

Twenty-Eighth Annual  
Undergraduate Research and Creative Arts Symposium

# URCAS

New Mexico State University



## CURCA

Center for Undergraduate Research and Creative Activity

Corbett Center

April 14, 2023

Sponsors:

William Conroy Honors College  
Alliance for Minority Participation (NM-AMP)  
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Maximizing Access to Research Careers (MARC)  
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# Symposium Sponsors & Partners

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## **Conroy Honors College**

The NMSU Honors College serves the citizens and state of New Mexico by providing an enriching environment for diverse, academically talented, and motivated students. Through the Honors Capstone and coursework, students undertake original scholarly activity in humanities, social sciences, science, engineering, agriculture, business, education, and the arts under close supervision by faculty mentors.

## **New Mexico Alliance for Minority for Minority Participation (AMP)**

The New Mexico Alliance for Minority Participation, funded by the National Science Foundation, is a partnership of 14 two- and four-year colleges and universities in the state, with NMSU serving as the Lead Institution. A primary goal of the STEM AMP program is to increase the number of B.S. degrees awarded to underrepresented students in New Mexico. AMP offers scholarships and research assistantships through programs such as STEM Prep, Undergraduate Research Scholars, Transfer Scholarship, and International Research and Education Participation.

## **Discovery Scholars in Arts & Sciences (DSP)**

The Discovery Scholars Program aims to nurture undergraduate discovery through research with faculty mentors and encourage students to continue their education in graduate or professional school. Any College of Arts and Sciences undergraduate who is engaged in scholarship with faculty guidance outside of regular class activities can join the program.

## **Maximizing Access to Research Careers (MARC)**

MARC was established in 1975 to increase the numbers of underrepresented groups in the biomedical and behavioral sciences and to diversify the research workforce. The MARC program at NMSU has been funded since 1977 to aid students obtaining advanced degrees in the biomedical research sciences through support and training. MARC offers 18 Undergraduate Scholars positions, support to present research at national professional conferences, various workshops throughout the year, special courses to earn honors credits, and summer research opportunities at leading institutions around the country.

## **SOAR Policy and Evaluation Center**

The Southwest Outreach Academic Research (SOAR) Evaluation & Policy Center are evaluators for grants, internal research, and external organizations in education, healthcare, and the social sciences. SOAR currently serves as the evaluator for grants and projects that are funded through the National Science Foundation, the United States Department of Agriculture, the National Institutes of Health, and others.

## **Partnership for the Advancement of Cancer Research (PACR)**

PACR is a collaboration between NMSU and Fred Hutchinson Cancer Research Center. Together, they are dedicated to improving cancer health equity by providing opportunities for research, education, training, and community engagement for underserved populations in the U.S. Southwest and Pacific Northwest. Rising juniors, seniors, and graduate students interested in public health and biomedical research are encouraged to apply for internships.

## **McNair Scholars Program**

Located in the Conroy Honors College, the McNair Scholars Program aims to increase the number of underrepresented and first-generation students in the professoriate. McNair Scholars engage in personalized scholarly activities and receive services and support throughout their junior and senior years in preparing for, gaining entrance to, and completing doctoral (Ph.D.) programs.

Also, **Colleges of Agricultural, Consumer, and Environmental Sciences; Arts and Sciences; Engineering; Health, Education, and Social Transformation; Offices of the Chancellor, Provost, and Vice-President for Research, Creativity, and Strategic Initiatives.**

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## Credits

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### Logo Design

The winning URCAS23 logo/branding design was submitted by senior Art History major Ruth Christensen (1<sup>st</sup> place), mentored by Professor Brita D’Agostino in ART 455. Advanced Graphic Design. After graduation Ruth is headed out to pursue a career in digital Illustration and design work. Ruth was assisted by Emily Fernandez (2<sup>nd</sup> place). Additional logos created by students in ART 455 will be displayed during the panel on Communication and Design.

Ruth writes, “This design focuses on the Golden Ratio. The Golden Ratio is the universal ratio of ‘divine proportion.’ It has been considered the key to beauty thorough out history and across many fields of study. The Golden ratio symbol fits the ideals and focus of the URCAS. It’s a concept that is applied across fields of art, science, mathematics, history, and humanitarian studies. It’s diverse and multidisciplinary meaning reflects what URCAS aims to do by bridging the gaps between the colleges here at NMSU. For the colors of this design, I wanted to maintain a more muted, neutral color scheme to avoid taking attention away from the Golden Ratio, but also to create a classical art deco feeling to the design. URCAS is serving as the linking of fields at the university in the same way the Golden Ratio is serving as a universal link of disciplines.”

### Appreciation

With special appreciation for their assistance today to VPR Luis Cifuentes; Dr. Nancy McMillan; Dean of Honors Phame Camarena; Associate Dean Anne Hubbell; Dr. Judith Flores Carmona; Dr. Rebecca Campbell; Marko Mohlenhoff; Zola Gallo, the staff of the Honors College led by MaryLouise Pino, including Roman Gutierrez, Elias Leverett, Emma Hernandez, Leonella Vazquez Perez, Ileana Saenz, Brenda Gonzalez, and Eveline Vazquez Delgado; members of the CURCA Advisory Council Abdu Abdelkefi, Rachel Boren, Soyounng Jeon, Joshua Clark, Megan Papesch; Jeanne Garland, Gaspard Mucundanyi, Mary Jo Ruthven, Graciela Unguez, Ivette Guzman, Mary Alice Scott, and all other research program directors, mentors, and other faculty and staff participating in URCAS.

# Overview

	Fountain Room	Doña Ana Room	Senate Chambers	Senate Gallery	Ballrooms
<b>8-9 Registration &amp; Set Up</b>		Panel 1. *8:30am* Sustainability in HRTM <i>Joshua Jackson</i>			<i>Poster Set Up in Central Ballroom</i>  Refreshments
<b>9-10 Panels</b>	Panel 2. Life Sciences 1 <i>Katie Banga, Phoenix Dendera, Ian Nelson</i>	Panel 3. Life Sciences 2 <i>Kaihre Brightwater, Christopher Gomez, Kaitlin Marry</i>	Panel 4. Creative Media & Writing <i>Meghan Romero, Jonathan Davis, Annie Ersinghaus</i>	Panel 5. Physical & Life Sciences <i>Daniel Montes, Daniela Palacios</i>	
<b>10-11 Panels</b>	Roundtable for Students and Faculty on Undergraduate Research Mentorship <i>Abdessattar Abdelkefi, Adriana Romero Olivares Jennifer Hernandez Gifford Sergio Martinez Jennifer Randall</i>	Panel 6. Computer Science <i>Angie Hernandez, Erick Nevarez, Horacio Gonzalez</i>	Panel 7. Communication & Design <i>Antonio Garcia, Ruth Christensen, et al., Devynne Hadley, et al.</i>	Panel 8. Life Sciences 3 <i>Jacob Martinez, Kayla Moehn, Mariah Leonard</i>	
<b>11-1 Poster Session &amp; Panels</b>  <b>11:15 Welcome</b>		12-1: Leaves from Registration Table: curator tour of the Juried Student Art Show in Devasthali Hall	Panel 9. 11-12. Arts Across Borders <i>Nakeisha Campbell, Jordy Espino Lopez Darcy Harman</i>  Panel 10. 12-1. Shakespeare <i>Jonathan Davis, Savannah Hair, Meghan Romero</i>		<b>Poster Session</b>  Lunch  <b>Welcoming Remarks by Dr. Luis Cifuentes at 11:15am</b>
<b>1-2 Keynote &amp; Awards</b>		<b>Keynote: Dr. Nancy McMillan, Geology, "In Praise of One- Offs"</b>  <b>1:45pm Awards</b>			
<b>2-3</b>	PACR-U54 Reception on Cancer Research and Health Disparities				
<b>5:30</b>	CONROY HONORS CENTER: Reception for Opening of the Honors Art Collective				
<b>7:30</b>	ISABELLA M. CROUCH READER'S THEATRE in the Communication Building: Terry Pratchett's <i>Wyrd Sisters</i> , adapted by Stephen Briggs. Dir. Darcy Harman (EMBER Theatre Company) 7:30pm: Friday and Saturday; 6pm: Sunday. Tickets \$10.				

# Overview

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The Undergraduate Research and Creative Arts Symposium, now in its twenty-eighth year, is the longest running student symposium at New Mexico State University. Since 1996, over 2,000 students have presented at the symposium. The annual symposium celebrates undergraduate scholarship in all fields. Represented here are some of the most advanced and creative projects presently being undertaken at NMSU.

URCAS is intended to recognize outstanding undergraduate research and creative projects and the faculty who have mentored them. It is meant to show off the work of creative undergraduate students to the university and the community. Presenting at the symposium also gives students valuable professional experience. Many of the students presenting today are completing course or Honors Capstone projects, while others have worked with mentors in laboratories and other research and arts settings through the AMP, Avian Migration, MARC, Discovery Scholars, McNair Scholars Program, ENHANCEMENT, MARTE, PACR, ROLE, S-STEM, and other mentoring programs.

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

Dr. Phame Camarena, Dean, Conroy Honors College

Dr. Tracey Miller-Tomlinson, Director, Center for Undergraduate Research & Creative Activity

Ms. Zola Gallo, CURCA Graduate Assistant

## URCAS at a Glance

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- 8-9 Registration and Poster Set Up, first Panel (8:30)
- 9-11 Panels & Roundtable for Students and Faculty on Research Mentorship
- 11-1 Poster Session & Panels, Lunch (Corbett Ballroom)
- 11:15 Welcoming Remarks by Dr. Luis Cifuentes, Vice President for Research, Creativity, and Strategic Initiatives (Corbett Ballroom)
- 11-12 Panel Talks and Exhibits
- 12-1 Walking Tour of the Juried Student Art Show (leaves from registration desk)
- 1-2 Keynote, Dr. Nancy McMillan, Geology and Discovery Scholars, "In Praise of One-Offs," followed by Awards (Doña Ana Room)
- 2-3 PACR Reception on Cancer Research and Health Disparities (Fountain Room)
- 5:30 Reception for Opening of the Honors Art Collective (Conroy Honors Center)
- 7:30 *Wyrd Sisters*, EMBER Theater Company (Reader's Theater, \$10)

# Talks & Exhibits

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## Session 8:30-9

### Panel 1. Sustainability in HRTM (Doña Ana Room)

**Joshua Jackson**, “Sustainable Programs for Hotel Linen”

Major: Hotel, Restaurant, and Tourism Management; Honors Capstone

Faculty Advisors: Dr. Jean Hertzman, HRTM; Dr. Rebecca Campbell, Honors

## Session 9-10

### Panel 2. Life Sciences 1 (Fountain Room)

**Katie Banga**, “Examining the Accessible Chromatin Regions Between Duplicated Gene Copies in the Tetraploid *Leucaena trichandra*”

Major: Genetics and Biotechnology

Faculty Advisor: Dr. Donovan Bailey, Biology

**Phoenix Dendera**, “Relationships between bee sociality and genetic structure”

Major: Biology

Faculty Advisors: Dr. Brook Milligan, Biology; Scarlet Sellers, Biology

**Ian Nelson**, “Correlating latitudinal provenance with density of diapause-associated genes in a common orchard pollinator (*Osmia lignaria*)”

Major: Biology

Faculty Advisors: Dr. Brook Milligan, Biology; Scarlet Sellers

### Panel 3. Life Sciences 2 (Doña Ana Room)

**Kaihre Brightwater**, “Effect of Endophytic Bacteria from London Rocket on Growth of *Phytophthora capsici* and Germination and Mortality of Chile Pepper”

Major: Biology; MARC

Faculty Advisor: Dr. Soum Sanogo, Entomology, Plant Pathology, and Weed Science

**Christopher Gomez**, “Examining the Effects of Salt Water on Photosynthetic Efficiency in Four Allium Cultivars”

Major: Horticulture; MARC

Faculty Advisor: Dr. Ivette Guzman, Plant and Environmental Sciences

**Kaitlin Marry**, “More than Coffee: Biofertilizers at the Life Monteverde Coffee Farm”

Major: Environmental Science; MARC

Faculty Advisor: Dr. April Ulery, Plant and Environmental Sciences

### Panel 4. Creative Media and Writing (Senate Chambers)

**Meghan Romero**, reading from *Escape the Death Ward*

Major: English; Honors Capstone

Faculty Advisors: Dr. Tracey Miller-Tomlinson, English; Dr. Tyson Stolte, English

**Jonathan Davis**, “A Duel with Sappho Without Her Handkerchief” (a poem in English and in Spanish)

Major: English, Creative Writing

Faculty Advisor: Dr. Tracey Miller-Tomlinson, English

**Annie Ersinghaus**, *Burning Water* (2022)

Major: Digital Film Making

Faculty Mentor: Professor Ilana Lapid, MFA, Creative Media

### **Panel 5. Physical and Life Sciences (Senate Gallery)**

**Daniel Montes**, “Regeneration response by myogenic stem cells in tissues of electric fish following serial tail amputations”

MARC

Faculty Mentor: Dr. Graciela Unguez, Biology

**Daniela Palacios**, “Mycelium Across All Borders”

Major: Chemical Engineering; AMP

Faculty Advisor: Dr. Adriana Romero Olivares, Biology

## **Session 10-11**

### **Roundtable for Students and Faculty on Undergraduate Research Mentorship (Fountain Room)**

**Dr. Abdessattar Abdelkefi** (*Mechanical and Aerospace Engineering*)

**Dr. Adriana Romero Olivares** (*Biology*)

**Dr. Jennifer Hernandez Gifford** (*Animal and Range Sciences*)

**Dr. Sergio Martinez Monteagudo** (*Family and Consumer Sciences*)

**Dr. Jennifer Randall** (*Plant Molecular Biology*)

### **Panel 6. Computer Science (Doña Ana Room)**

**Angie Hernandez**, “The Rashomon Effect”

Major: Digital Filmmaking and Computer Science; S-STEM

Faculty Advisor: Adan Delval, Computer Science

**Erick Nevarez**, “Computer Science Education Barriers in the US”

Major: Computer Science; S-STEM

Faculty Advisor: Adan Delval, Computer Science

**Horacio Gonzalez**, “Cyber Threats Facing Autonomous and Connected Vehicles”

Major: Cybersecurity; S-STEM

Faculty Advisor: Adan Delval, Computer Science

### **Panel 7. Communication & Design (Senate Chambers)**

**Antonio Garcia**, “Global Citizenship: Humanities through Linguistics”

Major: Languages and Linguistics; Honors Capstone; McNair Scholars Program

Faculty Advisors: Dr. Glenn W. Fetzer, Languages and Linguistics; Dr. Rebecca Campbell, Honors

**Ruth Christensen, Charity Amezcua, Yunnel Acevedo, Jessica Camargo, Emily Fernandez, Pamela Herrera-De Los Santos, Julian Rivera, Ian Sanchez**, “URCAS Logo Design Presentation”

Majors: Art, Art History, Graphic Design

Faculty Advisor: Professor Brita d’Agostino, MFA, Art

**Editor-in-Chief Devynne Hadley, with editors Brooke Yehle, Jessica Barrio, Daniel Aguilar**, “*The Agora*, an interdisciplinary undergraduate journal of research and creativity”

Devynne Hadley, Major: English, Rhetoric and Professional Communication; Honors Capstone

Brooke Yehle, Major: Genetics and Biotechnology; Minor, Biochemistry

Jessica Barrio, Major: English; Minor: Music

Daniel Aguilar, Major: Sociology  
Faculty Advisors: Dr. Tracey Miller-Tomlinson, English; Susan Beck, Library

### **Panel 8. Life Sciences 3 (Senate Gallery)**

**Jacob Martinez**, “Stable isotopes, immunology and condition of resident and migratory *Tadarida brasiliensis*: a comparison”

Major: Fisheries and Wildlife; MARC  
Faculty Advisor: Dr. Teri Orr, Biology

**Kayla Moehn**, “Too Stressed, Can’t Talk: Investigating the Effects of Chronic Stress on Stress Hormone Receptor Expression in the Budgerigar Brain”

Major: Genetics and Biotechnology; Honors Capstone  
Faculty Advisor: Dr. Timothy Wright, Biology

**Mariah Leonard**, “Effects of ketamine on the electrophysiological features of L-DOPA-induced dyskinesia in Parkinsonian rats”

Major: Biology; MARC and Minimizing Health Disparities (UA MHD)  
Faculty Advisors: Dr. Stephen Cowen and Abhilasha Vishwanath, University of Arizona

## **Poster Session & Lunch, 11-1 (Ballrooms)**

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**Welcoming Remarks by Dr. Luis Cifuentes, Vice President for Research, Creativity, and Strategic Initiatives (Corbett Ballroom), 11:15**

**Mohammad Badawy**, “Correlating the Meltdown Properties of Commercial Ice-Cream with Fat Contents”

Majors: Chemical Engineering, Microbiology; AMP  
Faculty Advisor: Dr. Sergio Martínez Monteagudo, Family and Consumer Sciences

**Autumn Bandy**, “Role of ELOVL4 Gene in Disease Development”

Major: Biology  
Faculty Advisor: Dr. Jennifer Curtiss, Biology

**Victor Baquera**, “Measuring the effects of early life stress on adult social networks in the *Melospittacus undulatus*”

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

**Julissa Barrera**, “Making better ice cream through ultrasound”

Major: Chemical Engineering  
Faculty Advisor: Dr. Sergio Martínez Monteagudo, Family and Consumer Sciences

**Paulina Burnside**, “Table Mountain as a Stratigraphic Reference for the Mogollon-Datil Volcanic Field”

Majors: English, Spanish  
Faculty Advisor: Dr. Jeffrey Amato, Geology

**Hiram Camarena**, “Relationship between Pax7+ cells and blastema regeneration in electric fish”

Major: Microbiology; Minor: Chemistry; AMP  
Faculty Advisor: Dr. Graciela Unguez, Biology

**Bethany Chacon, Adrian Gomez, and Edward Rivota**, “ROLE, Latinx Undergrad Research Program in Engineering”

Major: Electrical and Computer Engineering; ROLE



Faculty Advisors: Dr. Cecilia Contreras, Educational Leadership and Administration; Dr. Luis Rodolfo Garcia Carrillo, Electrical and Computer Engineering

**Francisco J. Dena**, "Pollen characteristics between pecan protandrous and protogynous pecan cultivars grown in New Mexico"

Major: Animal Science

Faculty Advisor: Dr. Jennifer Randall, Plant Molecular Biology

**Jacob DeVargas**, "Assessing DNA damage, cell viability and toxicity in melanocytes"

Major: Microbiology; AMP

Faculty Advisor: Dr. Amanda Ashley, Chemistry and Biochemistry

**Jeffrey Dominguez**, "Impact of a lipopolysaccharide endotoxin on growth and viability of ovarian granulosa cells"

Major: Animal Science; AMP

Faculty Advisor: Dr. Jennifer Hernandez Gifford, Animal and Range Sciences

**Abdallah Elaksher**, "How Does the Fear-then-Relief Phenomenon Impact Team Members following Stressful Situations?"

Major: Chemical Engineering; AMP

Supervisor: Nathaniel Roth, Experimental Psychology

**Ruben Nathaniel Escandon**, "Asymmetric Conjugate Additions to Cyclohexadienones: Total Synthesis of Clavilactone A"

Major: Biochemistry; AMP

Faculty Advisor: Dr. Rodolfo Tello-Aburto, Chemistry and Biochemistry

**Elizabeth Gamez**, "Re-Using Tea Leaves: A Biological Control Against Phytophthora Blight"

Major: Plant and Environmental Sciences; ENHANCEMENT

Faculty Advisor: Dr. Ivette Guzman, Plant and Environmental Sciences

**Shane Griffin**, "Moisture Contamination Detection In Onyx Additive Manufacturing Using Acoustic Emission"

Major: Industrial Engineering; AMP

Faculty Advisor: Dr. Ehsan Dehghan-Niri, Civil Engineering

**Michelle Gutierrez**, "The effect of bacterial endotoxin on immune response and serum cortisol in mature ewes during the estrous cycle"

Major: Animal Science; MARC

Faculty Advisor: Dr. Jennifer Hernandez Gifford, Animal and Range Sciences

**Cesar Herrera**, "Direct Shear Measurements of a New Mexico-made Lunar Regolith Simulant"

Major: Civil Engineering; AMP, MARTE

Faculty Advisor: Dr. Douglas Cortes, Civil Engineering

**Joshua Jackson**, "Sustainable Programs for Hotel Linen"

Major: Hotel, Restaurant and Tourism Management; Honors Capstone

Faculty Advisors: Dr. Jean Hertzman, HRTM; Dr. Rebecca Campbell, Honors

**Kenzie Keith**, "Product Purification After Supercritical Fluid Extraction of Coal Fly Ash"

Major: Chemical Engineering; Honors Capstone

Faculty Advisor: Dr. Catherine Brewer, Chemical Engineering

**Aaron Lopez Gonzalez**, "SE measurements of Si/SiO<sub>2</sub>/ALD TaN, Si/SiO<sub>2</sub>, and Si wafers for band gap determination"

Major: Engineering Physics; AMP

Faculty Advisor: Dr. Stefan Zollner, Physics

**Mike Lopez III**, “Using Bisulfite Sequencing to Characterize the Fate of Duplicate Gene Copies”

Major: Biology; MARC

Faculty Advisor: Dr. Donovan Bailey, Biology

**Sam Lucero**, “The application of a two system laser to observe excitation of NAD(P)H and FAD”

Major: Chemical Engineering

Faculty Advisor: Dr. Jessica Houston, Chemical Engineering, with Samantha Valentino

**Evan Ludwig**, “Synthesis of Rhapontigenin and Related Derivatives”

Major: Biochemistry

Faculty Advisors: Dr. Kevin Houston, Chemistry and Biochemistry; Dr. William Maio, Chemistry and Biochemistry

**Jonah Madrid**, “Insights on the impacts of accelerometer location on the dynamics and characteristics of complex structures”

Major: Mechanical Engineering; AMP; CAMP

Faculty Advisor: Dr. Abdessattar Abdelkefi, Mechanical and Aerospace Engineering

**Madison Marcus**, “The impact of water restrictions on pollen viability and pollen tube formation of the pecan cultivar ‘Pawnee’”

Major: Genetics and Biotechnology

Faculty Advisor: Dr. Jessica Houston, Chemical Engineering, with Andra Andazola, Kimberly Cervantes, Anna Harmon, Richard J. Heerema

**Marcos Marmolejo**, “The influence of global warming on melanized fungi”

Major: Microbiology; MARC

Faculty Advisor: Dr. Adriana Romero Olivares, Biology

**Marco Martinez**, “Obtaining dynamical masses for the binary star V343 Nor”

Major: Mathematics; AMP

Faculty Advisor: Dr. Eric Nielsen, Astronomy

**Kari Melander**, “The Relationship between Race, Calcium Consumption, and Osteoporosis Development”

Major: Human Nutrition and Dietetic Sciences

Faculty Advisor: Dr. Shadai Martin, Family and Consumer Sciences

**Isaac Melendrez**, “A New Look at Zinc Transport Within *Vibrio cholerae*”

Major: Chemistry and Biochemistry; MARC

Faculty Advisor: Dr. Erik Yukl, Chemistry and Biochemistry

**Melissa Mejorado**, “Fluorescence Lifetime Imaging Microscopy (FLIM) mechanisms Advantages and Limits”

Major: Chemical Engineering

Faculty Advisor: Dr. Jessica Houston, Chemical Engineering

**Nico Mendoza**, “Investigating Enhanced Bidirectional Movement for the Inflatable Soft Crawling Robot for Overhead Power Line Inspection”

Major: Industrial Engineering; AMP

Faculty Advisor: Dr. Mahdi Haghshenas-Jaryani, Mechanical & Aerospace Engineering

**Matthew Miranda**, “Establishing a baseline immune response in the pallid bat (*Antrozous pallidus*)”

Major: Genetics & Biotechnology; Honors Capstone

Faculty Advisor: Dr. Teri Orr, Biology

**Kayla Moehn**, “Too Stressed, Can’t Talk: Investigating the Effects of Chronic Stress on Stress Hormone Receptor Expression in the Budgerigar Brain”

Major: Genetics and Biotechnology; Honors Capstone

Faculty Advisor: Dr. Timothy Wright, Biology

**Nora Nava**, “Gas Physical Conditions around Fading Active Galactic Nuclei”

Major: Physics; AMP

Faculty Advisor: Dr. Moire Prescott, Astronomy

**Marissa Padilla**, “The Impact of Variations of Urban Microclimate on Transcription of Midgut Immune Genes in Aedes Mosquitoes”

Major: Biology; MARC

Faculty Advisor: Dr. Kathryn Hanley, Biology

**Daniela Palacios**, “Mycelium Across All Borders”

Major: Chemical Engineering; AMP

Faculty Advisor: Dr. Adriana Romero Olivares, Biology

**Elena Pearson**, “Ect2 Controls the Mechanical Properties of the Sea Star Oocyte During Meiosis”

Major: Biology; MARC

Faculty Advisor: Dr. C. Brad Shuster, Biology

**Kennedi Pyper and E. Gloria Sepulveda**, “Examining the Impact of Exogenous Cannabinoids on Cell Proliferation, Migration, and Inflammation”

Majors: Genetics and Biotechnology, Chemical Engineering; AMP

Faculty Mentor: Dr. Amanda Ashley, Chemistry and Biochemistry

**Isabella Rodriguez**, “Connecting the Sun to Life on Earth”

Major: Microbiology; Minors: Chemistry, East Asian Studies; AMP

Faculty Advisor: Dr. Juie Shetye, Astronomy

**Abril Romero**, “Fungal decomposition under global climate change”

Major: Biochemistry; MARC

Faculty Advisor: Dr. Adriana Romero Olivares, Biology

**Karla Ortega Sandoval**, “Metabolic profiling of drug resistant breast cancer cells through flow cytometry”

Major: Chemical Engineering; MARC

Faculty Advisors: Dr. Jessica Houston, Chemical Engineering; Dr. Kevin Houston, Chemistry and Biochemistry, with Samantha Valentino

**Nadia Samaniego**, “Insulin-like growth factor binding protein-4 in breast cancer”

Major: Biochemistry

Faculty Advisor: Dr. Kevin Houston, Chemistry and Biochemistry

**Miguel Salazar**, “Evaluation of the Effectiveness of Pyrethroid-based Paints for the Control of Turkestan Cockroaches Using the Ebeling Box”

Major: Horticulture, ENHANCEMENT

Faculty Advisor: Dr. Alvaro Romero, Entomology, Plant Pathology, and Weed Science

**Emilio Serrano**, “Model Validation of Flight Energy Consumption for a Drone”

Major: Mechanical Engineering; AMP; CAMP

Faculty Advisor: Dr. Liang Sun, Mechanical Engineering

**Emily Stutesman**, “An Exploration of Perceptual Training Methods for Improving Medical Image Perception”

Major: Kinesiology; Discovery Scholars Program

Faculty Advisor: Dr. Michael Hout, Psychology; Dr. Megan Papesch, Psychology, with Rebecca Penn

**Julian A. Vazquez**, “Bio-Inspired Penetration Method in Loose and Dense Sand”

Major: Mechanical Engineering; AMP, MARTE

Faculty Advisor: Dr. Douglas Cortes, Civil Engineering

# Panels, 11-1

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## Panel 9. 11-noon. Arts Across Borders (Senate Chambers)

***Nakeisha Campbell***, “K.I.Cs on Route 66: Kindreds in crisis”

Major: Anthropology; Honors Capstone; McNair Scholars Program

Faculty Advisor: Dr. Mary Alice Scott, Anthropology

***Jordy Espino Lopez***, “First Generation College Students: Testimonios from Latinx English Language Learners”

Majors: Social Work, Spanish; Honors Capstone; McNair Scholars Program

Faculty Advisor: Dr. Judith Flores Carmona, Borderlands and Ethnic Studies

***Darcy Harman***, “Directing EMBER Theater Company in Terry Pratchett's *Wyrd Sisters*, adapted by Stephen Briggs”

Faculty Advisors: Dr. Tracey Miller-Tomlinson, English; Professor Nichole Hamilton, MFA, Theatre Arts;

Professor Larissa Lury, MFA, Theatre Arts

## Panel 10. Noon-1. Shakespeare (Senate Chambers)

***Jonathan Davis***, “*Othello*: Shakespeare Kills Three Birds with One Stone”

Major: English, Creative Writing

Faculty Advisor: Dr. Tracey Miller-Tomlinson, English

***Savannah Hair***, “Interpretation of Female Characters in Shakespeare’s Plays”

Major: English

Faculty Advisor: Dr. Tracey Miller-Tomlinson, English

***Meghan Romero***, “Toiling Trouble of *Macbeth's* Witches on Modern Witchcraft”

Major: English

Faculty Advisor: Dr. Tracey Miller-Tomlinson

# Walking Tour of the Student Juried Art Show in Devasthali Hall, 12-1

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Tour leaves from Registration Desk, returns before 1pm. Curator of Education, Bonnie Jean Knighton.

# Keynote and Awards in Doña Ana Room, 1-2

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Dr. Nancy McMillan, Geology and Discovery Scholars, “In Praise of One-Offs”

Awards at 1:45

## Related Events

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PACR Reception on Cancer Research and Health Disparities, Fountain Room, 2-3

Reception for Opening of the Honors Art Collective, Conroy Honors Center, 5:30

Opening of Terry Pratchett's *Wyrd Sisters*, dir. Darcy Harman (EMBER Theatre Company), Isabella M. Crouch Reader's Theater, 7:30 (\$10).

*Adapted by Stephen Briggs. Additional performances Sat. at 7:30, Sun. at 6.*

## Abstracts

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**Emma Alvarez de la Rosa**, "Lullabies in the border: lullaby singing and parenthood in the maquiladora society of Cd Juárez"

Major: Music; Honors Capstone

Faculty Advisory: Dr. Lois Stanford, Anthropology

Lullabies play important roles in children's development, mother's well-being, and healthy parent-child relationships. These songs also comprise musical repositories of cultural values and traditions. This presentation examines the presence of lullabies in the Valle de Juárez and Ciudad Juárez region grounded in ethnographic and ethnomusicological analysis to understand their importance in the border region's history and culture. The conclusions discuss the impacts of maquiladora work on maintaining the lullaby tradition. Fieldwork was completed during the summer of 2022 at El Museo Regional del Valle de Juárez in San Agustín. Musical transcription and analysis of both lyrics and melody were completed, as well as open-ended interviews with participants. The lullabies gathered were analyzed and compared to characteristics of "generic Western lullabies," showing significant similarities. Results detail a decline in lullaby singing, reflecting the historical increase in maquiladora work, the main source of income for most families of the region.

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**Mohammad Badawy**, "Correlating the Meltdown Properties of Commercial Ice-Cream with Fat Contents"

Majors: Chemical Engineering, Microbiology; AMP

Faculty Advisor: Dr. Sergio Martínez Monteagudo, Family and Consumer Sciences

High-protein ice cream (HP-IC) is an ice cream product containing high concentrations of protein and is popular among young consumers. However, there are massive industrial challenges to creating HP-IC that maintains high quality in structure and flavor due to the high concentration of protein (up to 10x the concentration of protein in conventional ice cream). Understanding the structural properties of Ice-Cream will be a vital step in formulating a high-quality HP-IC product that is satisfactory to consumers. We have identified the Meltdown curve as a key indicator of Ice Cream quality and physical properties. Correlating the meltdown behavior of Ice Cream samples with the composition of the Ice Cream will allow further understanding of Ice Cream structure and enable the development of dynamic models capable of predicting this behavior. We have successfully collected several meltdown curve datasets from various commercial samples and are working on identifying the correlation to the Ice Cream's physical properties.

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**Autumn Bandy**, "Role of ELOVL4 Gene in Disease Development"

Major: Biology

Faculty Advisor: Dr. Jennifer Curtiss, Biology

ELOVL4 encodes an enzyme that elongates fatty acids to create very long chain fatty acids, which are crucial for membrane fluidity and cell signaling. In insects, very long chain fatty acids are precursors for pheromones and play a crucial role in cuticle development. Mutations in the human ELOVL4 gene have been linked to development of several disorders, including Stargardt Disease type 3, spinocerebellar ataxia with and without skin conditions, intellectual disability, and even death. Using *Drosophila melanogaster* as a model organism, we aim to investigate how mutations in the ELOVL4 gene lead to disease development. Knockdowns of the ELOVL4 gene in *Drosophila* show an unusual phenotype: absence of macrochaetae. Macrochaetae are sensory organs comprising four cells: an elongated bristle shaft cell, a socket cell, a neuron and a glial cell. We will present this phenotype as well as data from experiments designed to determine the mechanisms behind it.

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**Katie Banga**, “Examining the Accessible Chromatin Regions Between Duplicated Gene Copies in the Tetraploid *Leucaena trichandra*”

Major: Genetics and Biotechnology

Faculty Advisor: Dr. Donovan Bailey, Biology

Chromosomal and genic duplications are key sources of genetic novelty in evolution. When duplication events occur, two copies of the genes are usually not necessary, which often results in one being lost through mutational processes. However, duplicate copies can also be retained, going on to gain new functions or subfunctions between the daughter genes. The plant genus *Leucaena*, which contains 19 species with tetraploid genomes, provides exceptional opportunities to investigate the evolutionary changes brought forth by duplication events. Here we use the genome of the tetraploid *L. trichandra* and an Assay for Transposase-Accessible Chromatin (ATAC-seq) to determine the changes to the accessible chromatin regions between different copies of the chromosomes. Determining the regions of accessibility will provide key information regarding how chromatin accessibility varies among the different copies and the relative fate of duplicated gene copies.

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**Victor Baquera**, “Measuring the effects of early life stress on adult social networks in the *Melopsittacus undulatus*”

Major: Biology; AMP

Faculty Advisor: Dr. Timothy Wright, Biology

Chronic stress is thought to have far reaching negative effects on health and wellbeing. The purpose of this study is to observe the effects of stress experienced in early life of the budgerigars on their interconnections in social networks as adults. The objective is to see if early life stress weakens these interactions as adults and to see if early life stress compounds or counteracts the negative effects into adulthood as well as developing an automated tracking program. We will examine the interactions between early-life and adult chronic stress using a fully crossed experiment in which groups of budgerigars will experience either high or baseline stress as juveniles and again as adults. Measuring the distance to an individual's next nearest neighbor will quantify the strength of ties to the other individuals. Measurements are taken using video recording and a QR code tracking system to track codes worn by the budgerigars.

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**Julissa Barrera**, “Making better ice cream through ultrasound”

Major: Chemical Engineering

Faculty Advisor: Dr. Sergio Martínez Monteagudo, Family and Consumer Sciences

The objective of this research is to evaluate the feasibility of using ultrasound to reduce the concentration of stabilizers commonly used in ice cream formulations. The central hypothesis of this research project is that by appropriate choice of temperature and homogenization pressure, it may be possible to regulate fat destabilization (partial coalescence and agglomeration), utilizing protein rather than relying on chemical surfactants. 1) Evaluate the effect of pressure on particle size for different formulations. 2) Establish

relationships between concentration of stabilizers and homogenization pressure. 3) Evaluate the protein adsorbed as function of concentration of stabilizer, pressure, and temperature.

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**Kaihre Brightwater**, “Effect of Endophytic Bacteria from London Rocket on Growth of *Phytophthora capsici* and Germination and Mortality of Chile Pepper”

Major: Biology; MARC

Faculty Advisor: Dr. Soum Sanogo, Entomology, Plant Pathology, and Weed Science

London rocket (*Sisymbrium irio*) is a ubiquitous weed that displays resiliency to stresses of the American southwest. It is hypothesized that endophytic bacteria from London rocket may be involved in the resiliency of the weed and could be utilized in crops as a stimulant in seed germination, and in protection against plant pathogens. Endophytic bacteria were isolated from London rocket found in agricultural and non-agricultural environments. In diffusion well, volatile, and germination assays, it was found that endophytic bacteria from London rocket displayed antagonistic activity against *Phytophthora capsici*, the causal agent of Phytophthora blight in chile pepper and other vegetable crops, and stimulated chile seed germination in chile pepper. Combined results of these assays indicate that endophytic bacteria from London rocket can aid in reducing infection of chile pepper by *P. capsici* and could be used as a biological treatment in field studies.

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**Nakeisha Campbell**, “K.I.Cs on Route 66: Kindreds in crisis”

Major: Anthropology; Honors Capstone; McNair Scholars Program

Faculty Advisor: Dr. Mary Alice Scott, Anthropology

This work of ethnographic fiction disrupts the dominant narratives about people who are underserved and marginalized through a complex examination of the daily lives and thoughts of several unhoused individuals. It creates new narratives by piercing through the lives of those who are most vulnerable and illuminates us on the intersectionality of individuals who suffer from mental illness while being unhoused. Here, I use an ethnographic fiction to explore common mental health themes amongst persons who struggle to navigate life through the intersectionality of race, gender, social status, cultural variation, and substance use. These issues are important due to the rise of housing insecurity and the substance use epidemic which has risen by 30% from 2019 to 2020. This explores a new perspective from the traditional way of looking at mental health and substance use disorder. The anthropological approach to analyzing these issues allows us to glimpse deeper into the lives of those who are in truth misunderstood.

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**Ruth Christensen, Charity Amezcua, Yunnel Acevedo, Jessica Camargo, Emily Fernandez, Pamela Herrera-De Los Santos, Julian Rivera, Ian Sanchez**, “URCAS Logo Design Presentation”

Majors: Art, Art History, Graphic Design

Faculty Advisor: Professor Brita d’Agostino, MFA, Art

Each student from ARTS 555 Advanced Graphic Design was asked to come up with a unique design for the 2023 URCAS logo. This presentation will cover each of the designs that were submitted, with each designer talking about their concept and how they went about this project. There are eight presenters for this presentation in total, each with a completely unique and individualized logo and concept.

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**Paulina Burnside**, “Table Mountain as a Stratigraphic Reference for the Mogollon-Datil Volcanic Field”

Majors: English, Spanish

Faculty Advisor: Dr. Jeffrey Amato, Geology

As an undergraduate student at New Mexico State University, I am undertaking the project of correlating the stratigraphy of Table Mountain at City of Rocks State Park in southwestern New Mexico with calderas and outflow sheets in the Mogollon-Datil volcanic field. Table Mountain has good exposures of a stratigraphic section of 4-5 outflow sheets, only one of which has been dated, and studying these will

further our understanding of the volcanic activity that has occurred since the eruption of the Kneeling Nun Tuff at 35.3 Ma. Through geochronology and geochemistry, I will be able to match the tuffs of Table Mountain with specific calderas as well as contribute to filling in the region's geological timeline. This research will help understand the history of the Mogollon-Datil volcanic field and also provide information to visitors to the state park on the history of the area.

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**Hiram Camarena**, "Relationship between Pax7+ cells and blastema regeneration in electric fish"

Major: Microbiology; Minor: Chemistry; AMP

Faculty Advisor: Dr. Graciela Unguez, Biology

The study investigates the effect of subsequent injury on the number of Pax7+ myogenic stem cells (MSCs) in developing muscle and electric organ (EO) cells found within a blastema. To increase our understanding of stem cell-based regeneration in vertebrates we use the electric fish species *Brachyhyppopomus pinnicaudatus*. We hypothesize the number of Pax7+ cells will decrease after serial tail amputations. Tissue was obtained and labeled using immunohistochemical techniques, then observed through fluorescent microscopy (N = 3). Future objectives are to count the MSCs in the muscle fibers and EO cells in the blastema; increase the sample size; and determine if proliferation is affected by subsequent injury.

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**Bethany Chacon, Adrian Gomez, and Edward Rivota**, "ROLE, Latinx Undergrad Research Program in Engineering"

Major: Electrical and Computer Engineering; ROLE

Faculty Advisors: Dr. Cecilia Contreras, Educational Leadership and Administration; Dr. Luis Rodolfo Garcia Carrillo, Electrical and Computer Engineering

Research-Oriented Learning Experience is an immersive research program for undergraduate Latin students in Engineering. This program provides learning opportunities that challenge students to develop and cultivate their technical, leadership, and outreach skills. ROLE participants have the unique opportunity to develop technical skills through research and faculty-led mentorship, develop interpersonal skills through regular peer and near-peer interaction; cultivate academic and professional skills by attending monthly workshops; and give back to the community through outreach events. The 2022-2023 cohort is composed of eight undergraduate students majoring in Engineering. Through faculty and near-peer mentorship, the ROLE participants learn about coding and programming through the use of drones and unmanned aircraft systems. ROLE works to support resilience, critical thinking, and cultivating a research identity. Utilizing the research opportunities through ROLE in addition to rigorous coursework, the cohort looks forward to our futures in academia and the Engineering workforce.

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**Jonathan Davis**, "Othello: Shakespeare Kills Three Birds with One Stone"

Major: English, Creative Writing

Faculty Advisor: Dr. Tracey Miller-Tomlinson, English

On the influence of Spain in Shakespeare's *Othello*. Clearly, the Bard has Spain on his mind...because sunny and stereotypically passionate Spain is interesting to his audience in cold, calculating England. To those of us who know our European history, Othello cannot have been "The Moor of Venice", a Catholic city-state would not have allowed that. Instead, Othello is a former Spanish Muslim-turned-Catholic morisco. But for the story to work, clearly Othello needs to be a Moor. In *Le Cid* (1636) by Corneille, the playwright will play on some of the same stereotypes, but with lots of twists; Corneille clearly knew his Shakespeare.

**Jonathan Davis**, "A Duel with Sappho Without Her Handkerchief" (a poem in English and then in Spanish)

Major: English, Creative Writing

Faculty Advisor: Dr. Tracey Miller-Tomlinson, English



I originally wrote the poem in Spanish, to play with the idea that neither Lope de Vega nor Shakespeare ever wrote a play about dueling women. The Spanish language, like all Romance languages, is more heavily gendered than English, but it is actually easy to obscure gender in the context of this story to present plausible, unfamiliar scenarios related to gender (I am hoping this to be the case). Also in Spanish, certain key words in the poem can be used with to defamiliarize a story surrounding a duel. E.g., Safo is the name of the famous Classical Greek female poet (Sappho of Lesbos), but un safo (common noun) means “a handkerchief.” And *una persona en un duelo* means “a person at a duel,” *una persona en duelo* means “a person in mourning.” And yes, at least one character, perhaps more, were killed in the creation of this poem. An audience discussion of poetics could follow the presentation.

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**Francisco J. Dena**, “Pollen characteristics between pecan protandrous and protogynous pecan cultivars grown in New Mexico”

Major: Animal Science

Faculty Advisor: Dr. Jennifer Randall, Plant Molecular Biology

Alternate bearing is one of the most important horticultural constraints for profitable pecan (*Carya illinoensis*) production; due to the annual cycling between heavy and light crop load of pecan trees. Alternate bearing is caused by fluctuations in the number of female flowers produced in tree canopies which impacts pecan nut production. As pecan trees are protandrous and protogynous, timing of pollen development also differs. In this study, the characteristics of pollen tube growth, timing of in vitro germination, pollen tube length, and viability were compared between protandrous and protogynous pecan cultivar trees grown in NM. Pollen tube sizes in our in-vitro studies indicated an average length of 673.09  $\mu\text{m}$  for ‘Lakota’ (protogynous) and an average pollen tube length of 280.08  $\mu\text{m}$  for ‘Pawnee’ (protandrous). Further gene expression analysis comparing pollen tube characteristics between pecan protandrous and protogynous cultivars will provide insights into underlying genetic mechanisms.

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**Phoenix Dendera**, “Relationships between bee sociality and genetic structure”

Major: Biology

Faculty Advisors: Dr. Brook Milligan, Biology; Scarlet Sellers, Biology

Landscape genetics measures genetic diversity in populations in response to ecological characteristics. Genetic structure within populations can be determined using genetic measures including FST, which describes genetic differentiation in subpopulations in relation to the overall population. Bees (*Hymenoptera: Apoidea*) are useful models for studying landscape genetics because of the wide range of behavioral diversity, including variation in social organization, diet, nesting location, and foraging distances. While eusocial bees are the most commonly studied, the majority of species exhibit other degrees of sociality that can influence gene movement among populations. We conducted a meta-analysis of FST estimates to determine whether the sociality of bee species affects their ability to disperse their genes across landscapes. We hypothesize that solitary bees exhibit more structure than eusocial species because of shorter flight range. This analysis is important for understanding the influence of ecological traits on population structure and can have implications across many species.

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**Jacob DeVargas**, “Assessing DNA damage, cell viability and toxicity in melanocytes”

Major: Microbiology; AMP

Faculty Advisor: Dr. Amanda Ashley, Chemistry and Biochemistry

Melanoma is a rare, highly aggressive form of skin cancer with few treatment options for advanced stage disease. One of the major causes of melanoma is UV radiation induced DNA damage, which melanin prevents. Our overall goal is to diminish melanin accumulation to sensitize melanoma cells to DNA damage. We established growth kinetics for MNT1 melanoma cells. We successfully visualized cellular DNA damage using  $\gamma\text{H2AX}$  following DNA damage. We monitored cellular growth following exposure to different DNA

damaging agents and established the LD50 for each drug. Phytoene is a naturally derived carotenoid which diminishes melanin. We will treat melanocytes with phytoene, followed by varying DNA damaging drugs, and assess any differential drug response as well as DNA damage levels. We anticipate more damage will be observed in the cells when treated with phytoene. In the future, phytoene may be used in combination with DNA-damaging chemotherapy to more effectively treat melanoma.

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**Jeffrey Dominguez**, “Impact of a lipopolysaccharide endotoxin on growth and viability of ovarian granulosa cells”

Major: Animal Science; AMP

Faculty Advisor: Dr. Jennifer Hernandez Gifford, Animal and Range Sciences

The bacterial, endotoxin lipopolysaccharide (LPS), negatively impacts reproductive parameters by leading to ovarian dysfunction. The aim of this study is to evaluate the effects of increasing LPS doses on granulosa cell proliferation and viability. A human granulosa cell line (KGN) was plated in 96-well tissue culture plates and treated with 0, 0.01, 0.1, 1, or 10 µg/mL LPS in the presence or absence of follicle-stimulating hormone (FSH). Cells were cultured for 48 h in an IncuCyte incubator, with images being taken every 6 hours to evaluate cell growth parameters. Data collected for each treatment group was normalized to control (0 µg/mL LPS) at 6 h. Compared to the control, cell confluency decreased at 1 and 10 µg/mL LPS. However, no differences were detected among FSH-stimulated groups regardless of LPS dose. Results indicate that FSH has the ability to protect granulosa cells against the detrimental effects of LPS.

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**Abdallah Elaksher**, “How Does the Fear-then-Relief Phenomenon Impact Team Members following Stressful Situations?”

Major: Chemical Engineering; AMP

Supervisor: Nathaniel Roth, Experimental Psychology

The objective of this study is to learn how team members react after being relieved of a high-stress situation that occurred to them as a group vs individually. This project has significant benefits in informing the ways teams work together in STEM. The study will be conducted double-blind, with three variables being tested: individual vs group, fear stimuli vs no exposure, and sudden conformity vs long-term conformity. These variables will lead to eight testing groups with a combined total of 400 subjects. Currently, we have set up the study space, procedure, and proposal. Our expected findings are that the groups and individuals exposed to fear will conform to sudden tasks, but when mindfulness is introduced via a long-term task, the subjects will no longer conform.

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**Annie Ersinghaus**, *Burning Water* (2022)

Major: Digital Film Making

Faculty Mentor: Professor Ilana Lapid, MFA, Creative Media

A short documentary about water usage in the southwest.

For an environmental filmmaking class with Ilana Lapid at NMSU. Film can be viewed at

<https://youtu.be/eefK09DGg4E> .

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**Jordy Espino Lopez**, “First Generation College Students: Testimonios from Latinx English Language Learners”

Majors: Social Work, Spanish; Honors Capstone; McNair Scholars Program

Faculty Advisor: Dr. Judith Flores Carmona, Borderlands and Ethnic Studies

Having intersectionalities in higher education is experienced in unique ways, during this research project, pláticas are used as a methodology, and testimonios were gathered from five students who all happen to be first generation college students, Spanish speaking, honors students and Hispanic identifying find a space to coincide and share their college experience, learning the importance of embracing their language,

culture, and heritage, wanting to help other students feel support, with the goal of being one of the first ones in the family to graduate from college.

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**Ruben Nathaniel Escandon, “Asymmetric Conjugate Additions to Cyclohexadienones: Total Synthesis of Clavilactone A”**

Major: Biochemistry; AMP

Faculty Advisor: Dr. Rodolfo Tello-Aburto, Chemistry and Biochemistry

This research aims to develop a more efficient method for synthesizing Clavilactone A, a bioactive natural compound with promising antibacterial, antifungal, and anticancer properties. The current synthesis to produce Clavilactone A by Ogura and Takao is long and inefficient, and we hypothesize that we can achieve better results with a shorter sequence of steps and higher overall yield. We plan to use organic synthesis, particularly catalyst-controlled additions of butenolides to cyclohexadienones, to construct carbon-carbon bonds with high stereocontrol. Implements of wet-lab techniques such as reflux, cryogenic conditions, and inert atmosphere to prepare intermediates and products. Which will be characterized using methods like Nuclear Magnetic Resonance and Infrared Spectroscopy. Once key catalytic reactions are successfully demonstrated, we will apply them to produce Clavilactone A, enabling the further study of its biological properties and potential as an anticancer treatment.

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**Elizabeth Gamez, “Re-Using Tea Leaves: A Biological Control Against Phytophthora Blight”**

Major: Plant and Environmental Sciences; ENHANCEMENT

Faculty Advisor: Dr. Ivette Guzman, Plant and Environmental Sciences

Herbal teas are used traditionally around the world as medicine to enhance our health. Phenolic compounds are the largest group of plant antioxidants with antibacterial and antifungal properties. The objective of this experiment was to measure the phenolic compounds in tea waste and to test their inhibition of *Phytophthora capsici*, a soil-borne pathogen. The hypothesis was that used tea leaves with high phenolic amounts will inhibit *P. capsici* growth in culture. Phenolics were extracted with acidified methanol and with water. They were measured using the Folin-Ciocalteu assay in chamomile, ginger, green tea, and an herbal blend tea waste. *P. capsici* growth assays were performed on acidified agar plates. Results showed no inhibition. Future work includes testing to see if the tea waste can be used as a foliar spray to enhance plant immune response to *P. capsici* infections. The goal is to find a sustainable pesticide to combat pathogens.

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**Antonio Garcia, “Global Citizenship: Humanities through Linguistics”**

Major: Languages and Linguistics; Honors Capstone; McNair Scholars Program

Faculty Advisors: Dr. Glenn W. Fetzer, Languages and Linguistics; Dr. Rebecca Campbell

This presentation will examine the newly created course providing both credit in foreign language study and in the humanities. State criteria required by the New Mexico General Education Curriculum will have been incorporated in the preexisting course of fourth semester French offered at New Mexico State University. Literary works in French will have been examined by the students and explored through higher thinking, personal and social responsibility. As an intern under the department head, weekly journals will also have been completed to record the growth and progression of an undergraduate getting acquainted with both linguistic and pedagogical methodologies. This internship and project will culminate with the dissemination of the lessons learned of incorporating elements in the humanities in a fourth semester foreign language course. The results will prove that such courses are truly beneficial to not only students, but growth of the languages and linguistics department as well.

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**Christopher Gomez**, “Examining the Effects of Salt Water on Photosynthetic Efficiency in Four Allium Cultivars”

Major: Horticulture; MARC

Faculty Advisor: Dr. Ivette Guzman, Plant and Environmental Sciences

As extreme drought conditions continue, farmers in New Mexico may have to become reliant on brackish-affected aquifers to water crops. The goal of this study was to find an onion (*Allium* species) cultivar that is adapted to salt irrigation conditions. The hypothesis was that salt water decreases photosynthesis in onion plants. Four onion varieties (two bulb and two bunching) were grown from seed in a controlled environment. Utilizing an LI-6800 leaf gas analyzer, carbon assimilation rate ( $\mu\text{mol m}^{-2} \text{s}^{-1}$ ) in each cultivar was measured after irrigating with two treatments (high salt and low salt water). Results showed that Ailsa Craig bulbing onions had the highest average carbon assimilation rate at the end of the experiment with a value of  $10.76 \mu\text{mol m}^{-2} \text{s}^{-1}$  under salt water irrigation conditions. Knowing which cultivar performs the best under these conditions will aid to maximize food production using water high in salts.

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**Horacio Gonzalez**, “Cyber Threats Facing Autonomous and Connected Vehicles”

Major: Cybersecurity; S-STEM

Faculty Advisor: Adan Delval, Computer Science

The transportation system is rapidly evolving with new automated and connected vehicle technologies. The increasing levels of automation and connectivity on vehicles being developed and sold nowadays have increased the size of cyberattacks and the risk of exploiting security vulnerabilities by malicious actors. This poster gives a deeper understanding of potential cyberattacks on automated and connected vehicles and ways to prevent them, but it also shows some of the security vulnerabilities to which these vehicles are exposed. Detection of potential cyber threats and mitigation strategies to minimize future cyber security risks in the connected and autonomous vehicle sector should be our priority facing these emerging technologies that are becoming more popular.

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**Shane Griffin**, “Moisture Contamination Detection In Onyx Additive Manufacturing Using Acoustic Emission”

Major: Industrial Engineering; AMP

Faculty Advisor: Dr. Ehsan Dehghan-Niri, Civil Engineering

Additive manufacturing (AM) technology, also known as three-dimensional (3D) printing, has been widely used in commercial manufacturing, military, and private applications since the 1980’s. Some of these applications require the AM technology to be used in environments with non-ideal settings. Quality control of the AM parts manufactured from environmentally sensitive materials in these non-ideal settings is important in ensuring the structural integrity of the part is not hampered by the environment. This work focused on detecting moisture contamination during 3D printing Onyx. A controlled experimental procedure was designed to expose the Onyx filament to water. An acoustic emission sensor was installed on the base plate beneath the part to record acoustic emissions. Finally, a post process CT scan was done to determine the internal characteristics of the part. Results showed that acoustic emissions can be used as a strong method for real-time detecting moisture contamination in Onyx additive manufacturing.

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**Michelle Gutierrez**, “The effect of bacterial endotoxin on immune response and serum cortisol in mature ewes during the estrous cycle”

Major: Animal Science; MARC

Faculty Advisor: Dr. Jennifer Hernandez Gifford, Animal and Range Sciences

The bacterial endotoxin, lipopolysaccharide (LPS) elicits an immune response capable of negatively impacting female reproduction. The aim of this study is to investigate the impact of LPS on serum cortisol and body temperature in ewes ( $n = 36$ ) during the estrous cycle. Ewes were synchronized using controlled internal drug release (CIDR) followed by prostaglandin injections. After synchronization, ewes were

stratified by body weight (BW) into control, low LPS (1.5 mg/kg BW), or high LPS (3 mg/kg BW) groups. Treatment was administered on days 5, 10, and 15 of the estrous cycle. Blood samples and body temperature were collected at regular intervals on treatment days to measure the immune response to the increasing doses of LPS. We hypothesize that LPS treatment will result in an increased immune response leading to elevated cortisol concentrations which may have deleterious consequences on female reproduction.

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**Devynne Hadley** and members of the editorial board, “*The Agora*, an interdisciplinary undergraduate journal of research and creativity”

Major: English, Rhetoric and Professional Communication; Honors Capstone  
Faculty Advisors: Dr. Tracey Miller-Tomlinson, English; Susan Beck, Library

*The Agora* is a new interdisciplinary undergraduate journal of research and creativity from the Honors College at New Mexico State University. The journal strives to provide a space for undergraduate students to share their research papers, creative works, and any other projects through an open-access and peer-review process. The editorial team behind *The Agora* consists of undergraduate and graduate students, all of whom are contributing to the creation of our debut edition. With *The Agora* going live soon, our URCAS presentation will not only give an overview of the submissions in our first edition but will also detail the highlights from our journey of building this journal from the ground up. We will share our overall mission with *The Agora* and how we achieved it.

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**Savannah Hair**, “Interpretation of Female Characters in Shakespeare’s Plays”

Major: English  
Faculty Advisor: Dr. Tracey Miller-Tomlinson, English

This paper will examine the significance of the silence of female characters on the Shakespearean stage. Specifically, I will discuss how comparing the silence of the Roman matron Octavia to the outspokenness of Egyptian queen Cleopatra in *Antony and Cleopatra* can help us understand expectations surrounding female public behavior in the early modern period. Shakespeare creates realms where complexities of the ambiguity regarding silence or speaking often change meaning as women gain or naturally have political power. Cleopatra and Octavia, though fundamentally different regarding positions of political power, still undergo suppression from male figures in society. In closing, I will suggest how analysis can help answer a question in Shakespeare studies: how to interpret and perform the sudden silences of female characters at the end of plays such as *Measure for Measure*.

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**Darcy Harman**, “Directing EMBER Theater Company in Terry Pratchett’s *Wyrd Sisters*, adapted by Stephen Briggs”

Faculty Advisors: Dr. Tracey Miller-Tomlinson, English; Nichole Hamilton, MFA, Theatre Arts; Larissa Lury, MFA, Theatre Arts

Student Performers: Luis Castro, Austin Reeve, Eliza Phillips, Elia Vasquez, Vance Cook, Liam Mitchell, Shelby Gillette, Jonah Maze, Vivi Montoya, Alexa Lares, and Omar Moreno

Taking elements from *Macbeth* and *Hamlet* and several other Shakespeare plays, Terry Pratchett’s *Wyrd Sisters* uses comedy to explore the nature of rhetoric and rumor and the power of words in people’s perception of the world around them. The cast and crew delve into the historical context of Shakespeare’s original works and Pratchett’s reshaping of them, while employing stage movement, vocal production, and character building techniques to build a cohesive whole performance. Directed by Darcy Harman, with students Luis Castro, Austin Reeve, Eliza Phillips, Elia Vasquez, Vance Cook, Liam Mitchell, Shelby Gillette, Jonah Maze, Vivi Montoya, Alexa Lares, and Omar Moreno, and community members Mario Nunez, Karen Buerdsell, Susie Ouder Kirk, Sally Locke Scholl, Wes Smith, and Gus Sanchez. The play will be presented in the Isabelle M. Crouch Reader’s Theatre on the weekend of April 14<sup>th</sup>-16<sup>th</sup>. Tickets \$10. *Playtimes: Friday & Saturday, 7:30pm; Sunday, 6pm.*

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**Cesar Herrera**, “Direct Shear Measurements of a New Mexico-made Lunar Regolith Simulant”

Major: Civil Engineering; AMP, MARTE

Faculty Advisor: Dr. Douglas Cortes, Civil Engineering

MUREP Advancing Regolith-Related Technologies and Education (MARTE) is a collaborative initiative created by a multidisciplinary group of faculties at New Mexico State University and San Diego State University. NASA’s Apollo program brought back Lunar rock and regolith samples used to develop Lunar regolith simulants. Existing and new commercial ventures will likely raise the demand for Lunar regolith simulants far beyond current production capabilities. MARTE aims to develop the research support capabilities to contribute to the Artemis program and is working to establish a reliable, affordable, adaptable, and scalable supply chain of regolith simulants by partnering with local and national industrial aggregate producers. This study explores the large-strain mechanical response of a New Mexico-made Lunar regolith simulant by conducting direct shear tests at incremental normal stresses to determine the simulant's shear strength. Understanding these properties is essential in the development of materials that can capture the behavior of Lunar regolith in-situ.

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**Angie Hernandez**, “The Rashomon Effect”

Major: Digital Filmmaking and Computer Science; S-STEM

Faculty Advisor: Adan Delval, Computer Science

The Rashomon effect is defined as the term used to describe how a single event can be described in a variety of ways due to the unreliability of multiple witnesses. The Rashomon effect is a technique that has been used in cinema and storytelling throughout the years. The technique of having alternate versions of a story or even alternate realities is well-known in the filmmaking and screenplay-writing community. While touching base and explaining some of the psychological aspects implemented by this effect, such as changes in memory. This research will introduce the implementation of Augmented Reality (AR) technology in order to represent the Rashomon effect through an AR simulation.

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**Joshua Jackson**, “Sustainable Programs for Hotel Linen”

Major: Hotel, Restaurant and Tourism Management; Honors Capstone

Faculty Advisors: Dr. Jean Hertzman, HRTM; Dr. Rebecca Campbell, Honors

The project's primary goal is to design a program that other hotels can replicate to provide a sustainable system for hotels to dispose of their old linen that benefits both the community and the hotel. The secondary goals include: decreasing landfill waste, increasing hotel and community relations, and providing marketing opportunities. Reducing linen waste is essential for creating a sustainable operation while increasing resources for local non-profit organizations, lowering hotel costs, and opening a door for additional marketing opportunities. Developing community partnerships allows the hotel industry to assist others in need. Creating a step-by-step guide will allow this program to grow within hotels, communities, and small management companies. The ultimate goal is for this project to be adopted by major brands such as Marriott, Hilton, and IHG hotels, making the hospitality industry more sustainable.

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**Kenzie Keith**, “Product Purification After Supercritical Fluid Extraction of Coal Fly Ash”

Major: Chemical Engineering; Honors Capstone

Faculty Advisor: Dr. Catherine Brewer, Chemical Engineering

There are 17 rare earth elements (REE), 15 metals in the Lanthanide series plus scandium and yttrium, that have unique properties that cannot be found in other elements. Coal fly ash has a varying concentration of REEs and a growing demand for REEs. Discovering more efficient and environmentally friendly ways to extract these REEs is important. The objective of this design project is to optimize a purification process that allows the production of REE nitrates from REE-enriched extract from coal fly ash. Precipitation is the

method being designed to separate wanted and unwanted solids from the extract solution. The design aspect consists of identifying precipitation agents that will best work to extract the target REE from the rest of the materials, then how to form nitrate salts from the final nitrate solutions. Nitrate salts are the desirable final product due to its solubility.

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**Mariah Leonard**, “Effects of ketamine on the electrophysiological features of L-DOPA-induced dyskinesia in Parkinsonian rats”

Major: Biology; MARC, Minimizing Health Disparities (UA MHD)

Faculty Advisors: Dr. Stephen Cowen and Abhilasha Vishwanath, University of Arizona

Parkinson’s disease is a neurodegenerative disorder that reduces dopamine production by mediating dopamine cell loss. Levodopa (L-DOPA) is a drug commonly used to treat Parkinson’s Disease; This treatment can lead to L-DOPA-induced dyskinesia (LID) which are uncontrollable and involuntary movements. LID has been found to be present with 80 Hz oscillations in previous studies. Ketamine is used to treat many neurological disorders and has been found to reduce LID. The objective of this study is to explore how local field potential and single unit activity is altered when ketamine is injected into Parkinsonian or naive rats. We hypothesized ketamine causes disruptions of 80 Hz Oscillation which are present during LID. Neural recordings were collected from Parkinsonian rats and naïve rats. It was found in preliminary data that ketamine disrupts 80 Hz oscillations and replaces them with a slower 50Hz oscillation. The analysis of individual cell activity patterns is ongoing.

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**Mike Lopez III**, “Using Bisulfite Sequencing to Characterize the Fate of Duplicate Gene Copies”

Major: Biology; MARC

Faculty Advisor: Dr. Donovan Bailey, Biology

We are focused on the methylation patterns in the tetraploid *Leucaena trichandra* genome as an example of what can happen to genic methylation following genome duplication. These patterns are identified by a methyl group attached to the phosphate group of a nucleotide in the genome; methylation (presence of a methyl group on a nucleotide) is commonly found on cytosines. The goal of our project is to use bisulfite sequencing, a type of gene library that accounts for methylation, to detect the methyl cytosine patterns in the *Leucaena trichandra* genome to identify gene copies that are likely to be available (unmethylated) or unavailable (methylated) for expression and function. The results of our experiment is a graph that shows three different patterns of methylation (mC, mCH, mCHH) across our genome. The future direction of my project is to compare genic regions between chromosomes and the differences within those regions.

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**Aaron Lopez Gonzalez**, “SE measurements of Si/SiO<sub>2</sub>/ALD TaN, Si/SiO<sub>2</sub>, and Si wafers for band gap determination”

Major: Engineering Physics; AMP

Faculty Advisor: Dr. Stefan Zollner, Physics

The purpose of this research is to contribute to a project started by NY CREATES to measure the Standard Error of a variety of wafers with bases of Si, SiO<sub>2</sub>, and ALD TaN to determine their band gap. Ellipsometry techniques in the ultraviolet and infrared ranges are used to measure the samples. Another technique that contributes to this research is the sand-blasting and wet cleaning of the wafers. For this project, UV-VASE and IR-VASE ellipsometers are essential to perform the ellipsometry measurements, and aluminum oxide and isopropanol are used to sand-blast and wet clean the samples for further use.

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**Sam Lucero**, “The application of a two system laser to observe excitation of NAD(P)H and FAD”

Major: Chemical Engineering

Faculty Advisor: Dr. Jessica Houston, Chemical Engineering, with Samantha Valentino

About 264,000 women and 2,400 men are diagnosed with breast cancer each year in the US. The identification of immune cell features for the treatment of some diseases, such as cancer, is one of the many uses for flow cytometry. Several laboratories and clinics utilize flow cytometry to identify and examine distinctions between cell populations based on their phenotypes, morphologies, and other properties. In this research, two different lasers are utilized, the 349 nm is used to excite NAD(P)H and the 375 nm for FAD. This is done in order to look at the optical redox ratio of the two metabolites to gain insight into the metabolic profile of the cells. Future work will involve cytometry for a specific biomedical application involving the cells' lifetime calculated in MATLAB with the two laser systems.

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***Evan Ludwig***, “Synthesis of Rhapontigenin and Related Derivatives”

Major: Biochemistry

Faculty Advisors: Dr. Kevin Houston, Chemistry and Biochemistry; Dr. William Maio, Chemistry and Biochemistry

Rhapontigenin, a natural product isolated from *Rheum undulatum* native to eastern Asia, has been shown to have anti-allergic, antioxidant, antibacterial, and anticancer properties. Specifically, rhapontigenin can inhibit breast cancer cell invasion and migration. The synthesis of iso-rhapontigenin from vanillin, extracted from store-bought imitation vanilla flavor, has revealed a synthetic pathway that will allow for the synthesis of rhapontigenin and other related derivatives with a goal for finding enhanced anticancer activities.

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***Jonah Madrid***, “Insights on the impacts of accelerometer location on the dynamics and characteristics of complex structures”

Major: Mechanical Engineering; AMP; CAMP

Faculty Advisor: Dr. Abdessattar Abdelkefi, Mechanical and Aerospace Engineering

Researchers use different measurement techniques, such as accelerometers in the laboratory to capture a system's dynamics. A well-known structure in literature is the Box Assembly with Removable Component (BARC), further breaking down the structure, the Removable Component (RC) portion is often used as a relatively simplified version. However, placement of accelerometers on the RC have varied greatly throughout the literature which presents a challenge in comparing results. Finite Element Analysis (FEA) is performed for three common accelerometer locations to determine how their placement affects frequencies and mode shapes for the RC. Free vibration experiments are carried out to understand variation of frequencies and damping for each accelerometer location. Next, random vibration experiments are run to gain insight on the interaction between linear and nonlinear responses based on excitation level. Results demonstrate that the location of the accelerometer is highly influential on the linear and nonlinear characteristics of the system.

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***Madison Marcus***, “The impact of water restrictions on pollen viability and pollen tube formation of the pecan cultivar ‘Pawnee’”

Major: Genetics and Biotechnology

Faculty Advisor: Dr. Jessica Houston, Chemical Engineering, with Andra Andazola, Kimberly Cervantes, Anna Harmon, Richard J. Heerema

Pecans (*Carya illinoensis*) are among the largest contributors to New Mexico's agricultural economy. However, water availability is an important horticultural constraint for pecan production in New Mexico. With limited water resources for southwest pecan growers, understanding the impacts of water deficits on pollen viability and germination is important for production of quality pecan nuts. In this *in vitro* study, we sought to determine pollen viability, pollen tube formation, and differences in gene expression of pollen collected from fully watered and water deficit pecan trees. Preliminary results indicate decreased pollen viability of up to 70% for deficit watered trees as compared to fully watered trees. Decreased pollen tube length for deficit watered trees was also observed. Further research looking at gene expression differences



for genes relating to drought response, as well as successful pollination, will provide greater insight into the underlying genetic mechanisms that contribute to pecan nut quantity and quality.

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**Marcos Marmolejo**, “The influence of global warming on melanized fungi”

Major: Microbiology; MARC

Faculty Advisor: Dr. Adriana Romero Olivares, Biology

Melanins are pigments found in all kingdoms of life including fungi. They are considered an important trait for stress-tolerance and pathogenicity because it allows fungi to tolerate environmental stresses, like high temperature and nitrogen pollution. However, the production of melanin is energetically expensive and might be produced at the expense of other traits, such as growth. Our objective was to determine if the production of melanin elicited a tradeoff on fungal growth under environmental stress. Therefore, we hypothesized that melanized fungi will grow less than unmelanized fungi. To test our hypothesis, we inoculated fungi with a spectrum of melanin content, and compared their growth at different temperatures and nitrogen concentrations. We found evidence of a tradeoff between melanin content and growth under environmental stress. Studying fungal tradeoffs is important because it will allow us to better understand the response of fungi to environmental stress and potential threats to public health.

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**Kaitlin Marry**, “More than Coffee: Biofertilizers at the Life Monteverde Coffee Farm”

Major: Environmental Science; MARC, Honors Capstone

Faculty Advisor: Dr. April Ulery, Plant and Environmental Sciences

Infertile soils and fertilizer runoff are problems that plague countries across the world. One solution to this problem is to create sustainable fertilizers that replenish the nutrient content and improve the health of the soil. At LIFE Monteverde, a coffee farm in Costa Rica, they are using techniques like bokashi composting and microbial fermentation to create fertilizers that mimic the nutrient-rich forests. The diversity of bacteria and fungi and their relative concentrations are being investigated in 4 barrels of solid microorganisms. In one barrel, I also sampled from different depths ( 0”, 12”, 18”, 21”, 24”). Additionally, fields on the farm were sampled including two comparative test plots. To determine the concentrations and diversity of bacteria and fungi present in the soil/solid microbes, DNA was extracted. The DNA will undergo next-generation Illumina Sequencing looking at both the 16S and ITS environmental DNA barcodes.

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**Jacob Martinez**, “Stable isotopes, immunology and condition of resident and migratory *Tadarida brasiliensis*: a comparison”

Major: Fisheries and Wildlife; MARC

Faculty Advisor: Dr. Teri Orr, Biology

Bats hold a unique role in disease ecology due to their long-distance dispersal, resilient immunity, and variable-sized social groups. Mexican free-tailed bats (*Tadarida brasiliensis*) undergo intercontinental migrations and have overlapping North and South American populations as well as some non-migratory (resident) populations. However, it is poorly known if migration status influences condition including immunology of this species. We sought to document baseline immune markers of migrant and resident *T. brasiliensis* at summer roosts in southern New Mexico and Arizona. We present results from stable isotope analysis to assign individuals to migrant and resident groups along with differential white blood cell counts to establish baseline immune condition among groups. Additionally, body condition and hematocrit are compared to establish baselines for energetic and oxidative stress, respectively. Creating a model to disentangle migration status of populations to establish baseline immune condition will provide guidance for understanding populations with greater risk of viral infection.

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**Marco Martinez**, “Obtaining dynamical masses for the binary star V343 Nor”

Major: Mathematics; AMP

Faculty Advisor: Dr. Eric Nielsen, Astronomy

By obtaining dynamical masses of young binary star, we can measure the age of the system. We analyzed direct imaging and radial velocity data from the binary star V343 Nor; the combination of direct imaging and radial velocities allow us to obtain the individual masses of each star in the binary system. We used orbitize! to obtain Bayesian posterior probability distribution of the orbital parameters and individual masses from the published observations of V343 Nor. The results are consistent with published analysis of the same data, validating the method. After the publication of the initial dataset in 2016 our group has obtained new observations of V343 Nor. Since the method is validated, our next step will be to include these new data and determine constraints on the two masses will be improved.

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**Natalia Martinez**, “The Honors Art Collective”

Major: Art History; Minor: Museum Conservation; Honors Capstone

The first-ever Honors Art Collective will showcase artwork by Crimson Scholars and Honors students in the Conroy Honors Center. Artwork in several media will be on display. The gallery will open this evening, April 14, at 5:30pm and remain on view until May 5.

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**Kari Melander**, “The Relationship between Race, Calcium Consumption, and Osteoporosis Development”

Major: Human Nutrition and Dietetic Sciences

Faculty Advisor: Dr. Shadai Martin, Family and Consumer Sciences

Calcium is an essential mineral that plays a role in bone health within the human body. This mineral can also be found in non-dairy food sources, it is most commonly associated with dairy product foods like milk or cottage cheese. As racial minorities are disproportionately affected by lactose intolerance, dairy consumption is typically lower amongst racial minorities than in white populations. This may lead to lower calcium consumption in these demographics, and thus an increased prevalence of chronic diseases like osteoporosis. The purpose of this study is to compare calcium consumption and osteoporosis occurrence between racial minorities and non-Hispanic whites using data from the NHANES 2017-2020 database. Analysis of this data shows a relative increase in Calcium consumption amongst white populations in comparison to minority demographics. However, non-Mexican Hispanics, Asians, and mixed-race individuals were the only minority demographics who appeared to experience more cases of osteoporosis than white populations.

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**Isaac Melendrez**, “A New Look at Zinc Transport Within *Vibrio cholerae*”

Major: Chemistry and Biochemistry; MARC

Faculty Advisor: Dr. Erik Yukl, Chemistry and Biochemistry

ZrgA is a solute binding protein (SPB) believed to bind zinc in high affinity within the bacterium *Vibrio cholerae*. It is part of an ATP binding cassette transport system (ABC Transporter) which are responsible for the translocation of different substrates across the membranes of almost all organisms. To combat the increasing rise of bacterial antibiotic resistance, these ABC transport systems have become attractive points of interest as they can bring insight into new mechanisms for the future of antibiotic therapies. This study aimed to focus on obtaining the unsolved structure of ZrgA through methods of X-ray crystallography. Countless conditions were used to promote crystallization with only several conditions found suitable to achieve crystallization in the ZrgA protein. The crystal structure of both a zinc bound, and non-zinc bound ZrgA was obtained with high resolution thus giving insight into the functionality and binding locations of the previously unsolved ZrgA protein.

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**Melissa Mejorado**, “Fluorescence Lifetime Imaging Microscopy (FLIM) mechanisms Advantages and Limits”

Major: Chemical Engineering

Faculty Advisor: Dr. Jessica Houston, Chemical Engineering

Fluorescence Lifetime Imaging Microscopy utilizes fluorescence properties as a microscopy technique that has gained popularity because of its sensitivity at a molecular level and conformation. It provides a unique insight into cellular health in a non-destructive manner aiding it efficient when studying cellular metabolism and monitoring microenvironmental parameters. In addition to how FLIM operates, this research investigates three different methods and techniques used in FLIM: Wide-field-FLIM, Laser scanning microscope (LSM-FLIM), and time-correlated single photon counting TCSPS-FLIM. All FLIM techniques are analyzed on their speed, accuracy, sensitivity, performance, and frame per second (fps) while comparing the advantages and disadvantages when applying FLIM on metabolic imaging for in vivo cell metabolization. A FLIM technique that is fast and efficient for one application may be entirely inappropriate for another, however establishing a basic understanding of what each technique can provide and their limits is beneficial for future biomedicine, chemistry, and related research fields.

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**Nico Mendoza**, “Investigating Enhanced Bidirectional Movement for the Inflatable Soft Crawling Robot for Overhead Power Line Inspection”

Major: Industrial Engineering; AMP

Faculty Advisor: Dr. Mahdi Haghshenas-Jaryani, Mechanical & Aerospace Engineering

Inspection of overhead power lines is a vital task in the electric utilities’ maintenance process; however, the traditional use of manual labor is time-consuming, expensive, and unsafe. Robots using advanced sensing systems can address these issues. A soft crawling robot was developed with nondestructive testing capability. The goal of this project is to investigate the expansion and contraction capabilities of a variety of soft pneumatic actuators to increase the movement speed of the soft crawling Robot for Overhead Power Line Inspection (ROPLI). Two soft actuators (Soft Extension Actuator, SEA; extensible Pneumatic Soft Actuator, ePSA) were fabricated and tested. ROPLI’s locomotion was measured and compared to previous data in which McKibben actuators were used for its bidirectional movement. Using McKibben actuators, ROPLI can travel a speed of .257 cm/s. In testing these two actuators, we expect to find a replacement in which ROPLI’s movement speed is doubled.

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**Matthew Miranda**, “Establishing a baseline immune response in the pallid bat (*Antrozous pallidus*)”

Major: Genetics & Biotechnology; Honors Capstone

Faculty Advisor: Dr. Teri Orr, Biology

The order Chiroptera has an abnormally potent immune system that reduces the deadliest diseases to, at worst, minor symptoms. They are viral reservoirs, and it is possible that Chiroptera and these viruses have co-evolved, leading to a form of commensalism. My hypothesis states the innate immune system will remain unaffected when compared to non-viral reservoir species, yet the adaptive immune system will be affected in *Antrozous pallidus*, pallid bats. White blood cells (lymphocytes) are expected in lower amounts since there is reduced inflammation in Chiroptera which would be difficult to explain with hyperactive lymphocytes. To test this prediction, differential white blood cell counts were conducted across six individuals, four females and two males, using a light microscope under oil immersion from the pallid bat. I will present my results as well as incidental observations of a blood-borne parasite (a trypanosome a group of parasites that include malaria) in *A. pallidus*.

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**Kayla Moehn**, “Too Stressed, Can’t Talk: Investigating the Effects of Chronic Stress on Stress Hormone Receptor Expression in the Budgerigar Brain”

Major: Genetics and Biotechnology; Honors Capstone

Faculty Advisor: Dr. Timothy Wright, Biology

Stress is characterized by unpredictable disruptions to the environment and plagues both humans and animals. When confronted with stressful situations, hormones like corticosterone bind to stress hormone receptors to activate the stress response. In the short term, this response is beneficial, but over the long term, its effects on cognitive functions like vocal learning are thought to be detrimental. Budgerigars are

capable of lifelong vocal learning, so they serve as a good model for understanding the impacts of stress on vocal learning. Here we stressed eight adult male budgerigars for three weeks and examined stress hormone receptor distribution in vocal learning nuclei. Two brains from the stress treatment and control treatment were extracted each week for analysis. We expect to see a decrease in stress hormone receptor expression in a vocal learning nucleus and the hippocampus over time in response to chronic stress, which might inhibit vocal learning in budgerigars.

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**Daniel Montes**, “Regeneration response by myogenic stem cells in tissues of electric fish following serial tail amputations”

Faculty Mentor: Dr. Graciela Unguez, Biology; MARC

The study aims to increase our understanding of stem cell-based regeneration in vertebrates by characterizing the response of myogenic stem cells (MSC) in skeletal muscle and muscle-derived electric organ (EO) in a teleost fish after repeated injuries. To accomplish this goal, we use the electric fish *Brachyhypopomus pinnicaudatus*. Distal tail segments were cut in 3 adult fish, and 7-d regeneration tails were collected for subsequent 10 amputation cycles. Regenerated tail tissues were analyzed using immunolabeled cryosections with an antibody against MSC marker Pax7. To date, our preliminary data show that the number of MSCs increases in muscle tissue, but not in EO cells, adjacent to the amputation site. Interestingly, data suggest potential differences in MSC response between male and female electric fish.

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**Nora Nava**, “Gas Physical Conditions around Fading Active Galactic Nuclei”

Major: Physics; AMP

Faculty Advisor: Dr. Moire Prescott, Astronomy

Green Bean galaxy nebulae (GBs) are rare astronomical objects that have luminous, spatially-extended emission from ionized oxygen ([OIII]). The GBs are active galaxies hypothesized to be ionization echoes left behind when the central Active Galactic Nuclei (AGN) faded in ionizing output over 10,000-100,000 years ago. GBs are thought to be local cousins of the Ly $\alpha$  nebulae, which are found in the distant universe. Our goal is to use spectroscopic data from the Apache Point Observatory to investigate and analyze how the gas conditions of a subset of GBs compare to other AGN samples. Contrasting the properties of AGN powered GBs vs. other AGN samples may help us understand what triggered the supermassive black hole at the center of GBs to ramp down in such dramatic fashion. Our gas physical conditions estimates suggest that GBs present lower temperatures, lower metallicities, but higher densities compared to other AGN samples.

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**Ian Nelson**, “Correlating latitudinal provenance with density of diapause-associated genes in a common orchard pollinator (*Osmia lignaria*)”

Major: Biology

Faculty Advisors: Dr. Brook Milligan, Biology; Scarlet Sellers, Biology

The blue orchard bee (*Osmia lignaria*) is a native solitary species commonly used in agricultural pollination in the USA. Seasonally, *O. lignaria* enter a dormant state, called diapause in insects, to survive the winters, but there is variation in timing and length across populations in different regions of the USA. Diapause timing in commercially managed bees is of interest to farmers who attempt to match bee emergence with crop flowering. We sequenced genomes from four populations of *O. lignaria* to identify differences and similarities in genes among populations. Following the latitudinal trends of emergence, we expect to find differences in genes associated with diapause between northern and southern populations. The genetic information obtained from this study will help farmers choose bee lineages whose diapause and emergence phenotypes are best suited to matching the average bloom timing in their regions.

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**Erick Nevarez, “Computer Science Education Barriers in the US”**

Major: Computer Science; S-STEM

Faculty Advisor: Adan Delval, Computer Science

This study explores the reasons that many computer science students struggle to complete their degrees and frequently drop out. To figure out why, the researchers reviewed academic publications, spoke with faculty, and conducted interviews with recent graduates. They discovered that the main causes are that the major is challenging, that the students are unmotivated, and that they don't receive adequate support. To help more students graduate, the researchers suggest providing scholarships, internships, and mentoring programs. They also advocate for academic institutions and businesses to collaborate on improved student success strategies.

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**Marissa Padilla, “The Impact of Variations of Urban Microclimate on Transcription of Midgut Immune Genes in Aedes Mosquitoes”**

Major: Biology; MARC

Faculty Advisor: Dr. Kathryn Hanley, Biology

Our world is being constantly remodeled by humans. One of the most notable anthropogenic effects is urbanization- the expansion of cities at the cost of natural and agricultural lands. Urbanization alters local microclimate (temperature and humidity) and is therefore likely to affect the spread of mosquito-borne viruses such as dengue and Zika. In this project, we tested whether transcription of immunity genes changed in *Aedes aegypti* and *Ae. albopictus* mosquitoes, the two key vectors of urban mosquito-borne viruses, that were reared in conditions that simulated the microclimate of highly urbanized areas in Manaus, Brazil, or in Manaus forested parks. Midguts, the first site of viral replication in the mosquito, were dissected and subjected to RNA isolation and qRT-PCR to quantify the transcription of immune genes compared to housekeeping genes. Our findings will provide insight into how urbanization may reshape the susceptibility of critical mosquito vectors to the viruses they carry.

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**Daniela Palacios, “Mycelium Across All Borders”**

Major: Chemical Engineering; AMP

Faculty Advisor: Dr. Adriana Romero Olivares, Biology

The growing concern about our planet and waste production has led to the exploration of new materials. The use of biobased materials, including mycelium, is trending because they are ecofriendly and because they turn industries' waste into new and functional material. The purpose of this research project was to explore the different ways in which biobased materials could potentially be used as a more sustainable approach. The blending of biobased materials across all borders of design, engineering, art, and nature in this exhibit, is meant to illustrate how these materials could easily be used in daily life. We constructed molds to grow the mycelium-based materials used in the furniture and extracted dyes from mushrooms for the art.

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**Elena Pearson, “Ect2 Controls the Mechanical Properties of the Sea Star Oocyte During Meiosis”**

Major: Biology; MARC

Faculty Advisor: Dr. C. Brad Shuster, Biology

Female gametogenesis is a form of asymmetric cell division, called meiosis, which generates a haploid gamete. As the cell undergoes meiosis there is a wave of actomyosin that travels from the vegetal to animal pole of the oocyte with the protrusion of the polar body. Myosin II is dependent upon Rho GTPases, which is activated by ECT2. By disrupting the signaling process from ECT2, we can expect that the mechanical properties of the oocyte will be impacted prior to and during meiosis. To inhibit ECT2, multiple constructs were used and then measured by inducing meiosis to examine polar body formation.

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**Kennedi Pyper and E. Gloria Sepulveda**, “Examining the Impact of Exogenous Cannabinoids on Cell Proliferation, Migration, and Inflammation”

Majors: Genetics and Biotechnology, Chemical Engineering; AMP  
Faculty Mentor: Dr. Amanda Ashley, Chemistry and Biochemistry

Legalization of cannabis and increased potential for use during pregnancy creates a critical need to investigate effects of cannabis consumption on pregnancy establishment and embryo development. Our objectives are to investigate cannabinoid-driven alterations during implantation and placental formation using novel cannabinoid derivatives. We are investigating toxicity and immunomodulatory effects using cell culture methods and established growth kinetics and cell proliferation rates after exposure to cannabidiol derivatives at varying doses. Other experiments are investigating impacts of cannabinoid derivatives on cell migration and inflammation-related gene expression. Results from our studies will provide insights into the role(s) synthetic cannabinoids play during placental development.

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**Isabella Rodriguez**, “Connecting the Sun to Life on Earth”

Major: Microbiology; Minors: Chemistry, East Asian Studies; AMP  
Faculty Advisor: Dr. Juie Shetye, Astronomy

How did life in the Universe come to fruition? I learned about the planets where human-like life can evolve and thrive. Specifically, we were taught about the importance of a host star; “our Sun”. It is thousands of degrees hot, 4.5 billion years old and 93 million miles away. The Sun dominates every energy-driven process on the Earth. The objectives of the project are 1.) to find the origin of the events on the Sun that affect the Earth and 2.) to characterize the observed events in terms of their physical morphology. We identified and classified five different types of events: a.) Tornadoes, b.) Spicules, c.) Filaments, d.) Flares and e.) Coronal Mass Ejections. In terms of size, a spicule is fraction of the length of Earth, whereas a CME can cover a few 100 Earths. For each event we computed their monthly occurrence rates; spicules have an extremely high occurrence rate of  $1.82927E+14$  events per month, whereas Coronal Mass Ejections that can affect our Earth occur once every month. As a next step, I will be using a computer algorithm to identify these events, with a view to understanding their formation, and how they influence life on the Earth.

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**Abril Romero**, “Fungal decomposition under global climate change”

Major: Biochemistry; MARC  
Faculty Advisor: Dr. Adriana Romero Olivares, Biology

Fungi are an essential part of the soil microbiome and play a crucial role in the carbon cycle; through the process of decomposition, they sequester carbon and emit carbon dioxide. Since the climate is warming rapidly, it is important to understand how these processes will be affected. This is especially important because the enzymes that fungi use to decompose are controlled by abiotic factors such as temperature. Our objective is to study the decomposition rates of fungi to better understand how the process of decomposition, and thus, carbon sequestration and emission will be impacted under global climate change. For this, we measured the decomposition rates of 18 fungal species and three different types of plant material with different carbon chemistry. Our work is essential to better understand how fungal metabolism may shift when exposed to elevated temperatures and how that may reflect in decomposition rates and carbon cycling processes.

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**Meghan Romero**, reading from *Escape the Death Ward*

Major: English; Honors Capstone  
Faculty Advisors: Dr. Tracey Miller-Tomlinson, English; Dr. Tyson Stolte, English

*Escape the Death Ward* is a science-fiction and fantasy novel which examines society’s reliance on technology and the ethics of existing in a world where there are not lasting consequences. The characters are transported into a world they are deeply familiar with but do not have any of the technology they have come to rely on for communication and learning about the world itself. They must struggle with the

frustrations of being familiar with the world but not knowing how they can escape back to their original world. *Escape the Death Ward* will feature the first two chapters of the novel and three two-dimensional maps made with Paint Tool Sai.

**Meghan Romero**, “Toiling Trouble of *Macbeth*'s Witches on Modern Witchcraft”

Major: English

Faculty Advisor: Dr. Tracey Miller-Tomlinson

This presentation will examine the ways in which Shakespeare's representation of the three witches and Hecate within his play *Macbeth* as well as the surrounding mythos of the play being cursed has shaped modern interpretations of witchcraft and witches in other forms of storytelling and media. Shakespeare has heavily influenced Western canon and this project seeks to research the extent of his influence. As such, there will be some research on Shakespeare's own sources for his witches in order to evaluate how much of his representation was already popular and to analyze how much of modern media stereotypes came directly from him. This project will also be mindful of the curse of *Macbeth* and if that has shaped audience's perspectives on witches as well.

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**Karla Ortega Sandoval**, “Metabolic profiling of drug resistant breast cancer cells through flow cytometry”

Major: Chemical Engineering; MARC

Faculty Advisors: Dr. Jessica Houston, Chemical Engineering; Dr. Kevin Houston, Chemistry and Biochemistry, with Samantha Valentino

In this project, we use time-resolved flow cytometry to detect changes in NAD(P)H autofluorescence lifetimes to identify metabolic profiles of Tamoxifen resistance in breast cancer cells. NAD(P)H autofluorescence lifetime is an indicator of metabolism and ATP production pathways such as oxidative phosphorylation and glycolysis. When excited by 375-nm light, NAD(P)H autofluorescence emission decay time lengthens if protein-bound (i.e., lifetime~1-7 ns) and when unbound it emits with a shorter autofluorescence decay (~0.1-1 ns) time. By measuring NAD(P)H autofluorescence lifetimes, we can identify shifts in cellular metabolism (oxidative phosphorylation to glycolysis). For the experiment, measurements were made with an ER positive breast cancer cell line (T47D) and the same cell line under developed Tamoxifen resistance. This work was previously done with different ER positive cells line (MCF-7). The goal is to develop an understanding of the baseline metabolic profile of Tamoxifen resistance in breast cancer with the T47D ER positive cell line.

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**Nadia Samaniego**, “Insulin-like growth factor binding protein-4 in breast cancer”

Major: Biochemistry

Faculty Advisor: Dr. Kevin Houston, Chemistry and Biochemistry

Insulin-like growth factor binding protein-4 (IGFBP-4) inhibits estrogenic, IGF, and Wnt signaling. In prior work, high levels of IGFBP-4 expression were associated with better breast cancer patient survival. However, this association was reversed in patients with a mutation in the tumor suppressor p53. To better characterize the role of IGFBP-4 in breast cancer in vitro, stable subclones of two ER- $\alpha$  positive and two ER- $\alpha$  negative cell lines were generated. The over-expression of IGFBP-4 inhibited cell proliferation in MCF-7 cells, but induced proliferation in T-47D, MDA-MB-231, and MDA-MB-468 cells. Of these four cell lines, only MCF-7 has the wild-type version of p53. IGFBP-4 increased the expression of p53 downstream targets such as Mdm2 and EGFR. The increases in p53 activity due to IGFBP-4 expression are blocked by the inhibition of glycogen synthase kinase 3 $\beta$  (GSK3 $\beta$ ), a mediator of Wnt signaling. In conclusion, IGFBP-4 is an upstream regulator of p53.

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**Miguel Salazar**, “Evaluation of the Effectiveness of Pyrethroid-based Paints for the Control of Turkestan Cockroaches Using the Ebeling Box”

Major: Horticulture; ENHANCEMENT

Faculty Advisor: Dr. Alvaro Romero, Entomology, Plant Pathology, and Weed Science

Turkestan cockroaches are common pests in the Southwestern United States that are largely controlled by the perimeter application of insecticides. However, since this control method is often ineffective and can potentially have impact on the environment, alternative application techniques are needed. We compared the effect of three pyrethroid-based insecticidal paints, 0.25% deltamethrin, 0.5% transfluthrin, and 0.7% alfacypermethrin applied to Ebeling boxes made of PVC against nymphs of the Turkestan cockroaches. Overall, cockroaches exposed to the alfacypermethrin 0.7% paint had a more effective and faster mortality rate than other paints. 0.5% transfluthrin repelled effectively cockroaches. Insecticidal and repellent paints may provide an easily applied means of protection against peridomestic cockroaches, particular in sewage systems, crawl spaces, and basements.

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***Emilio Serrano***, “Model Validation of Flight Energy Consumption for a Drone”

Major: Mechanical Engineering; AMP; CAMP

Faculty Advisor: Dr. Liang Sun, Mechanical Engineering

This work aims to develop an approach to validate energy-consumption models for a multicopter drone in different flight modes (e.g., take-off, ascending, cruise, descending, and landing). Energy consumption models are crucial for the safe and efficient operation of wide-scale drones (e.g., package delivery drones, and passenger and cargo drones). The flight energy-consumption models reported in the literature have not been well validated and evaluated using real-world data. The data collection needs a sophisticated sensor suite and data collection systems. This project aims to develop methods to identify and estimate required parameters for model validation using existing data sets for over 190 flights using a DJI Matrices 100 drone with varying airspeed, altitudes, etc.

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***Emily Stutesman***, “An Exploration of Perceptual Training Methods for Improving Medical Image Perception”

Major: Kinesiology; Discovery Scholars Program

Faculty Advisor: Dr. Michael Hout, Psychology; Dr. Megan Papesch, Psychology, with Rebecca Penn

Medical professionals are routinely tasked with visually scanning through complex medical images in search for a variety of anomalies – e.g., tumors, polyps, or tears that might appear on an X-ray – that indicate that a patient is suffering from disease or injury. But such “anomaly hunting” tasks are perceptually challenging, and may require years of experience for a screener to perfect their skills. In this project, we are exploring four types of perceptual learning methods in a 7-week long training study. Our participants are trained to recognize and search for anomalies hidden in real-world scenes – sampled from a database of stimuli that allow us to simulate medical image perception – while their eye-movements are recorded. Our goal is to learn to what degree attention can be guided directly to ill-defined and subtle image deformations, and to explore what observer eye-movements can tell us about how people master these skills over time.

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***Julian A. Vazquez***, “Bio-Inspired Penetration Method in Loose and Dense Sand”

Major: Mechanical Engineering; AMP, MARTE

Faculty Advisor: Dr. Douglas Cortes, Civil Engineering

Earthworms are a group of species within the annelid phylum adapted to terrestrial environments (partially and fully saturated soils). Their evolutionary adaptations for soft-body underground motion are of particular interest to geotechnical engineers as they offer an alternative to traditional subsurface exploration. Available subsurface exploration methods rely on equipment above ground to provide the reaction force necessary to drive a rigid sampling and/or sensing probe into sediments. This probe is designed mainly based on earthworm movement mechanism by using a membrane that inflates and deflates with water and is being tested on sand samples with different densities.