of wood-fiber plastic composites, melting index of plastic, and blending additives.

“A Look into How Tourism Impacts Ancient Maya Archaeological Sites”

The goal of this research project is to examine and identify how tourism impacts the sustainability and integrity of ancient Maya archaeological sites located throughout Yucatan, MX. As a Spring 2014 participant of the HON-450V Sundt Honors Seminar: The Archaeology of Sustainability, I will travel to Yucatan, MX from the 20th of March to the 30th of March in order to collect data that investigates this issue. During the trip, I will examine the integrity of archaeological sites that are exposed to high levels of visitation, such as Chichen Itza, and sites that are exposed to less visitation, such as the Kinich Kak Mo pyramid. Moreover, the independent variable of this research project will be the amount of visitation to each site; the dependent variable will be the current condition that each site sample yields. For each site, three sample sections will be recorded. These samples will be chosen based on highly visited areas within the site, restored areas within the site, and areas that have not been restored. Utilizing this data, I will compare the current condition from each site and discuss resilience patterns amongst the sites. This comparison will serve as an investigation to find out if these archaeological sites are being sustained, or loved to death due to high levels of visitation. Following this investigation I will provide management recommendations that will serve to enhance the resilience of these sites. Overall, this rich cultural area serves as the driving force for tourism. If ancient Maya archaeological sites are not sustained, it is inevitable that tourism will decline. With a decline in tourism, this will certainly take a toll on the economy of the Yucatan peninsula, and more importantly result in the failure of resilience for the Maya society.
“A Regulator of Synapse Development is Controlled via Crucial Elements in its N-terminus”

Neuronal synapses are cell-cell contacts between neurons that underlie communication in the brain, which reside on dendritic spines. The proper formation of dendritic spines arises from interactions between both positive and negative subcellular regulation. An imbalance between these regulatory mechanisms leads to severe cognitive disorders such as Autism, which frequently manifest characteristic differences in spine number and morphology. Identifying the regulatory mechanism by which synapses form in time, space, and quantity is key to understanding the molecular foundation of such cognitive disorders. A RhoA GEF, Ephexin5, has been recently characterized as a negative regulator of spine formation and localizes to dendritic spines in neurons. Ephexin5 is degraded in a process required for the formation of new spines, but we know little of how Ephexin5 is regulated during its lifetime. To characterize the mechanism by which Ephexin5 localizes to dendritic spines, we took a structure-function approach. Through biochemical assays using deletion mutants of Ephexin5, we have uncovered a critical domain that is not only important for the localization of Ephexin5 to dendritic spines, but also plays a role in the activation of RhoA. This domain likely encompasses elements that interact with cellular mechanisms specifying the location of new synapses.

“Binary Metal Oxide Nanowire Arrays”

Binary metal oxides have recently attracted much attention for their use in electrochemical devices such as lithium ion batteries and electrochemical supercapacitors. A new approach to synthesizing these materials is to directly grow them onto different substrates which serve as electrodes for these devices. We are able to grow nanowire arrays using various treated-substrates for their electrochemical applications. We have successfully synthesized NiCo2O4 nanowire arrays directly grown onto nickel foam and carbon paper substrates. We study their phase, crystal structure, morphology, and microstructure by X-ray diffraction, scanning electron microscopy and transition electron microscopy. We can gain further insight into understanding the applicability of these binary metal oxides by using this new and unique approach to synthesizing these electrochemical materials.
Danielle Ceballes
Major: Management
Faculty Advisor: Dr. Rani Alexander, Anthropology
Sundt Honors Seminar

“ Marketable Resilience”

I will examine the biodiversity of native market systems in Merida, Yucatan, Mexico. I will question: (1) How many products are local? (2) How many products are imported? On the Sundt Honors Seminar trip to Yucatan from March 21-30, I will observe the interactions of vendors and their products for the Lucas Y Galvaz central market in Merida, the craft market in Izamal, and the market in Valladolid. Innovation, modularity, and diversity are three of Walker and Salt’s characteristics of a resilient system. The photographic essay will illustrate the variation among these three markets. Further, it will depict the biodiversity of the products sold, and what the proportion of foreign imports to local products and materials. The photographic essay will reveal globalization in action. The Mayan people have proven themselves a society of resilience. Hundreds of years after their societal collapse, the Yucatan peninsula is once again flourishing with an estimated population of 6 million.

Maria Chavez
Major: Conservation Ecology
Faculty Advisor: Dr. Karen Mabry, Biology

“Differential responses of two ecologically similar species to variation in temperature and resources”

Responses of species to shifting environmental conditions are increasingly important due to rapidly changing climates. The responses of species with complex life cycles, such as dragonflies, are especially interesting because the influence of aquatic rearing conditions may alter terrestrial life stages. We examined the effects of rearing temperature and resource level on larval survival of two ecologically similar species, Erythemis collocata (western pondhawk) and Pachydiplax longipennis (blue dasher). Within high (26 degrees Celsius) and low (21 degrees Celsius) temperatures, we crossed species and resource level and reared larvae individually. We predicted that warmer tanks would decrease survival, higher resource availability would increase survival, and the species response would be similar. We found that temperature affected survival, with lower survival rates in tanks at higher temperatures. There was an interaction between temperature and species; the western pondhawk was more sensitive to temperature than the blue dasher. Resource level did not appear to affect survival in either species. These results suggest that these two species might not respond similarly to changing environmental conditions. Thus, global climate change might be expected to affect interactions between these two sympatric, ecologically similar species, with potential consequences for community composition.
**Sativa Cruz**  
**Major:** Environmental Science  
**Faculty Advisor:** Dr. Rani Alexander, Anthropology  
**Sundt Scholar Seminar**

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**Richard De La Rosa**  
**Major:** Biology  
**Faculty Advisor:** Dr. Charles Shuster, Biology  
**MARC**

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**“Cooperation in Celestun Builds Resilient Communities in Coastal Regions of Yucatan”**

Using qualitative and observational data from the Sundt Honors Seminar Trip to Yucatan March 21st - 30th, I will compare community maintenance of the ecosystem in Celestun Lagoon and biosphere reserve, to community management practices at the Kaxil Kiuic biocultural reserve. I will focus on the fundamental question; how does connection and maintenance of one’s environment build a more resilient community? More specifically, how does maintenance of the coastal area around Celestun influence resilience and are maintenance strategies similar or different to practices inland at Kaxil Kiuic? Although this is a very complex system I will be providing an environmental assessment of the area. We are visiting the Kaxil Kiuic Eco Reserve in addition to the Ria Celestun Biosphere Reserve, and this is where data will be obtained. An evaluation of strengths and vulnerabilities at the Celestun biosphere reserve will be provided along with suggestions for building a more resilient environment. Cooperation between locals, government, hotel representatives and biodiversity will be assessed.

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**“Examination of G protein antagonism during cytokinesis”**

The Rho family of GTP-binding proteins (Rho, Cdc42 and Rac) regulate the actin cytoskeleton during cell motility, adhesion and division, and Rho is widely believed to be the master regulator of contractile ring formation during cytokinesis. And while Rac and Cdc42 are thought to be dispensable for cytokinesis, activated mutants of these proteins cause cytokinetic defects, suggesting that Rac/Cdc42 antagonize Rho. Indeed, an activated mutant of Rac in sea urchin eggs causes precocious cell adhesion assembly and cytokinesis failure. To understand how Rac antagonizes Rho, we are generating mutations in activated (Q61L) Rac that will differentially inhibit Rac’s actin- and cell adhesion-promoting activities. Work in other systems demonstrated that substitution of tyrosine 40 for cysteine ablates the ability of Rac to promote cell adhesion. A Q61L/Y40C double mutant of sea urchin Rac was generated by site-directed mutagenesis, and activated Rac and the double mutant were tested in serum-starved cultured cells. Immunofluorescence revealed that whereas activated Rac (Q61L) promoted both actin polymerization and cell adhesion, the double mutant was only able to stimulate actin polymerization. Future experimentation will involve expressing these mutants in sea urchin embryos to determine whether Rac-based cell adhesion plays a role in antagonizing Rho-mediated furrow ingestion.
“Taxonomic Composition of Cyanobacteria in the Gut Ecosystem of Malaria Mosquito Anopheles gambiae”

Previously, we have reported that the cyanobacteria were one of prominent inhabitants in the microbial community in the mosquito gut during the larval stage. Here we further characterize the taxonomic composition of the cyanobacteria. The sequencing reads of bacterial 16S ribosomal gene fragments were classified by RDP classifier. The resulting cyanobacteria reads were separated into the subgroups cyanobacteria and chloroplast. The reads in these two subgroups were clustered using alignment program SeqMan with 97% similarity as the cutoff. The resulting contigs were used to make a phylogenetic tree using the MEGA6 program. Three clades were identified: Cyanobacteria, Bacillariophyta, and Chlorophyta. The Cyanobacteria clade included five taxa: Nostoc, Microcoleus sp., Cyanobium sp., Geitlerinema sp., and Leblolyngbya boryana. The second clade belongs to Bacillariophyta: Durinska baltica, Fistulifera sp., and Cymatopleura solea. The third clade consisted of five taxa related to Chlorophyta: Oocystis, Chlorella, Scenedesmus, Chlamydomonas, and Dunaliella. The results support the evolutionary theory that chloroplasts evolved from cyanobacteria since the two clades containing the chloroplasts have been grouped together. The data indicates that cyanobacteria and algae are a possible food source for the mosquito larvae.

“Environmental Risk Assessment of Cenotes Located Near Popular Mayan Tourist Sites”

A cenote is a natural pit, or sinkhole resulting from the collapse of limestone bedrock that exposes the groundwater below. This makes cenotes very vulnerable to environmental damage and pollution from tourism activities. This can lead to contamination of the groundwater and the coastal areas to which it flows. This is importance to the resilience of the Yucatan because the majority of the population’s drinking water comes from groundwater. Pollution from cenotes also affects the coastal environmental which is could have major negative impacts on the fishing and tourism industries. It is therefore necessary to perform an environmental risk assessment of cenotes that are located near popular Mayan tourist sites in order to determine how future environmental damage can be minimized and any current damage can be remediated. As a part of the assessment, information will be gathered from local stakeholders about the current environmental state of the cenotes and any protective measures that are currently in place. Existing and potential sources of pollution will be identified during a site inspection and recommendations on minimizing or eliminating pollution from these sources will be given based on existing protective measures at similar locations and existing environmental engineering technologies.
“Evaluating changes in the catabolic profile of soil microbial communities from riparian areas of the Rio Grande as a result of Salt Cedar encroachment”

The early 1900’s reservoir levels were high within the Rio-Grande of NM, preventing vegetation of any kind to thrive. With time, reservoir levels decreased and dense riparian or wetland vegetation emerged such as cottonwood (Populus deltoids var. wislizenii), willow (Salix spp.) and cattails (Typha spp.). The natural vegetation over time once again began to change and marsh lands decreased, resulting on areas once composed entirely of cottonwood and willow been replaced by exotic vegetation of salt cedar (Tamarix sp.). One of the ecological consequences of the loss of natural riparian vegetation and salt cedar encroachment is the loss of the natural nesting habitat (Cotton wood –willow) for the Southwestern Willow Fly Catcher (SWFL) Empidonax traillii extimus, an endangered bird species. Changes in soil characteristics such as salt accumulation, soil microbial composition and loss of organic inputs, are among the factors involved in the loss of the breeding habitat for the SWFL. My proposed project will focus on exploring those changes in soil properties that could be related with the loss of habitat for the SWFL. It will include the determination of changes in the soil microbial community composition using a Microresp® system. This system evaluates changes in the soil microbial catabolic profile by inducing respiration through different substrates such as amino acids, carboxylic acids, sugars and polymeric lipids. Also, I will determine changes in soil chemical properties related to soil fertility such as Carbon and Nitrogen, and the degree of salt accumulation in the soil by measuring changes in soil electric conductivity in the soil solution from areas without encroachment and those where the salt cedar has replaced the natural vegetation. I believe the results of my study will provide valuable information that will contribute to our understanding of the mechanisms associated with the loss and fragmentation of the natural vegetation along the Rio Grande, and to the implementation of management strategies to preserve the natural nesting habitat for the SWFL.

“Analysis of chile plants transformed with a chile gene encoding 5-Enolpyruvylshikimate-3-phosphate synthase”

5-Enolpyruvylshikimate-3-phosphate synthase (EPSPS) plays a critical role in the biosynthesis of aromatic amino acids and numerous secondary metabolites in plants and microorganisms. EPSPS is the penultimate enzyme in the shikimate pathway and catalyzes the reversible production of 5-Enolpyruvylshikimate-3-phosphate and phosphate from shikimate 3-phosphate and phosphoenolpyruvate. EPSPS is the target for the binding of glyphosate, a commonly used herbicide. Binding of glyphosate inactivates the enzyme and abolishes the synthesis of aromatic amino acid thus leading to the death of the plants. The overall goal of this project is to use a cis-genic approach to develop glyphosate resistance in chile pepper.
Towards this goal, the EPSPS gene has been isolated from chile and single base changes have been made at the glyphosate binding site. The engineered gene was introduced back into chile using Agrobacterium tumefaciens mediated transformation. We have identified several putative transformants based on their selection on kanamycin (NPTII is used as the selectable marker) and some of them have been identified positive by genomic PCR for sequences in the DNA transferred to the plant. The transformants have been grown to full maturity and the seeds obtained from them have been germinated and tested for the presence of the transgene. We will discuss our results on the efficacy of the transgene to confer glyphosate resistance in chile.

“Rapid Prototyping Consulting Group”

Rapid Prototyping is a promising, commanding, and unfailing technology that will revolutionize and modernize every aspect of the daily human life. It is a process that allows human to concretize new ideas and test them in a relatively short time. This proposal seeks to share the learning experience of four undergraduate students along with their professor, Dr. Delia Valles, in founding a Rapid Prototyping consulting organization. Methodology: First, Students have been introduced to the technology of rapid prototyping and 3D printing. The learning process involved learning about the Rapid Prototyping applications and printing prototypes. In addition, an organizational chart that defines different roles and jobs has been developed. Students have also been working on launching a website as part of their marketing strategy to reach the grand public. A protocol that takes care of defining a clear consulting and production process has been established. The team has also been working on all the legal procedures that the organization need to go through before starting consulting for individuals. Results: The RP Consulting team has an official interactive website as well as a solid network with professional organizations working on the same field. The team has also finalized hiring for strategic and leading positions.

“Adapting the Novel to Film”

This thesis proposes an answer to the question: What creates a successful novel-to-film adaptation? Despite the huge influence literature and film have had on each other, novel-to-film adaptation theory remains largely unexplored. The majority of widely-distributed and monetarily successful feature films are based on another medium, and the novel is the most common medium to adapt, and yet there is no clear methodology for creating a successful novel-to-film adaptation. I will demonstrate some of the traits that define a successful adaptation, which I discovered by: analyzing some theories of relevant adaptation literature regarding the fundamental differences and similarities between the two mediums and the difficulties inherent in adaptation; by using Karen Kline’s second paradigm of film adaptation critique to analyze specific novel-to-film case-studies; and by using my own personal experience of adapting my 160,000 word novel to a feature-length screenplay.
“Important Resilient Animals in the Mayan Society”

The goal of my project is to observe the domesticated animals (such as the stingless bees, dogs, turkeys, etc.) and the native wildlife (various birds, jaguars, rabbits, turtles, iguanas, snakes and any other animals that can be observed) in their natural habitat, while on my Sundt Seminar Honors Course in Yucatan, Mexico. I will be visiting various cities and places such as Merida, Celestun Biosphere Reserve, local markets, and Kaxil Kiuic Ecoreserve to observe various animals and will be observing different iconography and sculpture at Maya archaeological sites from March 20-30, 2014. I will try to answer the question of why many of the species of domesticated and native wildlife are declining or rising. I consider this question as, in the Mayan’s society, animals appear to be very resilient animals. I will determine what important contributions, if any, they made to the Mayan’s resilience or decline.

“Can capsaicin exposure affect glioblastoma cell morphology and survival through multiple cell death pathways?”

Glioblastomas are among the most malignant forms of brain cancers, with a high incidence of mortality due to a paucity of treatment options. Recent studies suggest that the main capsaicinoid in chili peppers, capsaicin, may have anti-tumor activity by down-regulating pro-survival proteins and inducing apoptosis in glioblastoma cells. We further investigated capsaicin’s effects on cell death by treating a Grade IV glioblastoma cell line (ATCC CCF-STTG1) with varying concentrations of capsaicin. Our objective was to determine the 50% lethal concentration (LC50) and use this concentration to evaluate whether capsaicin exposure elicits any of the three major cell death pathways: apoptosis, necrosis and autophagy. To this end we labeled treated cell cultures with fluorescent probes with affinity for DNA (nuclei) and F-actin (cytoskeleton). Analysis uncovered a dose dependent effect that demonstrated an inverse relationship between capsaicin concentration and the number of nuclei, suggesting that capsaicin reduces cell survival or prolongs the cell cycle. Experiments are currently underway to evaluate capsaicin-induced cell death pathways using fluorescent probe indicators for apoptosis, necrosis and autophagy. The results of this study underscore the potential of plant neuroactive compounds as tools for cancer therapy.

Support: BP-ENDURE R25NS080685
“Then and There”

Blake, a transfer student with a hidden past, begins to falls in love with his two new best friends; Sarah, an odd-ball teen with a typical and healthy life who falls into drug abuse, and James, an out-of-the-closet ballet dancer who is at the end of his rope after being kicked out of his house. In the midst of their high school adventures, and Blake's struggle to choose only one, the death of one of the three alters the lives of the remaining two forever. As we follow this not-so-typical teenage love triangle, comprised of flawed emotions, destructive life choices, and ditched classes, Blake must decide whether to be straight or gay, in love or in lust, or real or fake. With much more than friendship on the line, what will happen? Love is love, but where does it lie?

“Intersection Traffic Safety: Red Light Violation Analysis”

The goal of this research project is to assess the impact of the Safe Traffic Operations Program on the road safety. Our study includes a total of 38,169 red-light violation records collected between March 2009 and February 2012. The hypothesis consists in the fact that the placing of cameras at main streets' intersections would significantly lower its red-light violations. Two levels of data analysis were conducted – one is using trend analysis and the other is using statistical analysis. Descriptive statistics suggest that a majority of the red-light violations occurred during daytime with two peak hours at 12pm and 4pm, and that the highest red-light violations occurred on Friday. The highest volume of the violations occurred within 1 second after the onset of the red-light signal, whereas the second highest volume of violations occurred more than 3 seconds after the red-light signal. No actual decreases were observed with either analysis in the number of red-light violations, but only increases or no changes. Therefore, negative preliminary conclusions were obtained towards the program. Future research may include understanding the correlations between red-light violations and crashes, drivers, and environmental factors.
“Improved Leg Exoskeleton Design for Gravity Offloading”

The project is intended for redesigning, prototyping and testing a passive leg exoskeleton with the purpose of validating the theory in which the leg would balance any configuration of reduced gravity. The design is aimed for use of physical therapy and rehabilitation on humans. This prototype will simultaneously replicate the movement of a human leg. The exoskeleton is a passive energy mechanism which maintains the potential energy of the human leg and maintains constant during human walk. As a result, the exoskeleton will compensate partial to full gravity forces applied on the leg making it easier for humans to rehabilitate.

“A restored fluorescence lifetime-based flow cytometer”

Flow cytometry research involves the rapid characterization of single cells in order to sort or count those cells by a variety of their unique intracellular or extracellular features. A flow cytometer works by rapidly flowing cells through the path of a finely focused laser beam. As the cell passes through the laser, the flow cytometer will collect scattered and fluorescence light that is emitted. In this contribution, we present a new type of flow cytometry system. That is, we have designed and are constructing a fluorescence lifetime-based flow cytometer. The fluorescence lifetime is a photophysical trait of all fluorophores and is defined as the average time it takes for an excited molecule to return to its original ground state and emit fluorescent photons. By designing and constructing a sensitive lifetime-based cytometer we introduce a new and more quantitative method to evaluate fluorophores that are inside or on the surface of single cells. We show how our laboratory is leading efforts to design new lifetime hardware that involves 532-nm laser excitation, high frequency modulation, and new levels of sensitivity to detect low levels of fluorescence emission. Results will include evaluation of this system’s efficiency through fluorescence-microsphere calibration standards. Future work involves using the instrument with a variety of mammalian cell experiments.
“Identifying the Role of Abams in Drosophila melanogaster Wing Development”

We identified a novel Drosophila melanogaster gene, abnormally blistered and misshapen eyes (abams). The abams gene is predicted to encode a member of the neprilysin family of metalloendopeptidases that are of growing interest in the context of multiple diseases including Alzheimer’s disease. D. melanogaster is an ideal model organ to study abams because it is easily genetically modifiable and gives insight into signaling cascades in cells that can be related back to human diseases. Previously, it was shown that abams plays a critical role in the signaling pathway cascade that occurs during D. melanogaster eye development. Here I show that abams also has important functions during wing development. To characterize the role of abams in wing development, I used the UAS/Gal4 system and RNA interference to knock down abams during wing development. Current efforts involve using immunofluorescence to determine the effects of abams knock down on signaling pathways during wing development. Our results are expected to illuminate the role of Abams and potentially of other neprilysins in regulating signaling during development.

“In The Step of Alice Dixon”

In her diary, Alice Dixon Le Plongeon writes a unique and vivid about her travels along with her husband, Augustus Le Plongeon, in 19th century Yucatan. Alice and her husband were the first to excavate and systematically photograph the Mayan sites of Chichen Itza and Uxmal, among other Mesoamerican pre-Columbian sites. Their contribution is one of the first to study and raise awareness of Maya archaeology in the Victorian era. Following in her steps, a college student of New Mexico State University and member of the Sundt Honor Seminar 2014 will compare present day Maya sites to those of Alice and Augustus photographs and descriptions from 1987. The importance of comparing the Mayan sites from then and now is to acknowledge the how much the study of Archaeology have discovered from Alice’s era, to show what has Archaeology have attributed to the cultural preservation of the Mayans.
"Expression of myogenic regulatory factors in the non-contractile electric organs of three electric fish species"

Members of the MyoD family of myogenic regulatory factors (MRFs) - MyoD, myogenin, myf5 and mrf4 - play a key role as transcriptional activators of skeletal muscle gene expression and full myogenic program in mammals. The expression of these factors under different electrical activation patterns and the mechanism by which they modulate (or maintain) the muscle phenotype is less well understood. We begin to address this question by studying the myogenically derived electric organ (EO) of 3 electric fish species: Sternopygus macrurus, Eigenmannia virescens, and Electrophorus electricus because their electrogenic cells differ in their electrical input. We previously examined the expression of MRFs in S. macrurus, and here, we report on the expression of these MRFs in the 3 EOs of E. electricus and 1 EO of E. virescens based on our transcriptomic and RT-PCR analyses. Our data is not consistent with an MRF expression profile that is linked to distinct electrical inputs to EOs. These data further indicate that the expression of multiple MRFs is not sufficient to induce non-contractile EO cells to fully express the skeletal muscle program. Future functional experiments will test electric fish-specific MRFs ability to induce a muscle phenotype.

"2,5 Substituents of Thiophene"

Thiophene is commercially extracted from petroleum reserves and is an essential structural feature in numerous electro-active organic compounds with novel applications in conductive materials and solar energy devices. Organic electropolymers have numerous applications in technology due to their ease of being made into intricate shapes and alterable conductivities. These experimental studies entail the design of synthetic strategies that can incorporate multiple thiophene substituents into highly conjugated molecules, extending synthetic strategies demonstrated by this laboratory for small molecules using monocarbene complexes and monoalkynes. These strategies employ reactions of chromium and tungsten carbene complexes with highly conjugated acetylenes. Current research focuses on incorporating the thiophene ring into these reactions, demonstrating reactions for difunctional systems that are capable of sustaining a polymerization reaction, and determining whether or not tungsten complexes have the reactivity demonstrated in chromium systems. This poster focuses on the preparation of key starting materials and preliminary studies of the key alkyne coupling reactions.
“Regulation of Cell Adhesion in the Early Embryo”

Cell adhesion molecules hold cells together and help establish apical-basal polarity. In early embryos, there is an increase in cell adhesion with successive divisions such that blastomeres transition from a spherical to epithelial cell morphology. While it is known that calcium-dependent cadherins mediate cell adhesion, it is unclear what signals trigger junction formation in the early embryo. The small GTPase Rac has been implicated in regulating cell adhesion in some cell types, and preliminary data indicates that activated mutants of Rac can trigger precocious cell-cell junction formation in sea urchin embryos. We hypothesize that the transition from spherical to epithelial cell morphology is mediated by the activation of Rac through the guanine exchange factor, TIAM1. Towards these ends, we isolated the PH-CC-Ex domain of sea urchin TIAM1, which can act as a dominant-negative mutant that disrupts endogenous TIAM1 activity. This domain will be expressed in sea urchin embryos, which will be followed by timelapse microscopy. If Rac is, indeed, required for the establishment of cadherin-based adhesion, then expression of the PH-CC-Ex domain should inhibit cell adhesion and epithelialization. If successful, this will be the first evidence for a G protein-mediated pathway regulating cell adhesion during the first stages of development.

“The effects of environmental health on societal resilience”

An Environmental Site Assessment (ESA) will be conducted at both the Dzibilchaltun and the Kaxil Kiuic sites. An emphasis will be placed on the soil and vegetation of these sites and how the observed conditions interact with the biodiversity of the area. During the Sundt Honors Seminar trip to the Yucatan Peninsula, both Dzibilchaltun and Kaxil Kiuic will be personally visited and the guides will be interviewed during the site tours. The soil portion of the ESA’s will be qualitative observations. They will not include soil sampling but they will include signs of soil erosion and contamination, soil types, and any other notable observations. For the vegetation aspect of the ESA’s, the information collected will also be qualitative. The points will include foliage types, density of foliage, signs of deforestation, and any other notable observations. Using the information collected from the Environmental Site Assessments of both sites, and assuming that the conditions had been similar during the time that the ancient societies inhabited the areas, conclusions will be drawn as to whether or not these environmental factors had played a role in each civilization’s resilience. The information from the ESA’s will also be used to compare the soil and vegetation conditions between the two civilizations and the longevity of each. With this comparison, assumptions can be made relating environmental health to societal health, in ancient times.
“‘Frailty Thy Name is Woman’: Hamlet and the Feminist Coming of Age”

This performance is a culmination of feminist theory, historical research, character analysis, and personal experience, all based on my personal connection to the text of Hamlet. In January of 2014, we did a full performance of Hamlet with a female in the lead. Now, with the experience of that show, I am creating a one woman show around the world of our version of the play which combines the research of the historical Hamlets Asta Nielsen and Sarah Bernhardt, as well as the theorists who inspired my journey to feminism. The soliloquies of Hamlet will serve as touchstones in my life that I drew on during performance, or mirror the play in the hopes of showing how Shakespeare’s Hamlet mirrored what I believe to be the female coming of age story.

“Gene Expression Profiles Linked to Different Activation Profiles of Myogenic Cells in the Electric Fish Sternopygus macrurus”

In the electric fish Sternopygus macrurus, skeletal muscle and the myogenic electric organ (EO) show extreme differences in their electrical activation patterns. Specifically, skeletal muscle generates action potentials at frequencies between 15-20 Hz, whereas the EO is driven to produce action potentials at frequencies between 60-150 Hz nonstop. The gene expression linked to differences in the excitability of these two tissues is not known. We have taken a transcriptomic approach using Illumina sequencing of muscle and EO tissues (n=1 fish) to test the hypothesis that genes involved in generating and maintaining action potentials, i.e., voltage-gated ion channels, and sodium-potassium ATPase pumps are differentially expressed in these tissues. Our expression data show upregulation of ion channels linked to high excitability in EO compared to muscle including 3 sodium channel isoforms (scn4aa, 52-fold; scn4ab, 4-fold; scn4b, 4-fold), 2 potassium channel isoforms (KCNQ3, 55-fold; KCNJ2, 38-fold), and 2 calcium channel isoforms (cacna1a, 29-fold; cacna1da, 14-fold). Transcriptional regulation of these high excitability-associated ion channels is not well known. However, the transcription factor NFI shown to regulate the expression of the scn4a channels in mammals is also upregulated in EO. We continue characterizing the expression of gene networks associated with different excitability properties.
Visual artists generally help to create and cement artistic changes before composers are able to create works incorporating new ideas. Painters are able to share the ideas and sentiment behind the literature in a way that can be more accessible to the common man. Musical change occurs more slowly due to the vulnerability of the concert attendee, who cannot be free from the feelings brought up by music until the concert is over. It is evident that the painter and musician, though utilizing different media, impress upon their audience an important new idea about the metaphysical, physical, and psychological realms which all must confront. It is the responsibility of all artists to cause their audience to experience something wholly new, and to comprehend, to react, and maybe to change. Through examination of Monet and Debussy, Nolde and Hindemith, with respect to historical context, one can see that these changes are not sudden, but a fluid timeline and lengthy exercises in new ideas are required before a new era can be established.

Cardiovascular disease is a group of disorders of the heart and blood vessels which can cause debilitation and life threatening consequences for all ages. According to the Center for Disease Control and Prevention, cardiovascular disease is the leading cause of death in the United States for every ethnic group (Center for disease Control and Prevention, 2013). In the state of New Mexico 222.3 deaths occur per 10,000 populations due to cardiovascular disease. Medical anthropology provides an innovative framework through which analyzes the complex social determinants of health that are often not addressed in education and intervention programs. The objective of the project is to record and analyze the life histories and current experiences of people who present cardiovascular disease. The project serves to further goals for the Las Cruces area in dealing with cardiovascular disease—developing these goals health care innovations can be modified and the amount of individuals from dying or even dealing with complications can be reduced.
"The Influence of Social Environment on FoxP2 Expression in Open Ended Vocal Learners"

FoxP2, a transcription factor, has been shown to play a role in vocal learning. Though much has been learned about the role FoxP2 plays in an organism's ability to produce context specific vocalizations, the most commonly used animal model the zebra finch, a songbird, is limited in that learning occurs only early in life. In contrast, in the budgerigar, a parrot, both males and females have the ability to modify and learn new calls as an adult and do so in response to changing social contexts. Here we use the budgerigar, as a model to investigate the role that social context plays on FoxP2 expression in adult vocal learners. We hypothesized that social context of pair formation influences the expression of FoxP2 in areas of the brain that control vocal learning. We used immunohistochemistry to quantify FoxP2 protein expression levels in adult male budgerigars from newly formed pairs and compared it to that of birds from a previously established pair. Our data shows a continuous down regulation of FoxP2 in both groups. This consistent down regulation may allow for the open-ended learning seen in budgerigars and contribute to their continuous modification of context specific vocalizations.

"A study of how surface to volume ratios affects pellicle formation and the growth of the Wrinkly Spreader phenotype"

Bioluminescent bacteria have been utilized by many marine invertebrates such as cephalopods, as a way to camouflage, attract mates, or lure prey. One cosmopolitan species, Vibrio fischeri, is used by many species of squid to disguise their silhouette during the night with a behavior termed “counterillumination”. V. fischeri assists this counterillumination by colonizing the light organ of the host. Various phenotypes can affect the efficacy with which the bacteria infect their hosts, particularly when the character is associated with colonization efficiency. The wild type phenotype of V. fischeri displays a smooth colony form when grown on Luria Bertani high salt (LBS) agar plates or in shaken LBS media. An alternate phenotype, coined the ‘wrinkly spreader’ (WS), forms in the pellicle, or thick biofilm in standing liquid cultures; it has been found to infect the host squid with greater efficiency than the wild type ‘smooth morph’. In this study, V. fischeri was grown in static flasks for nine days and plated in serial dilution on days three, six, and nine. These time points were subsequently examined for three days and any WS colonies isolated were streaked out onto new plates to ensure the morphology was not simply epigenetic. WS colonies typically appeared around day six dilutions and were found to be phenotypically different based on re-streaking single colonies onto new plates. These observations indicate that V. fischeri WS strains can form in static conditions with adequate nutrients in optimal surface to volume ratios, demonstrating the plasticity of these beneficial bacteria to adapt to new environmental conditions.
“Yellowism: Appropriation Taken Too Far?”

On October 7, 2012 Vladimir Umanets walked up to a Rothko piece entitled “Black on Maroon” that was on display at the Tate Museum in London, and with black paint scrawled the words: “Vladimir Umanets ’12, a potential piece of yellowism” across the canvas. He was sentenced to two years in prison for vandalism, and the internet was ablaze with opinions concerning the harsh punishment. The academic community, however, was oddly silent. I wrote my essay primarily to bring the movement of Yellowism into academic conversation. In the essay I demonstrate what Yellowism is not (ie. Vandalism, Dadaism), and explore how it does function, namely as a reaction against the commodification of art. I also compare and contrast Umanets’ vision with Duchamp’s by analyzing Duchamp’s pieces “L.H.O.O.Q.” and “The Fountain” with Rothko’s “Black on Maroon” and Umanets’ treatment of the mural. Ultimately, I conclude that although the imposition of interpretation is problematic, it is lesser evil than the commodification of art. Additionally, while Yellowism should be taken more seriously as a formal concept, its refusal to evolve will inhibit its expansion as a movement.

“Challenging galaxy formation theory via direct observational analysis”

The greatest questions in astrophysics focus on the evolutionary processes occurring in the universe. Galaxies in particular, are high priority since they represent the environments where structure formation is most active. They serve as the primary astrophysical laboratory for studying virtually all cosmic physical processes. However, the details of how the inflow of gas regulates the evolution and characteristics of galaxies are known only in theory; theory untested by observation. We employ an observational analysis designed to confront these theories. We have high-resolution (6 km/s) spectra of the halo gas obtained with the Keck Telescope, and high-resolution Hubble Space Telescope images of the galaxies to study relationships between halo cloud masses, densities, ionization conditions, velocity dispersions, sizes, and metallicities, and the galaxy masses and morphologies. To determine the halo cloud properties, we will employ the photoionization programs CLOUDY and RATES to obtain optimum results for differing density regimes. With the model cloud properties and measured halo masses, we then apply methods to estimate the cloud survival time, thereby deducing time scales on which cold/warm clouds must be replenished in halos of various masses allowing us to observationally determine the cold-mode accretion rate as function of halo mass.
“Synthesis of Fluorinated Carvone Derivatives”

Parkinson’s disease (PD) impairs over 4.1 million people worldwide and this number is projected to double by 2030. It has been established that PD can result from the degeneration of dopaminergic neurons of the substantia nigra pars compacta and degradation of nondopaminergic neurons throughout the nervous system. This results in a decreased level of the neurotransmitter dopamine and an inability of the nervous system to adequately respond to internal stimuli. While the biosynthetic dopamine precursor, levodopa, is widely distributed as a treatment for PD, patients encounter severe side effects and swiftly develop a tolerance to the treatment. As a result, the goal of my research project is the design and synthesis of a new class of small molecules with potential antiparkinsonian activities that may also lead to a new drug. Recently, semi-synthetic diol-derivitives of carvone have been found to possess antiparkinsonian activity via their ability to decrease the negative effects of dopaminergic cell deterioration. Furthermore, fluorinated compounds are increasingly important in the biomedical field, so expanding on current literature is key for progressing PD treatment. The recently published diol-derivative has been used on mice with induced PD. We are exploring the synthesis and purification of a fluorinated derivitive of R-Carvone. Currently, our research focuses on the synthesis of related fluorinated carvone derivatives which may act in a similar, more enhanced manner than the previously published diol-derivitives.

“Design and synthesis of a new class of selective estrogen receptor antagonist”

Estrogen is involved in the development of many breast tumors, and the expression of ERα is important for diagnosis, prognosis and treatment, and a target for development of improved therapeutics. Recent studies have revealed important functions for a new G protein coupled receptor (GPER or GPR30) in multiple cancers. Existing anti-estrogen therapeutics, such as tamoxifen, bind to both receptor classes but produce opposite responses. We have recently discovered a new small molecule AB-1 that selectively binds to estrogen receptors (ER) and does not interact with GPER. Using structure-guided design we have identified a series of synthetic analogs that are predicted to function as selective antagonists of ERα/β. We have developed a three-step synthesis process that involves Diels-Alder cycloaddition, followed by a lithium aluminum hydride reduction of the ester and/or cyano groups, and a Prins cyclization with a substituted benzaldehyde. The novel synthetic AB-1 analogs will be evaluated for binding affinity and functional activity for agonism/antagonism of estrogenic responses in a panel of cancer cell lines. These compounds will serve as structural foundations for the development of a promising new class of chemotherapeutic and diagnostic imaging agents.
“Tourism Impact on Biodiversity of Birds”

In this presentation, I will present a paper on a comparison of the biodiversity of birds in an Eco reserve and tourist spot in order to see if there is any relation between tourism and biodiversity of birds in the Yucatan peninsula. My observations on this presentation will be based on Kaxil Kiuic (the Eco reserve) and Uxmal (the tourist spot) from the Sundt Honors Seminar spring break travel from March 21, 2014 to March 30, 2014. In each location, I will keep a list of the different species of birds present along with the approximate number of tourists. The Yucatan Peninsula is a popular spot for Mayan interested tourists; Uxmal being at the top of every tourist’s list. In contrast, Kaxil Kiuic purpose is to promote diversity and limit the human footprint and is not visited in such high numbers as Uxmal. Tourism can have many impacts on an ecosystem, such as impacts on biodiversity. Diversity, in all forms, is an important factor to a resilient society because it gives rise to a variety of different ways in which a system can respond to a disturbance; as put by Walker and Salt, “diversity is the major source of future options.” If tourism is negatively impacting biodiversity among birds, not only will other species suffer, but the Yucatan society as a whole could become more vulnerable to future disturbances.

“CYP2S1 influences Banoxantrone-induced genotoxicity in human bronchial epithelial cells”

Cytochrome P450s are involved in about 75% of all drug metabolic reactions. This metabolism results in either bioactivation or inactivation of the drug. Cytochrome P4502S1 (CYP2S1) is a relatively new CYP and its function has not been fully elucidated. CYP2S1 exhibits considerable regulation in response to chemical cues; for instance, polyaromatic hydrocarbons and retinoic acid increase CYP2S1 expression while glucocorticoids reduce expression. Interestingly, reduced oxygen levels also increase CYP2S1 expression, whereas most CYPs expression is reduced. CYP2S1 expression is also elevated in a variety of epithelial-derived cancers. This expression pattern suggests that CYP2S1 may be poised as an important enzyme for bioactivation of banoxantrone (AQ4N). AQ4N is an anti-cancer prodrug which requires low oxygen and reduction to the bioactive metabolite, AQ4. Once metabolized to its active form, AQ4, intercalates DNA and also binds to and inactivates topoisomerase II. In heterologous expression systems, CYP2S1 has been shown to metabolize AQ4N to AQ4. However, no one has demonstrated the impact of CYP2S1-mediated metabolism on AQ4-mediated genotoxicity in human cells. We hypothesize that regulation of CYP2S1 expression will influence the genotoxicity of AQ4N in human bronchial epithelial cells (BEAS2B). In order to test this we performed a COMET assay which examines genotoxicity in BEAS2B cells differentially expressing CYP2S1. BEAS2B cell depleted by approximately 75% CYP2S1 (i.e. 759 & 984) and cells over-expressing CYP2S1 (i.e. 2#3 & 2#1) were compared to their respective controls (i.e. SCRAM & pCDNA). Our results are consistent with a role for CYP2S1 in the metabolism of AQ4N.
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“Providing Access to Clean Water”
Break down of the problem polluted water and a few solutions to solve it, investing in technology, education and conservation.

“Expression of Membrane Progesterone Receptors Beta and Gamma in Breast Cancer Cells”
Results from The Women’s Health Initiative Study (WHIS) reported an increased risk of breast cancer in women treated with combinations of estrogen (E) and progestin (P), while women receiving E alone did not have an increased risk. These results suggest P plays a major role in breast cancer development. Progestin elicits its functions through the nuclear P receptor or membrane progestin receptors (MPRs) of which there are three isoforms alpha (α), beta (β) and gamma (γ). Triple negative breast cancer (TNBC) cells, do not express nuclear receptors for E or P, but express MPRs, allowing us to study P-induced functions through MPRs. Breast cancer endocrine therapies often function through E/P nuclear receptors; therefore in TNBC these treatments are not as effective. We hypothesize that P induced effects in TNBC function through MPRs. We have determined mRNA and protein expression for MPRβ and MPRγ in TNBC cells using real-time quantitative PCR and western blot analysis, respectively. Functions of MPRβ will be investigated by knocking down MPRβ expression using siRNA approaches as well as reintroducing MPRβ into cells that are MPRβ negative. Effects on cell proliferation in the presence or absence of MPRβ will be accomplished using the WST-1 assay.
“The Culture of Cacao”

The goal of this project is to express the endurance of cultural practices of the Maya in the Yucatan Peninsula, particularly that of the production of cacao. My data will be obtained during the Sundt Honors research trip from March 21 to March 30. Most of my information will be obtained through interviews and archival material conducted and contained in the Ecomuseo del Cacao. Understanding the cultural endurance of the Maya is important to balance claims by certain anthropologists and popular writers that the Maya civilization collapsed entirely. In reality, there are currently over seven million people who identify themselves as Maya, which means that much of the Mayan knowledge and cultural practices have endured the passage of time and the European invasions over the last 500 years. To these modern Maya, the claims that their ancestors collapsed, and even that they were responsible for their own destruction, is tantamount to discrediting their language, practices, rituals, and heritage. My intent with this film is to highlight but one example of the resilience of the ancient Maya cultures and to substantiate an understanding that a civilization should not be considered collapsed so long as a part of its culture endures.

“Toward the measurement of fluorescence lifetimes for metabolic mapping with flow cytometry”

Monitoring the levels of intracellular reduced nicotinamide adenine dinucleotide (NADH) can be a powerful way to map the metabolic state of single, viable cells. Monitoring these levels is achieved by viewing the intrinsic fluorescence of NADH with fluorescence microscopy. Additionally with a microscope, the fluorescence lifetime is measured because it provides a quantitative evaluation of bound vs. unbound NADH. NADH binds to various enzymes intracellularly and its bound state can be perturbed (changed to high levels or low levels) by several factors, some of which include starvation and exposure to cellular toxins. The bound form of NADH has a distinct lower lifetime than the unbound state (~ 0.8ns vs 1.3 ns). If the fluorescence lifetime of bound vs unbound NADH can be measured in flow cytometry, the ability to metabolically-map cells would result in a powerful high throughput screening assay for cell sorting. In this contribution we show how serum starved MCF-7 cells, potassium cyanide (KCN) treated cells, and cells treated with the respiration inhibiting compound, sodium azide (NaN3) changes the autofluorescence signal and autofluorescence lifetime with a flow cytometer. Results showed a significant change in the autofluorescence intensity and data that suggest a decrease in the fluorescence lifetime compared to control cells (untreated). Our final goal is to sort cells based on fluorescence lifetime changes when measuring a mixture of cells that are treated or not treated with KCN and NaN3.
“Experiential Learning in the Development of a Rapid Prototyping Consultation Group”

The focus of this project is experiential learning through the development of a Rapid Prototyping Consultation group. The goal being an established Rapid Prototyping resource for students and faculty at the NMSU, ultimately engaging many fields of study into the quickly expanding field of 3D printing. Capstone projects are a trademark of an engineering degree at NMSU, with the culmination of a student’s experience and education expressed through this presentation. Another common element that extends to all STEM majors is a basic understanding of computer modeling and computer aided design. The established need for development resource that can provide almost instantaneous production of a prototype was evident as being not only a benefit to engineering majors, but all innovators, inventors, and STEM majors at NMSU. Ultimately, the processes for design, development and manufacturing will be standardized to expand the consultation group into a public resource. Preliminary results include completely familiarizing students with all facets and machinery involved in rapid prototyping. A website has already developed as a face for the consultation group, with key organizational positions determined based on expected duties. The next phase involves determining a protocol for all incoming projects.

“Neural expression patterns of FoxP2 and FoxP1 in adult open-ended vocal learners, budgerigar (Melopsittacus undulatus)”

The ability to learn vocalizations underpins human language. Among avian species, songbirds and parrots are known for their vocal learning traits. Zebra finches have served as a model for understanding the neural and genetic mechanisms underlying vocal learning during a single critical period. Budgerigars retain the ability to learn vocalizations throughout their lifespan. Therefore, we investigated the expression of a language-associated gene, FoxP2 within a homologous vocal learning nucleus, the MMSt (budgerigar) and Area X (zebra finch) during different calling states. Previous studies of zebra finch have demonstrated a correlation between FoxP2 and vocal plasticity. Consequently, we hypothesized that FoxP2 can also acts as a gateway for vocal plasticity in adult budgerigars. To test our hypothesis we performed immunohistochemistry on brain tissues from birds collected in different calling states. We found, FoxP2 expression in the MMSt was lower compared to the adjacent striatum regardless of their calling states. However, as we expected from previous work, non-singing zebra finches demonstrated similar expression levels in Area X and the adjacent striatum. The results implicate that FoxP2 expression has no dependence on calling behavior, but rather may depend on the nature of adult vocal plasticity in budgerigars.
"Design and Synthesis of Selective GTPase Probes"

The Rab7 GTPase is a regulator of late endocytic membrane transport and as such presides over an integrated growth factor trafficking and signaling nexus, which is pivotal for proper balance of neuronal differentiation and growth. Abnormal regulation of the Rab7 GTPase has been implicated in a wide range of diseases, including cancer, immune disorders and neurological diseases such as Charcot-Marie-Tooth disease (CMT). The central importance of the Rab7 GTPase in health and disease motivated us to develop fluorescent analogs of a selective small molecule activator of the Rab7 GTPase to probe the binding mechanisms through in vitro assays and investigate cellular responses through imaging. We hypothesize that synthetic GTPase probes containing the fluorescent HPY dyes developed in the Arterburn laboratory will have favorable solubility, cellular uptake and binding properties analogous to the parent activator. We have synthesized and evaluated structure-activity of a series of derivatives of novel Rab7 GTPase targeted activators. The compounds were evaluated using bead based flow cytometry assays to directly measure their effect on GTP binding. These compounds will function as scaffolds for probe development and may lead to targeted therapies for diseases such as CMT, whose treatment may benefit from the modulation of specific GTPase activities.

Laura Pineda

Major: Chemical Engineering

Faculty Advisor: Dr. Stefan Zollner, Physics Department

AMP

“Optical Properties of Bulk Nickel near the Curie Transition”

Nickel is a ferromagnetic transition metal that is used in numerous products because of its high corrosion resistance, toughness, and most importantly its ability to stay magnetic for long periods of time. Past literature has claimed that Nickel experiences a decrease in reflectivity when the Curie temperature (635K) is approached. To explore this phenomenon, we use ellipsometry to measure changes in the dielectric function (then convert to reflectivity) from 77K to 800K. Repeated measures have shown a change in the slope near 150K and again at 590K. We believe the change in the reflectivity at 590K is due to the transition from the ferromagnetic to the paramagnetic phase, which is affecting the optical constants of Ni. Measurements were then conducted on a non-ferromagnetic metal sample, Copper, to further verify the effects of demagnetization on the optical constants of Ni. Additional experiments are being performed to improve the accuracy of our temperature measurements.

Lauren Lujan Pincomb

Major: B.S. Biochemistry/B.A. Chemistry

Faculty Advisor: Dr. Jeffrey Arterburn, Biochemistry & Chemistry

MARC, NSF REU
“Do TRP Channels Form Heteromultimers?”

TRPV1 and TRPA1 are receptor-channels involved in migraine and pain pathways. There is currently a lack of information on the interaction and function of these two channels, and there is no targeted way to treat migraines. Prior research involving the formation of other TRP channel heteromultimers led us to test the hypothesis that TRPV1 and TRPA1 could also form such a complex. Primary dorsal root ganglion neurons from adult lab rats were transfected with a dominant negative TRPV1 mutant designed to render TRPV1 receptors nonfunctional, and a second control group was subjected to all the same conditions except for the addition of the mutant plasmid. We viewed the cellular response to capsaicin (agonist of the TRPV1 channel) and cinnamaldehyde (agonist of the TRPA1 channel) through calcium imaging. If these two channels form a heterotetrameric complex, then the dominant negative TRPV1 mutant would render the TRPA1 receptors nonfunctional. We found that far fewer of the cells in the mutant group responded to cinnamaldehyde than the control group. This study suggests that the TRP channels in question could form a heterotetramer in the nervous system; such a complex would represent a prime target for treatments for migraines and other neuropathic pain.

“Purification of Acetate Kinase for the Development of an Acetate Concentration Assay”

Acetate is a common byproduct of many biochemical reactions. The ability to measure the yield of acetate in a biochemical reaction has often proven difficult. The goal of my project was to measure the concentration of acetate. Knowing that acetate is a small molecule and is hard to detect, we developed an endpoint assay using acetate kinase. In order to do this, I cloned the gene that translates into acetate kinase into a pET-28a plasmid and purified the protein in order to obtain a sufficient amount. Acetate kinase phosphorylates acetate in the presence of ATP to form acetyl phosphate and ADP. ADP and phosphoenol pyruvate (PEP) are then converted to ATP and pyruvate by pyruvate kinase. From there, pyruvate and β-NADH are converted to lactate and β-NAD. At this endpoint, we indirectly determined the amount of acetate produced by quantifying NADH oxidation by monitoring at A340nm. Our data demonstrates that we are capable of using this assay to measure micromolar amounts of acetate in a reaction.
Casey Rede

**Major:** English

**Faculty Advisor:** Dr. Rani Alexander, Anthropology

**Sundt Honors Seminar**

“**Mayan Honey**”

The goal of this paper and my trip to the Yucatan Peninsula in Mexico is to research the effects of the trade and harvesting of honey and the breeding of stingless bees on the resilience of the Yucatec Maya. I am traveling to the Yucatan for ten days. My research for this paper will come primarily from the Ecomuseo de Cacao and some additional readings I will complete upon arrival back in the United States. I will research and discuss the potential effect of honey production and trade of honey on the resilience of the ancient Yucatan. Honey is among one of the many tradable goods that could have potentially created friendly neighbors, which meant they had help during the hard times and a large reason why there are still Mayans in Merida and the surrounding areas. It is an important point of research because the modern day “trade” of honey is crucial. The bee population is declining and it is crucial for the continued sustainability of the Mayans. I hope to discover the steps taken to preserve this way of life.

Hannah Rich

**Major:** Physics

**Faculty Advisor:** Dr. Boris Kiefer, Physics

“**Gasoline Engines in the Context of Climate Change**”

The 21st century is likely to face many challenges; among them is the future layout of energy technologies, in particular in the transportation sector. Currently, the transportation fleet is dominated to a high degree by conventional gasoline engines which contribute significantly to greenhouse gas emissions and human contributions to climate change and global warming. In this presentation, we will review predictions for the transportation sector until 2040. We will discuss possible scientific and technological modifications of current gasoline based technology and how it may affect these predictions. We will also show how material science can assist in addressing these challenges and the design of low temperature exhaust catalysts that are needed in this effort.
“Abatement of Uranium from Water Using Clay”

During the 1950’s race to mine uranium in the United States, mine tailings were abandoned and have since become a major health hazard. Within the Four-Corners area, specifically in the Navajo Nation, Uranium contamination of many well sites gravely endangers the residents. In the slightly basic conditions of the southwest, Uranium dissolved in water exists as Uranyl (UO22+) and is most often found as uranyl salts, for example uranyl nitrate (UO2(NO3)2). Our research lab has discovered that via cation exchange, clays are capable of abating uranium in water in order to convert polluted water into potable water for Navajo residents. The Navajo Nation EPA reports approximately 14,347 households and 54,000 people are without potable water, and have no other option than to drink from contaminated wells. The EPA limit for potable drinking water is 30ppb and many of these wells are contaminated up to and exceeding 2000 parts per billion (ppb). Our results from ICP/MS analysis have overwhelmingly shown that clay treatment of uranium contaminated water using the Lara Clay Pellet Methodology can abatement uranium concentrations to levels below 30ppb. This technology can make difference in the Navajo Nation, or any place on Earth with heavy metal contaminants.

“Effect of Knockdown of Odorant Receptor Co-receptor in Bedbugs”

Cimex lectularius, the common bed bug, have highly specialized olfactory mechanisms. The odorant receptors in insects are imperative for finding food, avoiding predators, and reproduction. Due to increased resistance to pesticides, bed bugs are difficult to control. The process of eliminating bed bugs from hotels, apartments, and households is time-consuming, labor-intensive, and expensive. The purpose of this study is to knock down the gene responsible for the odorant receptor co-receptor (ORCO) in bed bugs. By effectively knocking down the ORCO gene, the bed bugs should not be able to sense the chemical signals expelled by humans. In order to knockdown the gene, the gaps between the partial sequences of the ORCO receptor needed to be filled. The gaps were determined by cloning cDNA from the bed bugs in TOPO vector and sequencing the plasmids. A full sequence of the ORCO receptor was obtained. Bed bugs were injected with dsRNA to knockdown the expression of the ORCO gene. In order to determine the efficiency of the knockdown, a RT-PCR and a bioassay need to be completed.
“Effects of Electrode Structure on Electrochemical Performance for Li-Ion Battery Applications”

The interest in developing new electrode materials for the lithium ion batteries (LIBs) has been increasing drastically because of the surging demands for this form of clean energy and its use in many fields. LIBs with different electrode materials that have high capacity, good cycling performance, rate stability, low-cost and low toxicity are needed. The purpose of this project was to investigate the effects of the nanostructures of nickel oxide and nickel sulfide when compared to their bulk aggregates. Hollow spherical microstructures were formed and their electrochemical properties were tested. Because of their light density, li-ion kinetics could be improved due to the increased surface area contact with the electrolyte. The hollow structure could also mitigate the stress placed on the host structure during the lithium intercalation process. The cyclic voltammetry, impedance, rate and cycling performance of the hollow structures were investigated and compared with their aggregate forms.

“Durability Assessment of Ultra High Performance Concrete”

Ultra high performance concrete (UHPC) is an advancing material that offers improved mechanical properties, ductility, and durability. Due to limited standards, design codes, and specifications, it has been applied minimally in the structural design. It is necessary to develop an optimized, functional, economical, and sustainable UHPC to ensure the durability of the material. Effects of alkali-silica reaction (ASR). ASR is a primary form of degradation that has the potential to negatively affect the durability of concrete structures. In UHPC, the cement and fine aggregates used can cause deleterious internal pressures, when the proper conditions exist to allow for ASR. As a result cracking and loss of strength and stiffness of concrete takes place. In order to mitigate ASR, New Mexico State University implicates Pozzolans, silica fume and fly ash, into the mixture proportions. Two different mix designs were tested in accordance with ASTM C 1260, Accelerated Mortar Bar Method. This test is used to detect ASR caused by potential deleterious internal expansion and takes 16 days to perform. The first two days consist of preparing the specimens to be placed in the 1N NaOH solution and the last 14 days involve testing. According to ASTM C 1260, expansion of concrete is not to exceed 0.10%. The average trend of expansion for three different batches fell below this limit. If a specimen is to exceed expansion greater than 0.10%, the aggregate used can be considered to be potentially reactive leading to damage in the structure. A total of three ASR tests were performed, to take into account the durability effects of different mixture proportions. Two tests consisted of a high silica fume to fly ash ratio. The third test consisted of an even silica fume to fly ash ratio. When comparing the average expansion between the batches, a common visible trend was found between the two high silica fume mixes. The even mix resulted with the highest average expansion, but remained 0.03% below the ASTM requirements.
“Identification of two galectin transcripts in Euprymna species”

Euprymna scolopes and Euprymna tasmanica are cephalopods that form a symbiotic relationship with the bacterium Vibrio fischeri. Various proteins are believed to be involved in the homeostatic regulation of the bacteria within the squid. Candidates of these host regulators are sugar-binding proteins, known as lectins. Previously, a protein with galectin homology was identified in light organ (LO) exudates of E. scolopes. Galectins are proteins that aid in the removal of microorganisms by binding to beta-galactosidase residues found on their surfaces. We hypothesize that galectins are present in Euprymna squid and are expressed in higher amounts in V. fischeri-colonized squid. We have identified two sequences with galectin homology in the E. scolopes EST-database and used them to design specific primers to obtain their complete coding DNA sequences (cds) using E. scolopes whole squid cDNA. A tandem-repeat galectin (Es-Gal 1) of 1662 bp has been sequenced, containing four putative conserved carbohydrate recognition domains (CRD). Additionally we have a partial sequence of 980 bp for a second galectin-like molecule (Es-Gal2). Future work includes confirming the cds of Es-Gal2 in E. scolopes, sequencing both proteins in E. tasmanica, and comparing the expression levels of these two lectins in colonized vs. uncolonized LO using QPCR.

“Neurosensory systems in Xenopus laevis larvae can be identified using luxol fast blue and neutral red”

The myelin sheath is responsible for action potential propagation in neurons. Myelin sheath damage can result in complications in vision, hearing and balance by impeding neuronal signaling in the central and peripheral nervous system. Multiple sclerosis (MS) is a disease caused by myelin degeneration with symptoms that include muscle weakness, blindness and blurry vision. We are interested in developing a Xenopus model for MS and to this end we are implementing staining methods to observe myelination in sectioned tissue. Results presented here show preliminary success modifying the Klüver-Barerra method to stain the myelin sheath and Nissl bodies. X. laevis larvae were resin embedded and stained using luxol fast blue and staining the Nissl substance with neutral red instead of cresyl violet. We observed that resin preserved the tissue morphology, while neutral red provided higher contrast than cresyl violet. Moreover, in contrast to previous reports, our luxol fast blue staining method is compatible with resin embedded samples. Results show that the myelin sheath was identifiable in sensory systems such as the retina and inner ear. We conclude that this method can be used as an alternative myelin staining protocol. Work supported by NIH BP-ENDURE 8R25NS080685.

Elisa Sanchez
Major: Biology
Faculty Advisor: Dr. Maria Castillo, Biology

Kathryn Sanchez
Major: Biology and Government
Faculty Advisor: Dr. Elba Serrano, Biology

BP-ENDURE (BRAiN)
“Design of 3D Spacecraft Ground Simulator for Attitude Control using Variable Speed Control Moment Gyroscope”

The attitude dynamics of a spacecraft with a variable speed control moment gyroscope (VSCMG), is derived using variational principles. A complete dynamics model, that relaxes some of the assumptions made in prior literature on control moment gyroscopes, is obtained. A non-standard VSCMG model, which has an offset between the center of the gimbal axis and the center of the rotor (flywheel) is considered. The dynamics equations show the complex nonlinear coupling between the internal degrees of freedom associated with the VSCMG and the spacecraft base body’s attitude degrees of freedom. Some of this coupling is induced by the non-zero offset between the gimbal axis and the rotor center. This dynamics model is then generalized to include the effects of multiple control moment gyroscopes placed in the base body with non-parallel gimbal axes. It is shown that the dynamical coupling can improve the control authority on the angular momentum of the base body of the spacecraft using changes in the momentum variables of the VSCMG. The model developed is very general, so that it can be reduced to any available standard model of momentum exchange devices including control moment gyroscope (CMG) and reaction wheel (RW).

“Monte-Carlo Simulations to Optimize Particle Detector Design”

Attempting to better utilize their research material and time, Physicists have turned to computational techniques to model simulations with existing and proposed equipment. This not only allows Physicists the ability to offer theoretical results of an experiment before many resources are expended but also allows the comparison of competing designs based on each design’s supporting calculated results. Ring-imaging Cherenkov (RICH) detectors are useful in determining the mass of a particle without stopping the particle to a halt and usually the designs of RICH detectors allow the particles to continue on a path to other equipment for other measurements. Particle detectors can have many designs and labs do not have nearly infinite resources so the issue of available material optimization for detectors comes to light. Computational simulations can greatly aid in the decision of a lab for a design of a detector over another. Furthermore light-propagation simulations can be used in many other applications where photons are a particle of interest, whether directly or indirectly. This research focuses on the construction of an optimal RICH detector for use in our lab with an emphasis on results from Geant4 simulations of our three competing designs.
Arthur Tillbrook

**Major:** English

**Faculty Advisor:** Dr. Rani Alexander, Anthropology

**Sundt Honors Seminar**

“The Yucatan Peninsula: Capturing Culture Through Poetry”

My goal is to produce a series of poems based on the folklore of the Yucatan Peninsula and my experiences in the Yucatan peninsula. Historical sites are epicenters of stories and lore, slowly accumulating local tales that can be whimsical or downright disturbing. During the Sundt Honors Seminar study trip in the Yucatan Peninsula, I wish to connect the lore and physicality of historical Mayan sites through poetry. During my studies in Yucatan, I will visit numerous archaeological sites that are of historical importance. On top of that, I will research numerous folktales that are circulating within the area to understand what kinds of stories currently exist and try to understand how they are associated with locations. Stories and lore are integral parts of a culture, and how they persist ties directly into the resilience of a society, particularly the resilience of the Yucatec Maya society. The form and content of the poetry will function around the experience of Mayan sites and the folklore surrounding them. I will be receptive and open to all that I experience in Yucatan to allow for the best chances to generate poetry that captures the connection between the feeling and experience of a place and the folklore surrounding that particular place.

Cole Tobin

**Major:** Anthropology and Biology

**Faculty Advisor:** Prof Julie Fitzsimmons, Art Honors College

“Surrealism: Exploration of the Irrational Mind”

When thinking about the arts and sciences, one could easily come to a conclusion that the two are separate strands of thought, with no crossing over what so ever. Meaning, artists strictly rely on inspiration and material within the arts, and scientists strictly rely only on the sciences. There exists a dialogue that makes the two fields seem incompatible. Since both the arts and the sciences are a reflection of society, they look at the ideas a culture finds important, valuable, and of interest. Both fields tackle issues of how people interact with one another at individual and societal levels; raise the question of where and how humans as a species come from and function; and most importantly both try to explain the unknown. In this paper I am exploring the idea that there is a connection that exists between the sciences and the arts. Both the arts and the sciences can exchange ideas with each other and influence one another. The power of ideas and knowledge can influence artists to create works of art that were considered unfathomable to society at the time. This is seen with the Surrealist art movement and the influence of Freud’s theories of the subconscious, the rational and irrational.
“The Non-Parametric Data Analyses for Observational Before-and-After Studies of the Speeding Violations Data”

The Safe Traffic Operations Program (STOP) in the City of Las Cruces, NM was introduced in an attempt to improve traffic safety in March 2009. The goal of this research project is to assess the impact of the STOP on traffic safety. Our study includes a total of 12,400 speeding violation records collected from five camera sites in the city between May 2010 and April 2012. Descriptive statistics show that after the STOP activation, the number of speeding violation was significantly decreased in four of five camera sites. Also, during the study period, none of the camera sites experienced an upward trend on the number of speeding violations. Therefore, we may conclude that the STOP operation has a positive impact on decreasing the speeding violation. However, note that the speeding violator’s average speed at the time of violation has not been changed. Future research may include understanding the correlations among speeding violations and types of traffic accidents, drivers, and environmental factors. This study was supported, in part, by the City of Las Cruces under grant #11-12-334 and a grant from the National Science Foundation to New Mexico AMP with grant # HRD-1305011.

“Alyssa Trujillo
Major: Civil Engineering
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AMP

“Freezing and Thawing Durability of Ultra High Performance Concrete”

Ultra high performance concrete (UHPC) is being considered to redesign and optimize structural elements of new and existing infrastructures. UHPC is a fiber reinforced cementitious composite material with a water-to-cementitious materials ratio less than 0.25 and compressive strength four times greater than normal concrete. However, since UHPC is not air entrained, its ability to resist cycles of freezing and thawing is questionable. The goal is to determine if UHPC mixtures have the ability to withstand 300 cycles of freezing and thawing by maintaining a relative dynamic elastic modulus (RDM) greater than 60%. The RDM is the percentage of the dynamic elastic modulus after n cycles divided by the dynamic elastic modulus at zero cycles of freezing and thawing. The dynamic elastic modulus is calculated from the weight and frequency of the specimens at intervals no greater than 36 cycles. This semester, five batches of four UHPC mixtures with a water-to-cementitious materials ratio of 0.14 were tested. The mass and RDM of all the specimens increased throughout the test and had a RDM greater than 100% after 300 cycles. These UHPC mixtures provided the durability needed to withstand the cycles of freezing and thawing expected for real world applications.
“Use of Flow Cytometry to Determine Comparative Genome Size among Species within the genus Leucaena (Leguminosae)”

Plant genomes are highly plastic with regard to total genome size and the number of copies of each chromosome. Individual plants, populations, or even species can differ from one another by entire sets of chromosomes such that one is diploid while another is tetraploid. Flow cytometry is used to investigate comparative genome sizes to infer genome duplications, known as polyploidization, and genome reduction in polyploids, known as diploidization. These systems provide interesting opportunities to investigate the patterns and impacts of genome change on the evolutionary history of lineages. Previous estimates of genome size in Leucaena have been hindered by poor quality nuclei recovery. This problem has been avoided using the Otto buffer system. Population samples of all 24 species of Leucaena will be comparatively analyzed. Inferred genome sizes will be viewed in the context of the evolutionary history of Leucaena to identify polyploidization and periods of diploidization. Here we present the current results behind a project to obtain comparative genome size in the genus Leucaena. Current results indict a higher degree of genomic size variation within species than previously thought.

“Bismuth Oxide: A New Lithium-ion Battery Anode”

Polymer-assisted deposition (PAD) is an effective method for growing thin films. This method uses a polymer binding with metal ions, which controls the viscosity, and results in a homogeneous distribution of metal ions within the precursor that allows the formation of uniform thin films. Bismuth oxide grown on nickel foam substrates (p-Bi2O3/Ni) via a polymer-assisted solution approached was used as a lithium-ion battery anode material for the first time. The bismuth oxide particles were covered by thin carbon layers, which formed network-like sheets on the surface of the nickel foam. The composite p-Bi2O3/Ni material shows exceeding electrochemical properties with a capacity of 668 mA h g-1 at a current density of 800 mA g-1, which is higher than that of commercial Bi2O3 powder. This high performance can be attributed to immense volumetric utilization efficiency, better connection between active materials and the current collector, and shorter lithium-ion diffusion path.
“Rates and Changes of Forest Fragmentation Occurring From the Development of Snow Recreation: A Case Study of Eldora Mountain Resort, Colorado, U.S.A.”

While it is generally acknowledged that ski resorts and associated human activities impact forest ecosystems, little is actually known about the impacts of ski slopes on ecosystem processes. Consequently, our understanding of how to develop and manage ski resorts sustainably is limited. As a first step toward addressing these knowledge gaps, it is necessary to have information about rates and patterns of landscape change. Such information is currently not available for many locations, including the Eldora Mountain Resort in the Colorado Rocky Mountains. Our goal was to provide this information by 1) mapping land use and land cover in 1955 (pre-resort opening), 1983 (post-resort opening), and 2011 (current); 2) quantifying rates of land change using intensity analysis; and 3) characterizing patterns of land change using landscape metrics. Our results show that the landscape changed most intensively during the first time period (1955-1983), that forest land decreased most drastically, and that infrastructure associated with snow recreation increased most actively. In addition, the landscape has become increasingly fragmented and heterogeneous over time. These changes in land system architecture have many potential implications for ecosystem processes, as we will discuss in our presentation.

“How surface to volume ratios affect pellicle formation and growth of the wrinkly spreader phenotype in Vibrio Fischeri”

Bioluminescent bacteria have been utilized by many marine invertebrates such as cephalopods, as a way to camouflage, attract mates, or lure prey. One cosmopolitan species, Vibrio fischeri, is used by many species of squid to disguise their silhouette during the night with a behavior termed “counterillumination”. V. fischeri assists this counterillumination by colonizing the light organ of the host. Various phenotypes can affect the efficacy with which the bacteria infect their hosts, particularly when the character is associated with colonization efficiency. The wild type phenotype of V. fischeri displays a smooth colony form when grown on Luria Bertani high salt (LBS) agar plates or in shaken LBS media. An alternate phenotype, coined the ‘wrinkly spreader’ (WS), forms in the pellicle, or thick biofilm in standing liquid cultures; it has been found to infect the host squid with greater efficiency than the wild type ‘smooth morph’. In this study, V. fischeri was grown in static flasks for nine days and plated in serial dilution on days three, six, and nine. These time points were subsequently examined for three days and any WS colonies isolated were streaked out onto new plates to ensure the morphology was not simply epigenetic. WS colonies typically appeared around day six dilutions and were found to be phenotypically different based on re-streaking single colonies onto new plates. These observations indicate that V. fischeri WS strains can form in static conditions with adequate nutrients in optimal surface to volume ratios, demonstrating the plasticity of these beneficial bacteria to adapt to new environmental conditions.
“Growth dynamics of Williopsis saturnus related to exopolysaccharide production”

A yeast-bacterium co-culture was isolated in R2A agar plates from a low pH hydrogen-producing bioreactor with compost (reference). Overgrown cultures in solid media showed the formation of gas bubbles that were persistent and resistant to physical manipulation. GC analysis of the bubbles’ gas space identified the significant enrichment of hydrogen, most probably produced by the prokaryotic component of the co-culture, while the growth of the isolated yeast showed the production of an exopolysaccharide (EPS) directly related to the formation of the bubbles. Preliminary characterization of the EPS using Fourier Transformed Infrared Spectroscopy (FTIR) showed a significant similarity to cellophane, a polymer known for its low gas permeability with several potential industrial applications. The production of the EPS by the yeast, presumptively identified as Williopsis saturnus, has been related to the growth dynamics of the organism by measuring the content of EPS secreted to the media during different stages in the yeast growth.

“Properties of Plastic-Cellulosic Composite Through Simulation Techniques using Accelrys Materials Studio 6.1”

Molecular dynamics simulations permit the study of complex, dynamic processes that occur in biological systems. It is the most detailed molecular simulation method which computes the motions of individual molecules. This technique solves equations of motion for a large number of particles in an isolated cluster or bulk and has become a powerful tool for answering scientific problems as numerical experiments for new materials without synthesizing them. Recently attention has been drawn to the utilization of bio-reinforced composites in several applications due to an increased concern for sustainability. Recent studies in Wood Plastic Composites (WPCs) that use materials other than wood with are taking a special emphasis on the utilization of more basic foundations such as Cellulose which is important component produced by every plant and it is the most abundant biological molecule in the world. This study investigates the miscibility and mechanical properties of pairings of cellulose and lignin with several different polymer matrices such as HDPE using molecular dynamics simulation techniques with the Accelrys Materials Studio 6.1 software.
“Differential FoxP2 and FoxP1 developmental expression in a vocal learning nucleus of the budgerigar.”

The FoxP2 and FoxP1 transcription factors have been shown to regulate genes that play a role in the development and maintenance of neural circuits involved in both birdsong and human speech. However, the precise roles of FoxP2 and FoxP1 gene expression during vocal development in an open-learning species are not well understood. Here we used in situ hybridization and immunohistochemistry to measure neural FoxP2 and FoxP1 mRNA and protein expression within the vocal control nucleus MMSt of juvenile and adult budgerigars (Melopsittacus undulatus). We found that FoxP2 mRNA and protein expression levels in the MMSt were lower than that of the surrounding striatum throughout development and adulthood. In contrast, FoxP1 mRNA and protein demonstrated an elevated MMSt/striatum expression ratio as birds matured, regardless of their sex. These results show that the life-long vocal plasticity seen in budgerigars is associated with persistent low-level FoxP2 expression in the budgerigar MMSt and suggest that FoxP1 plays an organizational role in the neural development of vocal motor circuitry. These developmental expression patterns of the FoxP2 and FoxP1 genes in budgerigars further our understanding of the molecular mechanisms of vocal learning and production, which is relevant for designing therapeutic approaches for language impairments in humans.

“Flavor Volatiles and Aroma Profiles of the Jalapeño Pepper”

Jalapeño peppers (Capsicum annuum) are one of the most popular and best known chile peppers in the world. Currently there is no flavor standard for what constitutes a jalapeño pepper. In order to better understand jalapeño flavor, this study aimed to characterize the aroma and volatile compound composition of eight jalapeños, three F1 hybrids, two landraces, two open-pollinated varieties, and one heirloom variety. Headspace solid-phase micro-extraction (HS-SPME) and gas chromatography-mass spectrometry (GC-MS) determined the volatile and aroma profiles of the eight different varieties. The chemical profiles of the jalapeño varieties have shown to be complex and diverse. Each variety produced a unique aroma and volatile profile. These unique profiles not only show the differences between the varieties, but also suggest that there is more than one acceptable jalapeño flavor. The further characterization and identification of the volatile compounds and classes of compounds responsible for jalapeño flavor will allow growers, breeders, and producers to select for varieties that produce the ideal flavor.
“Creating oxazole compounds using Suzuki coupling and boronic esters and creating 1,3 carbonyl compounds from sulfoxides”

The field of organic chemistry is driven on the need to explore new ways to construct carbon-carbon bonds in an economically and selective way for use in natural products total synthesis. For example, the Maio laboratory has recently developed a method to generate tri-substituted oxazole-containing alkenes via a carbolumination/Suzuki cross coupling strategy. Oxazoles are features of numerous natural products, and are known to be biologically active. Several examples have been generated, showing the functional group tolerance of this novel reaction sequence. A second area of exploration involves the union of Methyl (phenylsulfinyl) acetate with nitriles for the construction of 1,3-carbonyl compounds. These moieties are common in natural products.

“The Commercialism of Maya Identity in Merida, Mexico”

In this poster I will investigate the commercialization of Maya identity presents itself in Merida, Mexico. I will observe how workers dress, the types of goods being sold, and how marketplaces, restaurants, hotels, and shopping centers are decorated. I will also determine is the goods being made are actually produced are made by Maya speaking peoples. The research on which this poster is based is from my first hand observations, photographs and interviews that I conducted in Merida, Mexico for the Honors College Sundt Seminar Spring Break Trip to the Yucatan on March 21st– March 30th 2014. This research aims to explore how the people of the Yucatan have used the Maya identity to improve marketing and sell goods and services, particularly to tourists, in order to form a resilient economy.
**Kobi Weaver**

**Major:** Anthropology  
**Faculty Advisor:** Dr. Rani Alexander, Anthropology  
**Honors Thesis**

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**Leif Winstead**

**Major:** Chemistry  
**Faculty Advisor:** Dr. Michael Johnson, Chemistry and Biochemistry  
**MARC**

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**“Using Chemical Analysis to Determine Activity Patterns of a Elite Residence of Chum Balam-Nal in Blue Creek, Belize”**

The purpose of this poster is to explore the activity patterns and conditions of abandonment prior to the Maya Collapse, A.D 750 to A.D 1050, in the elite Maya residence Structure 3, of the residential group Chum Balam-Nal, in Blue Creek, Belize. This research was gathered during the June–July 2014 field season with the Maya Research Program directed by Thomas Guderjan. I conducted chemical spot testing of the plaster flooring of Structure 3 to determine phosphorus and potassium concentrations as well as pH levels in order to produce concentration maps. This, along with artifact data collected through the excavation, adds to the discussion about how Blue Creek fits into the Maya Collapse.

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**“The Kinetics of Nucleophilic Addition to Crystal Violet”**

The use of reverse micelles (RMs) to produce well ordered nanoparticles has been extensively reported over the past decade. Reverse micelles are spherical assemblies of surfactants surrounding a water core. We studied the bleaching of crystal violet (CV) resulting from the attack of OH- and CN- on the sp2 central carbon of CV to form both trityl-alcohol and trityl-cyano molecules. A conventional UV-Vis spectrometer was used to collect absorbance vs. time data and the traces were fitted using a single exponential decrease to obtain the pseudo first order rate constants. Changes for both reaction rate and reversibility were observed for these nucleophilic reactions as the RM size was varied.
The reason behind disassembly of sarcomeres – the contractile units – in many muscle pathologies is unknown. Knowledge about the temporal expression of proteins that contribute to both the formation and stability of sarcomeres could greatly inform the etiology and diagnosis of sarcomere degeneration present in muscular diseases. The electric fish S. macrurus has the unique ability to regenerate all tail tissues after amputation including skeletal muscle and the muscle-derived cells of the electric organ, i.e., electrocytes. During regeneration, some muscle fibers fuse and disassemble their sarcomeres to convert into electrocytes. To characterize the molecular changes that occur in sarcomeres during the muscle-to-electrocyte conversion, we are using an immunofluorescence approach to study protein components of distinct sarcomeric regions. Specifically, we are using antibody markers of the Z-disk (EA53), inter-Z-disk region (E398P), M-region (MF20), and I- and A-bands (phalloidin) to describe the process of sarcomere disassembly in this innovative model system. By observing the regions of the tail that the proteins are found, we can deduce the process by which muscle fibers degenerate. Our preliminary data suggest that the proteins of the I-bands dissociate first, then those of the A-band, and lastly those of the Z-disk.