

125th Annual Meeting
of the
Texas Academy of Science



February 25th – 27th, 2022

University of Houston, Clear Lake
2700 Bay Area Blvd
Houston, TX 77058

Official Program

**Texas Academy of Science 125th Annual Meeting at University of Houston-Clear Lake
Program Schedule**

Abbreviated Program Schedule

Friday, February 25th

08:00 a.m. – 11:30 a.m. TAS Board of Directors Meeting, Forest Room, Bayou Bldg.
08:00 a.m. – 12:40 p.m. Student Meet & Greet, Recreation and Wellness Center, 1st floor
10:00 a.m. – 05:00 p.m. Meeting Registration, Recreation and Wellness Center, main entrance
10:00 a.m. – 01:00 p.m. Set up of all Posters, Recreation and Wellness Center, 2nd floor track area
11:40 a.m. – 12:40 p.m. Section Chairs Pre-Session Lunch Meeting, Garden room, Bayou Bldg.
01:00 p.m. – 03:15 p.m. Oral Paper Sessions 1, Bayou Bldg.
03:15 p.m. – 03:30 p.m. Coffee Break 1, Atrium 2, Bayou Bldg.
03:30 p.m. – 04:00 p.m. Keynote, Dr. Kamlesh P. Lulla, NASA Senior Scientist and Director for University
Research Collaboration and Partnerships, Recreation and Wellness Center, 1st floor
04:00 p.m. – 05:30 p.m. Judging Poster Session 1, Recreation and Wellness Center, 2nd floor
05:30 p.m. – 07:00 p.m. Judging Poster Session 2, Recreation and Wellness Center, 2nd floor
07:00 p.m. – 08:00 p.m. Sponsor Presentations (Blue Origin and Halliburton) with pizza/drinks available,
Recreation and Wellness Center, 1st floor

Saturday, February 26th

07:00 a.m. – 10:00 a.m. Meeting Registration, Recreation and Wellness Center, main entrance
07:00 a.m. – 08:00 a.m. Past Presidents Breakfast, Forest room, Bayou Bldg.
08:00 a.m. – 10:15 a.m. Oral Paper Sessions 2, Bayou Bldg.
10:15 a.m. – 10:30 a.m. Coffee Break 2, Atrium 2, Bayou Bldg.
10:30 a.m. – 12:45 p.m. Oral Paper Sessions 3, Bayou Bldg.
12:45 p.m. – 01:45 p.m. Lunch, Recreation and Wellness Center, 1st floor
01:45 p.m. – 02:00 p.m. Business Meeting, Recreation and Wellness Center, 1st floor
02:00 p.m. – 03:40 p.m. Graduate Student Oral Presentation Competition, Recreation & Wellness Ctr, 1st floor
03:40 p.m. – 04:00 p.m. Coffee Break 3, Recreation & Wellness Center, 1st floor
04:00 p.m. – 05:00 p.m. Section Chairs Post-Session Meeting, Garden room, Bayou Bldg.
04:00 p.m. – 05:00 p.m. Science Jeopardy, Recreation and Wellness Center, 1st floor
05:00 p.m. – 05:30 p.m. Outstanding Texas Educator Award and Lecture, Recreation & Wellness Ctr, 1st floor
05:30 p.m. – 06:00 p.m. Distinguished Texas Scientist Award and Lecture, Recreation & Wellness Ctr, 1st floor
06:00 p.m. – 06:30 p.m. Removal of all Posters from Recreation & Wellness Center, 2nd floor
07:30 p.m. – 09:30 p.m. Reception and Awards Banquet, Recreation & Wellness Center, 1st floor

Sunday, February 27th

08:00 a.m. – 01:00 p.m. Geology of Bolivar Peninsula Field Trip
09:00 a.m. – 01:00 p.m. Space Center Houston visit

NOTES:

1. Oral Paper Sessions, Bayou Bldg. Room Numbers: 1218, 1326, 1313, 1217, 1215, 1213, 1211, 1439, 1324, 1135
2. Administrative headquarter for judges: Bayou Bldg. Room Number 1311

Presenter Key for Poster and Paper Abstracts

N Non-student
U Undergraduate student
G Graduate student

**Texas Academy of Science 125th Annual Meeting at University of Houston-Clear Lake
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Welcome and Acknowledgements from the Program Chair



Welcome to the 125th meeting of the Texas Academy of Science! It is with great enthusiasm that we bring our annual meeting in-person to the beautiful campus of the University of Houston in Clear Lake, Texas. Please join me in thanking the local host and the University of Houston in Clear Lake for graciously hosting our event during the pandemic.

We would not be able to hold this meeting without the exemplary work of numerous colleagues. Many thanks to Dr. Kathy Wood, our current TAS president, who helped me with this program. The TAS Board of Directors, Section Chairs and Vice Chairs have done an amazing job of reviewing award nominations and submitted abstracts and working with our many authors to produce exciting and informative oral presentations and poster sessions. I thank former president Dr. Keith Pannell, who recruited new industry sponsors with funding for the meeting and student awards. I thank

Dr. Douglas Barrett of the University of Texas at Austin who worked alongside me in the preparation of the final program. A special thanks to TAS Coordinator of Information Technology, Dr. Ricardo Bernal, whose input was needed during every step of this process. His expertise and dedication were an essential part of planning this meeting.

Highlights of this meeting include our Keynote Speaker, Dr. Kamlesh P. Lulla, NASA Senior Scientist, who will be talking about NASA's space exploration and how remote sensing of the Earth has made possible a better understanding of our planet. We will have also the Graduate Student Oral Presentation Competition, the popular Science Jeopardy Competition, new sponsor presentations from Blue Origin and Halliburton, the presentations from this year's Distinguished Texas Scientist and Outstanding Texas Educator, and the Awards Banquet. We look forward to these exciting events, learning about the current scientific research being conducted throughout Texas, and socializing with new and old friends.

Sincerely,

A handwritten signature in black ink that reads "Francisco Gonzalez-Lima". The signature is written in a cursive, flowing style.

Francisco Gonzalez-Lima, PhD
George I. Sanchez Centennial Professorship, The University of Texas at Austin
President-Elect, Chair of 2022 Meeting Program, Texas Academy of Science



About the Texas Academy of Science

History

First founded by teachers as the Academy of Science in Texas in 1880, the organization as we know it now emerged around 1929 and included a physicist, a botanist, a mathematician and two biologists as its founding members. Now, TAS publishes a peer-reviewed journal (The Texas Journal of Science since 1949), conducts an annual meeting that highlights research across 17 sections across the sciences, provides substantial funding opportunities for students (~\$25,000 awarded annually) and facilitates expert testimony on policy issues related to STEM or science education. TAS membership approaches 600 individuals, with a large portion of the membership as students.

Mission

As part of its overall mission, the Texas Academy of Science promotes scientific research in Texas colleges and universities, encourages research as a part of student learning and enhances the professional development of its professional and student members. TAS possesses a complex, intriguing and long-standing educational mission.

Strategic Planning

The Texas Academy of Science (TAS) Board of Directors approved a vision for a 5-year Strategic Plan: “to increase the visibility and effectiveness of TAS in promoting strong science in Texas.” As part of that initiative, the Academy seeks to reach out to foundations and organizations that support and benefit the Texas science community. We believe that a number of opportunities exist for strategic partnerships that could bolster the impact of organizations that raise the profile of science in Texas. Our ultimate goal will be to make TAS the premier state academy in the United States; however, this cannot be accomplished without funding from both individuals and corporations. It should also be noted that 100% of the contributions given to TAS for student awards goes directly to the award.

Welcome and Acknowledgements from the Academy President



It is such a pleasure to welcome all of you to our 125th Annual Conference for the Texas Academy of Science! The past couple of years have been a wild ride for most of us. I don't think we could ever have imagined how different the world would be now with COVID infringing on every aspect of our lives. So I am very glad that this year we can meet face-to-face!

One of the things that I really appreciate about TAS is that it is an organization completely maintained by volunteers. Volunteers that already have a "day job" that keeps them extremely busy. They really don't need to add anything else to their to-do list... And yet they spend hours making sure that TAS can be one of the premier organizations in our state. Therefore, we are always looking for new people like you to

help make TAS even better. Every year there are positions that we need to fill from our membership and hope that in the future you might consider volunteering for one of these positions.

An example of this is Dr. Ricardo Bernal who has been handling all of the significant IT demands of TAS for many years and has continually impressed me with his willingness to serve TAS in any way that he can. He will be stepping down from this position after the conference, so we will be looking for a new Coordinator of Information Technology – if you have the skills for this and the interest, please let us know.

Dr. Cat Early will also be turning over her Collegiate Academy Counselor position to Dr. Milka Montes. In 2006, I first began attending TAS meetings directly due to the encouragement of Dr. Early. Up until that time, I had been routinely attending a much larger annual meeting with a different organization, but really felt kind of "lost in the crowd." Cat described the extensive student involvement/focus of TAS along with the large number of awards given out every year to both undergraduate and graduate students – this appealed to me and I decided to try TAS out. I have never regretted that decision, and I'm grateful to her for being such a good PR person for the organization and for developing the Collegiate Academy into the form that it is today.

Some other people will also be leaving the Board of Directors at the end of this conference, since their terms of service have now ended – our Immediate Past President, Dr. Shannon Hill (who has been a continual source of wisdom that I have tapped into for the last 2 years), one of our Student Directors, Terri Cox, as well as Dr. Brent Bill (one of our Academic Directors) and Dr. Ira Staehle (one of our Non-Academic Directors). So, I think you can see that we are always looking for volunteers!

Dr. Francisco Gonzalez-Lima has certainly been a critical part of the behind-the-scenes work that goes into putting on a conference like this one. As our president-elect, he was responsible for putting the entire program together this year – a daunting task – and at the end of the Awards Banquet on Saturday night, he will step into the position of TAS President for 2022.

It has been an honor to serve as President of TAS this year, and I'm looking forward to continued association with an organization that I have grown to love and respect.

Mary Kathleen Wood

Kathleen Wood, Ph.D.

President, Texas Academy of Science 2021-2022

About Clear Lake, Texas and University of Houston – Clear Lake



By Mike Fisher - Sunset Over Kemah Bridge, CC BY 2.0,
<https://commons.wikimedia.org/w/index.php?curid=11350320>

Clear Lake, also known as the Bay Area, is a waterfront residential district which is home to Space Center Houston, where astronauts give talks and there are hands-on exhibits exploring NASA's programs and discoveries. Across the area's namesake lake, the Kemah Boardwalk has retro rides and casual bayside restaurants. Vast wildlife reserve Armand Bayou Nature Center offers guided photo hikes and canoe trips. The 111-acre Bay Area Park, next to the University of Houston – Clear Lake, is home to an off-leash dog park, which offers both small dog and large dog areas.

The community was named Clear Lake City for Clear Lake, which lies south of the Johnson Space Center and, along with Clear Creek, separates Harris County from Galveston County. The lake is effectively the mouth of Clear Creek, which empties into Galveston Bay.



The University of Houston – Clear Lake (UHCL) is a public university in the University of Houston System. Founded in 1971, UHCL had an enrollment of more than 9,000 students for fall 2019. Adjacent to NASA's Lyndon B. Johnson Space Center, UHCL was created to meet a vital demand for trained engineers, physicists and mathematicians to join the U.S. space program.

Situated on a 524-acre wildlife preserve, UHCL has become a cornerstone of higher education in Texas. Since opening its doors in 1974, the university has awarded more than 75,000 degrees. The campus sits in a bottomland hardwood forest adjacent to the Armand Bayou Nature Center and is home to a wide range of wildlife, including alligators, wild turkeys, bobcats, and whitetail deer.

**Texas Academy of Science 125th Annual Meeting at University of Houston-Clear Lake
Program Schedule**

Local Eateries

UHCL Patio Café
2700 Bay Area Blvd
0.1 miles from UHCL

Quiznos
2700 Bay Area Blvd
0.1 miles from UHCL

**Tommy's Seafood
Restaurant & Oyster Bar**
2555 Bay Area Blvd
0.2 miles from UHCL

Denny's
2735 Bay Area Blvd
0.2 miles from UHCL

McDonald's
2727 Bay Area Blvd
0.2 miles from UHCL

Wael's
2449 Bay Area Blvd
0.4 miles from UHCL

Hunan Star
2453 Bay Area Blvd
0.4 miles from UHCL

Jack in the Box
2420 Bay Area Blvd
0.4 miles from UHCL

Pho 21
2443 Bay Area Blvd
0.4 miles from UHCL

Greek Deli Cafe & Imports
2410 Bay Area Blvd
0.4 miles from UHCL

Bubble Island
2441 Bay Area Blvd
0.4 miles from UHCL

Sokols' Greek Deli & Cafe
2410 Bay Area Blvd
SuiteC/D
0.4 miles from UHCL

Tokyo Bowl
2402 Bay Area Blvd Ste N
0.5 miles from UHCL

Wingstop
2410 Bay Area Blvd Ste E
0.4 miles from UHCL

Arby's
2415 Bay Area Blvd
0.4 miles from UHCL

Chasin Tails Cajun Cuisine
2402 Bay Area Blvd
0.5 miles from UHCL

TRU India
2431 Bay Area Blvd
0.5 miles from UHCL

Tony's Pizzeria
2403 Bay Area Blvd
0.5 miles from UHCL

Mornings Kolaches
2402 Bay Area Blvd Ste H
0.5 miles from UHCL

Cappuccino Bono
2700 Bay Area Blvd
0.1 miles from UHCL

Millers Cafe
2403 Bay Area Blvd Ste C
0.5 miles from UHCL

Desi Kitchen
2402 Bay Area Blvd Suite A
0.5 miles from UHCL

Pho Hoang Restaurant
2402 Bay Area Blvd Ste C
0.5 miles from UHCL

Schlotzsky's
2403 Bay Area Blvd Ste A1
0.5 miles from UHCL

Perk and Puff Lounge
2403 Bay Area Blvd
0.5 miles from UHCL

Menchie's Frozen Yogurt
2353 Bay Area Blvd Suite A
0.6 miles from UHCL

Subway
2325 Bay Area Blvd
0.6 miles from UHCL

**Ashley's Donuts Kolaches
and Tacos**
2160 Bay Area Blvd
0.7 miles from UHCL

**Don Pico's Mexican
Restaurant**
2110 Bay Area Blvd
0.8 miles from UHCL

Frenchie's Italian Cuisine
1041 Nasa Pkwy # 1
2.2 miles from UHCL

**El Dorado Mexican
Restaurant**
1962 El Dorado Blvd
1 mile from UHCL

**BJ's Restaurant &
Brewhouse**
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2.9 miles from UHCL

2021-2022 TAS Board of Directors and Contacts

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**Texas Academy of Science 125th Annual Meeting at University of Houston-Clear Lake
Program Schedule**

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**Texas Academy of Science 125th Annual Meeting at University of Houston-Clear Lake
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THE TEXAS JOURNAL OF SCIENCE

Call for Manuscripts

The *Texas Journal of Science* is an open access publication of The Texas Academy of Science. The goal of the Journal is the timely dissemination of research results and scientific information to the scientific community. The Journal is received by TAS members, educational institutions throughout the USA, and international institutional subscribers. Scholarly papers reporting original research results in any field of science, technology or science education will be considered for publication.

The Journal is available online where accepted papers are published immediately and an annual print volume is mailed to TAS members at the end of the year. Old issues (1949-2010) are also available online for free from the Biodiversity Heritage Library. A link to old issues is available on www.texasjournalofscience.org

We are actively seeking quality manuscripts. Please visit www.texasjournalofscience.org to submit your manuscript for consideration.

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Tim Walsh, Wayland Baptist University

Meeting Notes and Poster Guidelines

Local Host Contact: Dr. George Guillen, phone: 281-283-3950, guillen@uhcl.edu; Office: N116

Registration: Meeting registration will be held at a table in Recreation and Wellness Center, main entrance, and will be open from 10:00 a.m. to 5:00 p.m. Friday February 25th and again on Saturday February 26th from 7 a.m. until 10 a.m. The local host should provide a table next to electric outlets.

Free Parking: Parking is allowed anywhere on the University campus except specifically reserved or handicapped sites.

Board of Directors Breakfast Meeting: 8:00 a.m. – 11:30 a.m. Friday, Forest Room, Bayou Bldg. The local host should provide breakfast no later than 8:00 a.m. and a large table seating 28 people.

Section Chairs Pre-Session Lunch Meeting: 11:40 a.m. – 12:40 p.m., Garden Room, Bayou Bldg. The local host should provide lunch no later than 11:30 a.m. and a large table seating 16 people.

Coffee Breaks: Coffee Break 1 will be Friday, 3:15 p.m. – 3:30 p.m., Atrium 2, Bayou Bldg. Coffee Break 2 will be Saturday, 10:15 a.m. – 10:30 a.m., Atrium 2, Bayou Bldg. Coffee Break 3 will be Saturday, 3:40 p.m. – 4:00 p.m., Recreation and Wellness Center, first floor. The local host should have ready coffee, tea, water and cookies for 400 people for each of the three breaks.

Oral Presentations: Oral talks should be set up by the Section Chairs in each of the following rooms according to the program schedule: Bayou Bldg. Room Numbers: 1218, 1326, 1313, 1217, 1215, 1213, 1211, 1439, 1324, 1135. By 10:00 a.m. Friday, all of these rooms should be ready and equipped by the local host with working audiovisual projector, screen and microphone to allow slides and oral presentations.

Posters: Posters should be numbered and set up by the presenters in the Recreation & Wellness Center, second floor track area, between 10:00 a.m. – 01:00 p.m. Friday February 25th. Posters can be taped on windows/wall if needed. Since we anticipate and encourage poster viewing outside of the judging time periods, please keep your poster up and remove them Saturday between 6:00 p.m. – 06:30 p.m. A total of 138 Poster Boards should be placed by the local host around the perimeter the track area no later than 10 a.m. Friday.

Judging Poster Session 1: Will be between 4:00 p.m. and 5:30 p.m. on Friday.

Judging Poster Session 2: Will be between 5:30 p.m. and 7:00 p.m. on Friday.

Sponsor Presentations and Friday Pizza dinner: The Sponsor Presentations (Blue Origin and Halliburton) with pizza/drinks available, will be in Recreation & Wellness Center, first floor, Friday evening, 7:00 p.m. – 8:00 p.m. This will allow everyone to view the presentations, including those who are participating in the poster sessions. Recreation & Wellness Center, first floor should be equipped by the local host with internet, audiovisual projector, screen and microphone to allow Zoom and in-person presentations, and with round tables for seating 400 people.

Saturday Lunch: Lunch will be served Saturday from 12:45 p.m. – 1:45 p.m., Recreation & Wellness Center, first floor. This area should be set up by the local host with lunch and round tables for seating 400 people.

Saturday Reception and Banquet: The Reception and Awards Banquet will be held at the Recreation Center between 7:30 p.m. – 9:30 p.m. The Recreation Center should be equipped by the local host with audiovisual projector, screen and microphone to allow in-person presentations, and with food and drinks and round tables for seating 400 people.

2022 Outstanding Texas Educator

Sarah DiMaria



Sarah DiMaria is part of the founding staff at Cedars International Next Generation High School, a Project-Based Learning STEM school in Austin, Texas. Currently, she teaches AP Calculus, coordinates professional development, and serves as the instructional coach for the campus. She also sponsors the Student Council and has been a mentor teacher for new math and science teachers.

She graduated with her Bachelor of Science in Mathematics and teaching certificate in secondary mathematics and science education from Michigan State University in 2012. Shortly after she obtained her Masters of Arts in Teaching and Curriculum from MSU as well. She began her teaching experience in Michigan but shortly after moved to Austin, TX in 2014. She taught at Manor New Technology High School in Manor, TX before having the opportunity to be a founding staff member of Cedars in 2016. She has taught almost every math class from 8th-grade math through AP Calculus

along with Physics and Environmental Science in a project-based environment. She has co-taught integrated courses, taught online and hybrid throughout her teaching experience.

In 2016 she was named T-STEM teacher of the year. Sarah has engaged with educational research at the University of Texas and Michigan State University. In 2019, she served on a panel of members of the mathematics community to rewrite the NAEP Mathematics Framework Update in Washington DC. Sarah was one of three K-12 educators and the only high school teacher on the panel.

In 2021, she was awarded the Presidential Award for Mathematics and Science Teaching at the state level for Texas. This award is the highest honor bestowed by the United States government specifically for K-12 science and math teachers. The Awards were established by Congress in 1983. Only three math teachers are selected from each State, and she was selected for the state of Texas.

She has had the opportunity to speak at national conferences on the topics related to project-based learning, equity in mathematics, and classroom pedagogy. She has developed and implemented teacher training in Project-Based Learning in the United States, China, and Australia as a part of the Advanced Reasoning in Education's Think Global Academies team.

She continues to grow professionally as a fellow of the Knowles Teaching Initiative and Hollyhock Programs. As a part of Stanford University's Hollyhock Fellowship, Sarah focused on creating equitable access and opportunities for all learners in their classrooms. The Knowles Fellowship, awarded to approximately 35 early-career high school math and science teachers nationwide each year, focuses on deepening content knowledge for teaching, teacher leadership, and reflective practices over five years. Sarah continues to serve on many committees as a Senior Fellow and is currently developing professional development around rigorous math and science project-based learning through Knowles.

2022 Distinguished Texas Scientist

Dr. Ping Yang



University Distinguished Professor & Associate Dean for Research
College of Geosciences, Texas A&M University
Email: pyang@tamu.edu

Dr. Ping Yang is University Distinguished Professor and Associate Dean for Research in the College of Geosciences at Texas A&M University (TAMU), College Station, Texas. He also served as Head of the Department of Atmospheric Sciences during the period 2012-2018. He holds the David Bullock Harris Chair in geosciences at TAMU. In addition, he has joint professorship appointments with the Department of Physics & Astronomy and the Department of Oceanography. Yang has supervised 29 doctoral dissertations and 20 master's degree theses. As of 2/4/2022, Yang has published 350 peer-reviewed journal papers and 4 books. His publications have been cited 21,404 (Google Scholar)/14,121 (Web of Science) times with an H-index of 75 (Google Scholar)/59 (Web of Science). Since Yang joined TAMU, he has secured 79 research grants/contracts, totaling \$15.6M. His research focuses on light scattering, radiative transfer, and remote sensing. Dr. Yang is a Fellow of the American Physical Society (APS), the Optical Society of America (OSA), The Electromagnetics Academy, the American Geophysical Union (AGU), the American Meteorological Society (AMS), and the American Association for the Advancement of Science (AAAS). Dr. Yang is a recipient of the NASA Exceptional Scientific Achievement Medal (2017), the Van de Hulst Light-Scattering Award (2022), the David and Lucille Atlas Remote Sensing Prize by AMS (2020), Ascent Award by the AGU Atmospheric Science Section (2013), and a National Science Foundation (NSF) CAREER award (2003). Within TAMU, Dr. Yang received the university-level faculty research award bestowed by The Association of Former Students in 2017 and several college-level awards.

2022 Vice President

Dr. Robert Ronald Kane



Bob Kane was born in Minneapolis, Minnesota and lived in Maitland, Florida before moving to Dallas, Texas for 4th grade. After graduating from WT White High School in Dallas, he attended Texas Lutheran College (TLC; now Texas Lutheran University), where he had the opportunity to perform research with Preston Reeves. Jumping the gun, he moved to Texas Tech University just a bit before finishing his BS at TLC. After straightening out that small detail, he officially began graduate work with Robert Walkup at TTU in the area of total synthesis and synthetic methodology. Upon earning the PhD, he moved to UCLA for postdoctoral work with M.F. Hawthorne, where he made homogeneous hydrophilic boron-rich compounds and conjugated them to antibodies.

Bob joined the faculty at Baylor University in 1996, where he is now an Associate Professor of Chemistry & Biochemistry and Director of the Institute of Biomedical Studies. His teaching at Baylor has been recognized by Phi Beta Kappa eight times and Mortar Board three times. While at BU, he has served as advisor for 8 undergraduate Honors theses, 6 MS degrees, and 11 PhD dissertations. He has published 53 manuscripts (29 at BU, including 16 undergraduate co-authors) and has been awarded seven patents. His research utilizes synthetic chemistry to address biological challenges and is currently focused on transplantation. Bob and his wife Deb are in their seventh year living as 'Faculty in Residence' in student housing at Baylor.

2022 – 2023 Academic Director

Dr. Yolander Renea Youngblood



Dr. Youngblood is a Mississippi native that left her small family farm to pursue academia. As a wife and mother of three girls, she joins the ranks of many other women who balance work and family here in Cypress, TX. Her hobbies include traveling to the beach and the family farm back in Mississippi.

Professionally, she focuses on preparing students for STEM careers. Currently her laboratory is researching *Amaranthus palmeri*. As a faculty member, she also teaches Botany and Practicum. Her passion for students pushes her to be involved in different types of projects. Each project is independent and fits a student's need; hence she is one

of "1000 inspiring Black Scientists in America" (<https://crosstalk.cell.com/blog/1000-inspiring-black-scientists-in-america>), a 2021 Fellow for the Center for Advancement of STEM Leadership (CASL), and the recipient of Prairie View A & M University's 2020 Outstanding Faculty Service Award.

2022 – 2023 Non-Academic Director

Dr. Hania W. Janek



Dr. Janek is an educator, researcher and leader at Baylor Scott & White Health. In 2005, she obtained her PhD from Baylor University in Biomedical Studies; and in 2015, she completed her Master of Science in Medical Education Leadership through the University of New England. Currently, she is the System Vice President for Education at Baylor Scott & White Health and holds a Clinical Professor Faculty appointment in the Department of Medical Education with the College of Medicine at Texas A&M University.

As the academic and administrative leader of Education, Dr. Janek is responsible for BSWH education programs, including the integrated libraries, continuing medical education, allied health, academic affiliation agreements, clinical simulation, and education innovation and scholarship. She partners with education leaders throughout the BSWH system to ensure an integrated and seamless management of clinical learning and education. In previous roles at BSWH, she held responsibilities for the advancement of BSWH research, investigators and scholarship through various academic initiatives integrating research, education and quality strategies. Furthermore, she supports a culture of scientific inquiry embedded in interprofessional collaboration and innovation that improves the health of patients and communities through education and research advancements.

Dr. Janek's scholarly interests involve a focus on the role of academic research and medical education on improvement of patient and health system outcomes. For over a decade, she has led teams towards creating an academic and scholarly environment, including the use of effective research and education programs, mentorship, establishing intradepartmental and interprofessional involvement and external collaborations. She serves as a member of the Board of Directors for the Alliance of Independent Academic Medical Centers (AIAMC) and is most recently served as the Chair of the AIAMC Committee on Integration of Academics and Quality for National Initiative VII: Teaming for Interprofessional Collaborative Practice. Dr. Janek has served as a principal and co-investigator for numerous educational, QI, clinical and basic research studies and grants and has published 43 peer-reviewed manuscripts.

2022 – 2023 Student Director

Christopher Johnson

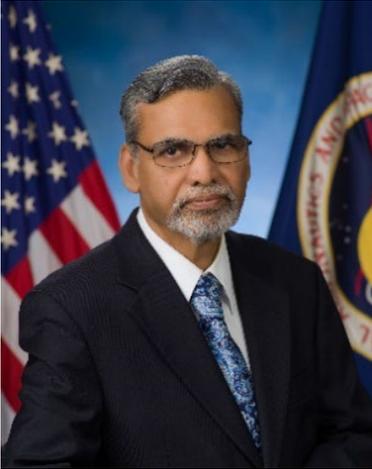


Christopher Johnson accepted a position in University of Texas Medical Branch DPT Program class of 2024 and starts in September 2021. He earned his Bachelor of Science in Marine Engineering at the United States Merchant Marine Academy, in Kings Point, NY in 2006. He studied and completed his prerequisites for UTMB at McLennan Community College (MCC). While at MCC, Chris held the position of Vice President of the Biology Club from 2019-2020. He also served as a Supplemental Instructor for Anatomy and Physiology under the guidance of Dr. John Seawright.

While at the Academy, Chris spent 1 year at sea as a cadet aboard American flagged ships, learning the trade and receiving on the job training prior to completing requirements to sit for the United States Coast Guard (USCG) examination. Chris has traveled all over the world aboard private and government owned ships over the past 15 years and has visited over 40 countries. From 2011-2016, Chris worked for the Department of the Navy as a Port Engineer. He was assigned to the FFG class of vessels and was responsible for managing the maintenance budget and ensuring that all maintenance and upgrades were accomplished to ensure the ships could meet their operational requirements. Chris currently holds a USCG Unlimited Horsepower Chief Engineer License for Diesel Propulsion Vessels and a USCG Unlimited Horsepower Third Assistant Engineer License for Steam and Gas Turbine Propulsion plants.

Keynote Speaker from NASA

Dr. Kamlesh Lulla



Senior Scientist and Director for University Research Collaboration and Partnerships, NASA Johnson Space Center, Houston, Texas.
kamlesh.p.lulla@nasa.gov

We are honored to have Dr. Lulla presenting in our TAS meeting in recognition of his 33 years as distinguished scientist in NASA research and projects at NASA Johnson Space Center in Texas. Dr. Lulla is also an outstanding example of the TAS mission to foster student mentorship and research excellence in Texas. He is a champion of diversity and inclusion in all agency and center projects and programs.

Dr. Lulla holds two PhD degrees with expertise in Environmental Science and Geoscience remote sensing. He served in academia as a tenured university professor of Remote Sensing and Earth Sciences for over 12 years before joining NASA. Dr. Lulla has an impressive record of scientific work. Dr. Lulla's research, technology development, and educational outreach in Earth observations and remote sensing has spanned more than four decades, long before he joined NASA, and his research papers have appeared in many peer-reviewed journals. He is an author of over 200 scientific and technical papers, and is internationally acclaimed for his research and scientific accomplishments in optical remote sensing technologies and Earth observation sciences.

Dr. Lulla has also co-edited and co-authored eight books. For example, he published a historic book in concert with NASA's Russian counterparts during the years of the Shuttle-Mir Program. Russian scientists working alongside Dr. Lulla and US experts created the book, "Dynamic Earth Environments," a 300-page volume that catalogues changes in Earth processes through remote sensing and geoscience. Dr. Lulla's latest edited book was "Wings in Orbit", a scientific tome that captures the legacy of the famous winged space shuttles that provided ready access to space and enabled cutting-edge research and investigations — serving as a precursor to the International Space Station Program.

Dr. Lulla's lifelong fascination with our planet has translated into groundbreaking scientific research that will be more useful than ever as the planet faces the challenges ahead.

Graduate Student Competition

A single session will be held, Saturday February 26th, 2:00 – 3:40 p.m., in the Recreation and Wellness Center 1st floor, without any conflicting sessions, thereby enabling maximum participation. The participants are:

Structural and Functional Studies of the Human Mitochondrial Chaperonin Hsp60 – Alejandro Rodriguez and Ricardo A. Bernal; The University of Texas at El Paso

In cells, proteins are responsible for virtually all cellular activities. The proper folding of proteins is essential as the structure of a protein dictates its function. Misfolded proteins can occur for a variety of reasons but are commonly due to either environmental stressors or improper folding of nascent polypeptide chains. Chaperonins are a family of proteins that assist in the folding of newly synthesized or misfolded proteins. In humans, the mitochondrial chaperonin heat shock protein 60 (Hsp60) is responsible for the folding of mitochondrial proteins. The mechanism through which Hsp60 folds client proteins, however, is not fully understood. Our work demonstrates that Hsp60 functions via a highly dynamic mechanism. The structure of Hsp60 complexes varies between single and double ring conformations depending on its nucleotide bound state. The apo form of Hsp60 with no nucleotide bound forms double ring complexes that adopt a “football-like” conformation upon binding ATP and its co-chaperonin, Hsp10, that has been solved to a 3.4 Å resolution. Interestingly, our cryo-EM studies suggest that following ATP hydrolysis, the ADP conformation separates into single rings of Hsp60 still bound to Hsp10. These results highlight a novel single-ring ADP intermediate as well as a double-ring apo conformation that have not been previously observed. These intermediates appear to be integral parts of the Hsp60 protein folding pathway and not off-pathway intermediates. Our high-resolution cryo-EM studies will not only better elucidate the protein folding mechanism of Hsp60 at a near-atomic level, but also help explain the effects of disease-associated single point mutations reported in humans. Understanding this can help in the targeted production of drug molecules that better interact with Hsp60.

Mutations in Small Heat-Shock Protein 27 Affect Phosphorylation Regulated Chaperone Activity – Bianka A. Holguin, Maria I. Grajeda, Alejandro Rodriguez, Janelly Villalobos, Anna Karen Orta, Andres Orta, and Ricardo Bernal; The University of Texas at El Paso

Small heat shock protein 27 (Hsp27) is a ubiquitously expressed molecular chaperone involved in many physiological processes. Hsp27 is specifically involved in substrate protection during the stress response pathway. As an ATP-dependent chaperone, Hsp27 will bind partially denatured proteins, keeping them in a folding-competent state for later refolding or degradation. Hsp27 monomers organize into dimers that are engaged in a dynamic equilibrium between large polydisperse oligomers. Upon phosphorylation, induced by the stress pathway, this equilibrium is shifted to the formation of dimers. Point mutations of Hsp27 are causative for the neurodegenerative disorders Charcot-Marie-Tooth disease and distal Hereditary Motor Neuropathy IIB. Here we show that the oligomerization and chaperoning ability of Hsp27 is altered by five key point mutations. We found that mutations at the dimer interface cause a gain of function effect along with increased monomerization. Mutations outside of this region either have no effect or completely abolish chaperone activity accompanied by increased oligomer size. Furthermore, we found that the increase in chaperoning ability comes from the inability of mutant Hsp27 to release its substrate. These results highlight the notion that oligomerization and efficient chaperoning are highly interconnected processes. The inability to oligomerize results in a chaperone that cannot effectively transfer substrate to a chaperonin complex for refolding. Our data suggests that some mutants of Hsp27 may aberrantly bind neuronal proteins, removing them from important neuronal processes. This ill-timed chaperoning of substrates may be one probable mechanistic mode of disease progression.

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Niche Modeling of Crayfish in Central Texas – Nathan Schubert and Joshua Banta; The University of Texas at Tyler

Freshwater species make up ~10% of all known species and occupy less than one percent of earth's habitat, which is being degraded by human usage. Crayfish have a large impact on their aquatic or terrestrial environment and can be an indicator the health of aquatic environments, as they generally require undegraded environments. In many habitats, crayfish make up more than half of the macroinvertebrate biomass, and play important ecological roles, as a food resource for both aquatic and terrestrial species, as predators of fish and invertebrates, and as bioprocessors of vegetation and detritus. The objective of this project is to model the habitat that Texas crayfish inhabit and the extents to which their habitats overlap with other crayfish species. Crayfish are an understudied taxon, and especially in the case of Texas. To model species distributions throughout Central Texas, environmental data and species occurrence locations will be combined using the software Maxent to make maps of habitat suitability for each species across the entire landscape. This work will help us understand the similarity and differences between crayfish niches in Texas. Future work with central Texas crayfish can use the results of this study to compare niches and understand where competition and invasion could affect populations of native crayfish.

An ethogram and behavioral analysis of male-male combat in a rare and federally threatened rattlesnake – Zander E. Perelman, Howard K. Reinert, and William I. Lutterschmidt; Sam Houston State University and The College of New Jersey

Although the occurrence of male-male combat events has been documented for a number of snake species, these behaviors are not often quantified or analyzed beyond simple descriptions. Combat events between snakes within the genus *Sistrurus* are rarely observed, and only one previous report has offered detailed descriptions and analysis of observed behaviors. Here, we discuss a combat event between two free-ranging male Eastern Massasauga rattlesnakes (*Sistrurus catenatus*) in western Pennsylvania. A detailed video recording of the event was used to describe and analyze the behaviors that occurred during this combat event. In addition to a general description of the behaviors observed, this video record allowed us to establish a time log to quantify duration and total counts for all observed behaviors. Observations of male-male combat were possible because of the close monitoring of a radio-tracked female Eastern Massasauga (MS-01). While monitoring MS-01, we first encountered a non-telemetered male Eastern Massasauga (MS-04) in close proximity (0.5 m) to the female on 30 July 2021. This mate accompaniment of MS-01 by MS-04 was followed by male-male combat between MS-04 and a newly found non-telemetered male Eastern Massasauga (MS-05) on 1 August 2021. On 2 August 2021 the progression of this mating system culminated with one male (MS-05) successfully copulating with the female (MS-01). Successfully observing the full progression of behaviors allowed us to accurately describe the combat event and subsequently analyze and compare the combat behaviors displayed by MS-04 and MS-05 with respect to the outcome of the combat; MS-05 winning and copulating with MS-01.

Sewable Reduced Graphene Oxide Coated Nylon Fibers for Electronic Textile-based Strain Sensing – Nafize Ishtiaque Hossain and Shawana Tabassum; The University of Texas at Tyler

This paper presents a simple and cost-effective electronic textile-based stretchable strain sensor and demonstrates its versatile applications including real-time measurements of finger kinematics, phonation, as well as subtle motions (i.e., eye blinking). Moreover, the sensor could easily discriminate between phonation and cough patterns, thereby expanding its applications to COVID detection, speech rehabilitation training, and human/machine interactions. The strain sensor was made of reduced graphene oxide (rGO) coated nylon fibers, which are sewn into a stretchable textile. Three different concentrations of rGO dispersions were prepared to investigate the optimum sensor performance under different amounts of tensile and bending strains. The fibers coated with 2mg/ml of rGO dispersion exhibited high sensitivity, stretchability, linear operation, and temperature invariance under a wide range of tensile (from 2% to 80%) and bending (from 63 to 290 degrees) strains. In addition, an internet-of-things (IoT) based data acquisition unit was integrated with the sensor fibers. The sensor readings were processed by a microprocessor and then transmitted wirelessly to the cloud. Data was remotely accessed via a Blynk-based smartphone application. The IoT integration allowed remote monitoring of body kinematics and physiological parameters. Therefore, our integrated electronic textile sensor holds the potential to provide real-time health monitoring and tracking to allow immediate intervention.

8-Anilino-BODIPYs: How para- electron-donating and -withdrawing moieties affect the optical properties of BODIPY fluorophores – Laura Saucedo, James Leventis, Alejandro Metta-Magaña, and Keith Pannell; The University of Texas at El Paso.

Boron dipyrromethene (BODIPY) dyes are popular fluorophores that are highly tunable, have narrow Stoke's shifts, and high quantum yields. When BODIPYs have meso-amines their strong emission hypsochromically shifts relative to the unsubstituted BODIPY and they fluoresce blue. However, placing an aniline in the meso position produces a BODIPY with zero to weak emission. This project presents a series of 8-anilino-BODIPY derivatives studied to understand the influence the interaction between the meso nitrogen lone pair and the BODIPY core has on the chemistry and properties of BODIPYs. The aniline lone pair interaction with the BODIPY core was modulated by electron-donating (ED) or –withdrawing (EW) moieties placed para on the aryl group. The data showed that ED derivatives hypsochromically shift the absorbance from 8-[(C₆H₄)HN]-BODIPY, while the EW derivative bathochromically shifted the absorbance and fluoresced. The EW substituent resulted in significant reduction of the lone pair delocalization to the BODIPY core and removed the normal co-planarity between the nitrogen plane and BODIPY core. These results demonstrate that by decreasing the bond order between the substituent and the BODIPY core fluorescent 8-anilino-BODIPYs can be synthesized.

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Program Schedule

Award Banquet Agenda

Saturday, February 26, 2022

7:30 p.m. – 9:30 p.m. Reception and Awards Banquet, Recreation Center

- Welcome (Dr. Kathleen Wood, *President*)
- Welcome to UHCL
 - President of UHCL (Dr. Richard Walker)
 - Local Host & Professor (Dr. George Guillen)
- Outstanding Texas Educator Award (Dr. Matt Barnes, *VP*)
- Distinguished Texas Scientist Award (Dr. Matt Barnes, *VP*)
- Undergraduate Poster Section Awards (Dr. Cathy Early, *TAS Collegiate Academy*)
- Undergraduate Oral Presentation Awards (Dr. Cathy Early, *TAS Collegiate Academy*)
- Sammy Ray Marine Science Award (Joe Kowalski, *Marine Science Section Chair*)
- Amir-Moez Award for Excellence in Mathematics (Dr. Scott Cook, *Mathematics Section Chair*)
- Graduate Student Presentation Competition Awards (Dr. Travis Laduc, *TAS Graduate Academy*)
- Student Research Grants (Joe Kowalski, *TAS Research Grants*)
- Outgoing Board Members (Dr. Kathleen Wood, *President*)
- New Board Members (Dr. Kathleen Wood, *President*)
- Introducing the New President of TAS (Dr. Kathleen Wood, *President*)
- Recognition from NASA to TAS, Next Year's Conference & Final Comments (Dr. Francisco Gonzalez-Lima, *new President*)

Geology Field Trip and Space Center Houston Visit



1. Environmental Geology and Coastal Ecology of Bolivar Peninsula

8:00 am to Noon, Sunday, Feb. 27, 2022

Dr. Jim Westgate, the Co-chair of the Geoscience section, will lead the field trip:

Phone: (409) 880-7970

Email: westgatejw@lamar.edu

The trip will meet on campus at the registration desk in Recreation and Wellness Center (main entrance), drive to Galveston ferry, then meet again at the [Pt. Bolivar lighthouse next to US87](#).

Bolivar Lighthouse -- Point Bolivar

By Jim Evans - Own work, CC BY-SA 4.0,

<https://commons.wikimedia.org/w/index.php?curid=89394631>



2. Self-Guided Visit to Space Center Houston

9:00 am to 1:00 pm, Sunday, Feb. 27, 2022

Phone: (281) 244-2100

Email: schinfo@spacecenter.org

1601 NASA Pkwy

Houston, Texas, USA 77058

<https://spacecenter.org/visitor-information/>

Texas Academy of Science 125th Annual Meeting at University of Houston-Clear Lake Program Schedule

COMPLETE TECHNICAL PROGRAM AND SCHEDULE

FRIDAY, FEBRUARY 25, 2022

Ongoing, 10:00 am – 5:00 pm: Meeting Registration, Recreation and Wellness Center, main entrance

Set-up of all Posters (for both Poster Sessions)

10:00 am – 1:00 pm, Recreation and Wellness Center, 2nd floor track area

Assigned locations around the perimeter of Recreation and Wellness Center, 2nd floor track area, please leave posters up until Saturday at 6:00 pm.

Student Meet & Greet, Recreation and Wellness Center, first floor

08:00 a.m. – 12:40 p.m.

001. TAS Board of Directors Meeting

8:00 am – 11:30 am, Forest Room, Bayou Building

002. Section Chairs Pre-Session Lunch Meeting

11:40 am – 12:40 pm, Garden room, Bayou Bldg.

003-010. Oral Paper Session 1

1:00 pm – 3:15 pm, all rooms listed below are in Bayou Building

003. Anthropology Oral Section and Section Meeting

1:00 pm to 2:15 pm, Room 1135

1:00 003.001 G **Mobility among ancient aboriginals of the Canary Islands: A case study using ten adult skeletons from the funerary deposit of Lomo Maspalomas, Gran Canaria, Spain.** Texas A&M University, College Station. **Paloma Cuello del Pozo**

1:15 003.002 G **Variability in Skeletal Body Mass Estimation Formulae across Ecogeographically Diverse Human Groups.** University of North Texas Health Science Center, Fort Worth, Texas. **Alexa P. Kelly**, Scott D. Maddux

1:30 003.003 U **Taphonomic analysis of rodent postcranial remains from Botswanan barn owl (*Tyto alba*) roosts.** ¹Department of Anthropology, Baylor University, Waco, Texas; ²Department of Biological Sciences, Sam Houston State University, Huntsville, Texas. **Garrett Cooper Croley¹**, Noah Wingate¹, Monte Thies², Patrick John Lewis², Timothy Lee Campbell¹

1:45 003.004 U **Evaluation of Human Cremated Remains From an Etruscan Urn.** Baylor University, Waco, TX. **Kaylee Hogness**

2:00 **Anthropology Section Meeting**

004. Biomedical Sciences Oral Section 1

1:00 pm to 2:30 pm, Room 1213

1:00 004.001 U **Dynamics of Eastern Equine Encephalitis Infection Rates: A Mathematical Approach.** ¹Tarleton State University, Stephenville, Texas, ²Centers for Disease Control and Prevention, Fort Collins, Colorado. **Aurod Ounsinegad¹**, Dr. Nicholas Komar², Dr. Christopher Mitchell¹

1:15 004.002 U **Supraventricular Tachycardia Study Using a Dynamic Computer-Generated Atrium.** Tarleton State University, Stephenville, Texas. **Avery Campbell**, Gavin McIntosh, Bryant Wyatt

1:30 004.003 U **A mathematical model for Onchocerciasis and Resistance in Treatment.** Tarleton State University Stephenville TX. **Dashon Mitchell**, Kaylee Terrell, Dr. Christopher Mitchell

1:45 004.004 U **Detection of *Sin Nombre Virus* and other *Orthohantaviruses* on Wild Caught Rodents across the State of New Mexico.** University of New Mexico, Albuquerque, New Mexico. **Gilberto Ian Lares**, Samuel Melvin Goodfellow, Robert Anthony Nofchissey, and Steven Blake Bradfute

2:00 004.005 U **Defining the role of short-chain fatty acids in primary open-angle glaucoma.** University of Houston-Victoria, Victoria, Texas. **Jose Ramirez**, Thanh Le, David Keyser, Tori McCoy, Humberto Hernandez

2:15 004.006 U **Characterization of a novel tick gene in *Amblyomma Americanum*.** Stephen F. Austin State University, Nacogdoches, Texas. **Kathy Li** and Lindsay Porter

005. Cell and Molecular Biology Oral Section 1

1:00 pm to 2:45 pm, Room 1324

1:00 005.001 U **A quantitative and qualitative investigation on the effects of feeding and aging on α -latroinsectotoxin in *Latrodectus geometricus*.** Stephen F. Austin State University, Nacogdoches, TX. **Eleanor J. Penhallegon** and Lindsay M. Porter

1:15 005.002 G **Sequencing and functional characterization of *Latrodectus geometricus* defensin, Lg-defensin.** Stephen F. Austin State University, Nacogdoches, TX. **Jacklyn Thompson**, Dr. Lindsay Porter

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1:30 005.003 G **Sequence Resolution and Bioinformatic Analysis of Defensin from Black Widow Spider, *Latrodectus mactans*.** Stephen F. Austin State University, Nacogdoches, Texas. **Kaleth Salazar** and Lindsay Michelle Porter

1:45 005.004 U **Phenotypic Analysis of Cancer Cell Lines Following PA28 γ Reduction Through CRISPR/Cas9.** Austin College, Sherman, TX. **Jessica Hoffman**, Lance Barton

2:00 005.005 G **Genetic characterization of the *Oct β 2R* gene among Amitraz-resistant *Varroa destructor* mites.** Stephen F. Austin State University, Nacogdoches, Texas. **Jordy Sloan**

2:15 005.006 U **Identification and characterization of novel genes in *Drosophila's* retinal development utilizing a transcriptomics approach.** Sam Houston State University, Huntsville, TX. **Sequoia Smith**, Mardelle Atkins

2:30 005.007 U **Identification and Characterization of Tango6 in Development.** Austin College, Sherman, Texas. **Sydney Versen**, Hannah Herron, and Kelli Carroll

006. Chemistry and Biochemistry Oral Section 1

1:00 pm to 2:30 pm, Room 1218

1:00 006.001 N **Electrochemically Driven Biofilms for Drug-metabolic and Inhibition Assays.** University of Houston Clear Lake, Texas. **Charuksha Walgama**

1:15 006.002 G **Advancements in High Performance Liquid Chromatography (HPLC) Methods for Quantifying Anticancer Drugs and Metabolites in Human Biological Samples: A Literature Review.** University of Houston-Clear Lake, Houston, Texas. **Amey Gonzalez**, Leopoldo Romero, Charuksha Walgama

1:30 006.003 G **Examination of the Toxicity and Localization of HK-97 Virus-Like Particles in Zebrafish.** The University of Texas at Tyler. **Andrea Hernández Irias**, Brent Roy Bill, Dustin Patterson

1:45 006.004 N **Comprehensive Structural and Compositional Investigation of Maya Pottery Sherds from Lake Petén Itzá, Guatemala, Central America.** Stephen F. Austin State University, Nacogdoches, Texas. **Kefa K. Onchoke**

2:00 006.005 U **Spectroscopic and Electrochemical studies of dibenz[a,h]anthracene (DBaA): an environmental mutagen.** Stephen F. Austin State University, Department of Chemistry & Biochemistry, Nacogdoches, TX. **Karl Allen K. Vedan**, Kefa K. Onchoke

2:15 006.006 G **Computational Analysis of Channel Reactions Between Dimethylmercury and the Cl⁻ radical.** University of Houston at Clear Lake, Houston, Texas, **Betzaida Aponte Hernández**, Cody J. Perry, and Yi Su

007. Freshwater Science Oral Section and Section Meeting

1:00 pm to 2:45 pm, Room 1211

1:00 007.001 G **Distribution and habitat use of Kisatchie Painted Crayfish in northeast Texas with investigation of multi-scale environmental influences on crayfish community structure.** Texas Tech University. **Hayden C. Hays** and Matthew A. Barnes

1:15 007.002 U **Snail (*Pomacea maculata*) Days of Summer: Associations between reproductive output, snail removal efforts, and environmental DNA (eDNA) concentration.** Southwestern University, Georgetown, Texas. **Cynthia Bashara**, Lillian Dolapchiev, Romi Burks, Chris Vaughn, and Matthew Barnes

1:30 007.003 U **Filter me...if you can: using size fractionation to separate, measure, and determine the size of *Pomacea maculata* eDNA.** Southwestern University. **Lillian Dolapchiev**, Cynthia Bashara, Matthew Barnes, and Romi Burks

1:45 007.004 G **Pesticide cocktail affects free-swimming behavior and induces oxidative and nitrate stress in goldfish, (*Carassius auratus*).** University of Texas at Rio Grande Valley. **Esmirna Cantu**, Michelle Rivera, Brittney Lacy, and Md Saydur Rahman

2:00 007.005 G **Stream Metabolism and Microbial Diversity of a Wastewater Effluent dependent Stream Ecosystem.** University of Texas at San Antonio, **Fabiola Estrada** and Allison Veach

2:15 007.006 N **Vegetation analysis in the upper reach of an ephemeral creek in San Antonio, Texas.** University of Texas at San Antonio. **Jeffrey T. Hutchinson**

2:30 **Freshwater Science Section Meeting**

008. Plant Biology Oral Section and Section Meeting

1:00 pm to 2:00 pm, Room 1439

1:00 008.001 U **Identification of bacteria in symbiosis with *Vachellia farnesiana*.** University of Mary Hardin-Baylor, Belton, Texas. **Caleb Shackelford**, Kathleen Wood

1:15 008.002 U **Molecular Identification of *Oenothera* plant specimens collected from Guadalupe County, Texas.** Texas Lutheran University, Seguin, TX. **Jesse Ramos**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez

Texas Academy of Science 125th Annual Meeting at University of Houston-Clear Lake Program Schedule

1:30 008.003 G **Anatomy and morphology of the seed coat in the Texas species of *Argemone* (Papaveraceae).** Texas State University, San Marcos, Texas. **Shelby L. Conway**, David E. Lemke

1:45 **Plant Biology Section Meeting**

009. Physics and Engineering Oral Section 1

1:00 pm to 3:00 pm, Room 1217

1:00 009.001 U **Effect of Repeated Alcohol-Based Hand Rub Disinfectant Treatments on the Mechanical Integrity of Disposable Nitrile and Latex Exam Gloves.** ¹ Occupational Safety and Health Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX, ² Mechanical Engineering Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX. **Jonathan Patterson**², John Cuadros Olave¹, Robert Phalen¹, Youssef Hamidi²

1:15 009.002 U **Effect of Multiple Decontaminations on Tensile Properties of Disposable Vinyl Exam Gloves.** ¹ Occupational Safety and Health Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX, ² Mechanical Engineering Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX, **Jonathan Patterson**², Robert Phalen¹, Youssef Hamidi², Joseph Kuates¹

1:30 009.003 N **Light Scattering Computation for Dielectric Spheroidal Particles.** Texas A&M University, College Station, Texas. **Jiachen Ding**, Ping Yang

1:45 009.004 G **Convergence and truncation criteria in Invariant-Imbedding T-Matrix method for non-spherical particles.** Texas A&M University, ¹Department of Atmospheric Sciences, Texas A&M University, College Station, TX, ²Department of Mathematics, Texas A&M University, College Station, TX. **Yuheng Zhang**¹, Jiachen Ding¹, Ping Yang¹, and Richard Lee Panetta^{1,2}

2:00 009.005 U **Guidance and Navigation Controls for Drone Swarm Applications.** University of the Incarnate Word, San Antonio, Texas. **Charles Beck**, Jovany Avila, Michael Frye Ph.D

2:15 009.006 U **Use of Unmanned Aerial Systems in Infrastructure Inspections – A Close Look at Advanced Skyraanger R70 Payloads.** University of the Incarnate Word, San Antonio, Texas. **Orion Jones**, Jovany Avila, Michael Frye, Ph.D.

2:30 009.007 G **Particle Interactions in Compact Objects and the Early Universe.** University of Houston-Clear Lake. **Faiz Khan**, Samina Masood

2:45 009.008 G **A Machine Learning Approach for Long-Term Prediction of Power Plant Alloys.** The University of Texas at El Paso, El Paso, Texas. **Md Abir Hossain**, Calvin Maurice Stewart

010. Terrestrial Ecology and Management Oral Section and Section Meeting

1:00 pm to 2:15 pm, Room 1215

1:00 010.001 G **Examining variation in vegetation density within Texas Tortoise (*Gopherus berlandieri*) home ranges in Cameron County, Texas.** Texas State University, San Marcos, Texas. **Daniel Guerra**, Joseph Veech

1:15 010.002 G **Nest microclimates impact on parental behavior in Carolina Wrens.** Sam Houston State University, Huntsville, TX. **David Farris** and Diane Neudorf

1:30 010.003 G **Genetic Analysis of Beaver Reintroductions in Texas.** Sam Houston State University, Huntsville, Texas. **Drew R. Neyland**, Alexandra Herrera-Martinez, Juan D. Daza, Christopher P. Randle, William Godwin, Monte L. Thies

1:45 010.004 N **Interaction of domestic dogs (*Canis lupus familiaris*) with selected medium-sized and large mammals in an urban system.** East Texas Baptist University, Marshall, TX. **Troy A Ladine**

2:00 **Terrestrial Ecology and Management Section Meeting**

011. Coffee Break 1

3:15 pm – 3:30 pm, Atrium 2, Bayou Building

012. Keynote, Dr. Kamlesh P. Lulla, NASA Senior Scientist and Director for University Research Collaboration and Partnerships

3:30 pm – 4:00 pm, Recreation and Wellness Center, 1st floor

013. Judging Poster Session 1

4:00 pm – 5:30 pm, Recreation and Wellness Center, 2nd floor track area

Anthropology Posters:

013.001 U **An *in-silico* method for modeling the nasal cycle in 3D: Implications for assessing human nasal form and function.** University of Texas at Arlington, Arlington, Texas. **Baonhu Tran**, Lyndee Ward, Elizabeth Thai, and Scott Maddux

013.002 U **Supracondylar process percent incidence in a modern forensic collection.** ¹Department of Anthropology, Baylor University, Waco, Texas, ²Department of Biological Sciences, Sam Houston State University, Huntsville, Texas, ³Department of Anthropology, Texas State University, San Marcos, Texas, **Kylie Adyson Mongan**¹, Stephanie Anne Baker^{2,3}, Timothy Lee Campbell¹

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013.003 U **The Prevalence of Afro-Cuban Religions and their Scope of Influence on the United States.** Texas A&M University, College Station, Texas. **Lilian Ferran**

013.004 U **Taphonomic analysis of micromammal skeletal part proportions and breakage patterns found within barn owl (*Tyto alba*) pellets from Bolts Farm, South Africa.** Baylor University, Waco, Texas. **Noah Dawson Wingate**, Garrett Cooper Croley, Timothy Lee Campbell

013.005 G **Quantitative analysis of coronal suture separation due to cranial trauma.** ¹Department of Biology, Sam Houston State University, Huntsville, Texas, ²Department of Anthropology, Baylor University, Waco, Texas, ³Department of Anthropology, Texas State University, San Marcos, Texas. **Stephanie Anne Baker**^{1,3}, Timothy Lee Campbell², Juan Diego Daza¹, Patrick John Lewis¹

013.006 N **Comparison of two packing methodologies for microfaunal mCT scanning.** ¹Baylor University, Waco, Texas; ²Sam Houston State University, Huntsville, Texas; ³Forensic Anthropology Center, Texas State University, San Marcos, Texas. **Timothy Lee Campbell**¹, Stephanie Anne Baker^{2,3}, Deborah Lenz Cunningham³, Juan Diego Daza²

Biomedical Sciences Posters:

013.007 U **Correlating CD30 Expression with Anti-CD30 BITE Induced Lysis.** ¹Texas Christian University, Fort Worth, Texas, Departments of ²Pediatrics and ³Biochemistry, Medical College of Wisconsin, WI, USA. **Alexandra Dunker**¹, Charles Hay², Mary Faber², and Jeffrey Medin^{2,3}

013.008 U **Nutritional Influence on Movement in *Drosophila Melanogaster*.** University of Mary Hardin-Baylor, Belton, TX. **Amanda Franks**, Seena S. Mathew

013.009 U **Detection and characterization of the cytotoxicity of novel compound NC2559 on cancer cell lines.** University of Texas at El Paso, El Paso, Texas. **Cristina Guerena**, Edgar Borrego and Dr. Renato J. Aguilera

013.010 U **Progressive Deterioration of Muscles in a Cachexia Tumor Model System with Focus on Myosin Heavy Chain.** Sam Houston State University, Huntsville, Texas. **Ellen Thompson**, Grace Stegemoller, Logan McDowell, Mardelle Atkins

013.011 U **The link between periodontal health and anti-inflammatory diet: an ongoing study.** Temple College, Temple, TX. **Glenda Panzieri** & Phillip Greco

013.012 G **Bacterial Community Profiling of *Ixodes scapularis* ticks from Western New York, USA.** Sam Houston State University, Huntsville, TX. **Rachel Porter**, Javier Gomez, Megan Burch, Luis M. Lopez Salazar, Alyssa Russell, Sebastian Juarez-Casillas, Grant Means, Aaron Lynne, Jeremy Bechelli

013.013 U **SARS-CoV-2 Spike Protein Sequence Variation Among Nonsymptomatic Test Subjects.** Abilene Christian University, Abilene, Texas. **Sierra Brock**, Daniella Martinez, Gracie Granados, and Joshua Brokaw

013.014 U **Core/Shell Superparamagnetic Nanoparticles and their Potential for Magnetic Hyperthermia Cancer Therapy.** University of Texas at El Paso, El Paso, Texas. **Siria Jansen**, Marcos Garcia, Yohannes Getahun, Ahmed A. El-Gendy

Cell and Molecular Biology Posters:

013.015 U **Exploration of the Hallmarks of Cancer in Mus musculus cell lines A9 and Mutated PA28y Deficient Cancer Clones.** Austin College, Sherman, Texas. **Brigid Fox**, Henry Neal, Lance Barton

013.016 G **Application of Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS) for Tracking Fecal Contamination by Pinnipeds.** University of Houston – Clear Lake, Houston, Texas. **Caroline Kmiecik**, Akshita Mirani, Michael G. LaMontagne

013.017 U **Testing Pine Oil as a Bio-friendly Substitute for Xylene in Histological Staining Techniques.** University of Houston – Downtown, Houston, TX. **Christina Nguyen**; Naghmeah Arezoo Foroghi; Taylor Han Nguyen; Adriana Patricia Visbal

013.018 U **Characterization of PA28y-deficient MEF Mutagenesis in Comparison with the 4T1 Breast Cancer Model.** Austin College, Sherman, Texas. **Electra Coffman**, Ray Vazquez, Lance Barton

013.019 U **A role for the neoblast in annelid regeneration.** University of the Incarnate Word, San Antonio, TX. **Fatima Ali** and Veronica Martinez Acosta

013.020 U **Mitochondrial defects can be rescued by Inhibiting Hippo signaling.** Sam Houston State University, Huntsville, TX. **Harris Obioma**, Peyton Brent, Felix Oppong, and Ellen Thompson, Mardelle Atkins

013.021 U **Application of matrix assisted laser resorption- time of flight to identification of rhizobacteria with beneficial traits.** University of Houston – Clear Lake, Houston, Texas. **Jerry Dale Purdon**, Michael Geary LaMontagne

013.022 U **Comparative study of the effect of weak magnetic field on size of bacteria.** University of Houston – Clear Lake, Houston, TX. **Kathryn Rutherford**, Dillon Cline, Samina Masood

013.023 U **Effects of thermal exposure and feeding status on metabolic and cardiovascular processes in pulmonate land snails.** Texas Lutheran University, Seguin, Texas. **Linden Claire Williamson**, Joceline Arleth Lopez, Kevin Bryan Tate

013.024 U **Spatial and temporal expression patterns of biliverdin reductase isoforms suggest potential developmental roles for these genes in zebrafish blood cell development.** Abilene Christian University, Abilene, Texas. **Macee Valtr**, Ashley Price, and Dr. Andrew Holowiecki

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- 013.025 U **Modelling, Cloning, and Expression of the J domain of *C. elegans* Rme-8 Protein.** Stephen F. Austin State University, Nacogdoches, Texas. **My Tran**, Bingbing Xiao, Madison Thornhill, Odutayo Odunuga
- 013.026 U **A Genetic Toolbox to Investigate Regeneration in *Lumbriculus variegatus*.** University of the Incarnate Word, San Antonio, TX. **Roman Barrera** and Veronica Martinez Acosta
- 013.027 U **Characterization of a Chaperonin Mutant.** University of Texas at El Paso, El Paso, TX. **Samantha Garcia**, Daniel von Salzen, and Ricardo Bernal
- 013.028 U **Glycoalkaloid solasonine as a target for SHH signaling to block MED12 mutant breast cancer oncogenesis.** University of the Incarnate Word, San Antonio, Texas. **Shivani Akula**, Marieke Burleson
- 013.029 U **Inhibition of the MRTF/SRF pathway negatively impacts skeletal muscle, cardiac muscle, and blood vessel development in zebrafish.** Austin College, Sherman, Texas. **Yasmine Bukhari**, Emily Davis, Sarah Joseph, Keegan Nichols, Eva Perez, Tawfeeq Shaik, Madison Taylor, and Kelli Carroll

Chemistry and Biochemistry Posters:

- 013.030 G **In-situ multi-residue derivatization and extraction of Per- and polyfluoroalkyl substances (PFASs) using stir bar sorptive extraction prior GC-MS analysis.** The University of Texas at El Paso, El Paso, Texas. **Ahsan Habib**, Wen-Yee Lee
- 013.031 U **An extended collection of lanthanide coordination polymers with functionalized terephthalate linkers.** Angelo State University, San Angelo, Texas. **Aidan Henry**, Mia Estelle Van Rheede van Oudtshoorn, Emma Rust, Matthias Zeller, and Ralph A. Zehnder
- 013.032 U **Implications of RecA binding in tuberculosis drug resistance.** Wayland Baptist University, Plainview, Texas. **Allison Alvarez-Garcia**, Kyle Rickman, Ellen Hamzy, Paxton Patterson, Dr. Robert Moore
- 013.033 N **Interference in Amyloid-Beta Peptide Aggregation by polyphenols.** Stephen F. Austin State University, Nacogdoches, TX. **Bidisha Sengupta** and Robert Friedfeld
- 013.034 G **Towards the rational design of redox properties of iridium photoredox catalysts.** The University of Texas at El Paso, El Paso, Texas. **Christian Sandoval-Pauker** and Balazs Pinter
- 013.035 U **New insight into the structural features and antitumor activity of Cu(II) complexes containing 4,4'-dimethoxy-2,2'-dipyridyl.** University of the Incarnate Word, San Antonio, Texas. **Daniel Lovasz**, Betsy Leverett, Hadi Arman and Rafael Adrian.
- 013.036 U **A Study of the Effects of an Ionic Liquid on the Synthesis of Biodiesel Fuels.** Stephen F. Austin State University, Nacogdoches, TX. **Elizabeth Gonzalez** and Russell J. Franks
- 013.037 G **Computational quest for effective smart molecular probes for ex-vivo early diagnosis of Alzheimer's disease.** University of Texas at El Paso, El Paso, Texas. **Gabriela Molina-Aguirre** and Balazs Pinter
- 013.038 U **Spectroscopic (FT-IR, UV-Vis, and Fluorescence) and HPLC-PDA Studies of Carbamazepine, Diclofenac and Ketoprofen.** Stephen F. Austin State University, Nacogdoches, Texas. **Gary Lopez**, Anthony Broom, and Kefa Onchoke
- 013.039 U **Microalgae-based Amendments: Extracts from Freshwater Microalgae Enhance Seed Germination and Abiotic Stress Response in Tomato.** University of the Incarnate Word, San Antonio, Texas. **Genevieve Tourelles**, Lauren Bomer, Kayla Brown, B.D. Leverett
- 013.040 U **Synthesis and Characterization of Biodiesel Fuels from Shellbark Hickory and Bitternut Hickory.** Stephen F. Austin State University, Nacogdoches, TX. **Gillian M. Bustos** and Russell J. Franks
- 013.041 G **Molecular Modeling of Covalent Bonding between Topiroxstat Analogs and Xanthine Oxidase.** Chemistry and Physics Department, University of Texas of Permian Basin, Odessa, TX. **Hans Ott**, Giovanni Jimenez, Chao Dong
- 013.042 U **Bacteriophage purification and propagation for *Pseudomonas Aeruginosa*,** University of Texas at El Paso, El Paso, TX. **Jesus Garcia**, Ricardo A. Bernal, Zacariah Hildenbrand
- 013.043 G **Investigating Substrate Inhibition of Enzymes Encapsulated within HK97 Virus-Like Particles.** University of Texas at Tyler, Tyler, Texas. **Joseph Lively**, Dustin Patterson
- 013.044 U **Mixed copper(II) phenanthroline-terpyridine complexes as antitumor agents.** University of the Incarnate Word, San Antonio, Texas. **Joseph Sulaica**, Betsy Leverett, Hadi Arman and Rafael Adrian
- 013.045 U **A Method for the Determination of Pesticides in Wastewater Samples with High Performance Liquid Chromatography with Photodiode-Array (PDA) and Fluorescence Detectors.** Stephen F. Austin State University, Nacogdoches, Texas. **Joshua Spencer Hamilton**, Kefa Karimu Onchoke
- 013.046 U **Quantification of Kaempferol Conjugates in Watercress Juice and Extract using HPLC and Protein Binding Studies.** Stephen F. Austin State University, Nacogdoches, TX. **Laken Simington** and Bidisha Sengupta
- 013.047 U **Agricultural Applications of Microalgae: Extracts from Marine Microalgae Enhance Seed Germination and Abiotic Stress Response in Tomato.** University of the Incarnate Word, San Antonio, Texas. **Lauren Bomer**, Genevieve Tourelles, Kayla Brown, B.D. Leverett
- 013.048 U **Quantification of Hydrolyzable Tannins in Hickory Nuts.** Stephen F. Austin State University, Nacogdoches, TX. **Macayla E. Guerrero** and Russell J. Franks

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- 013.049 U **Synthesis, characterization and antitumor activity of mixed palladium(II) phenanthroline-bipyridine complexes.** University of the Incarnate Word, San Antonio, Texas. **Mariana Araujo Rincon**, Betsy Leverett, Hadi Arman and Rafael Adrian
- 013.050 N **Combined effects of cationic porphine, dihydroxynaphthalene and Fe(III) in the presence of hydrogen peroxide as a potent anti-cancer agent against ovarian cancer.** ¹Department of Chemistry and Biochemistry, Stephen F. Austin State University, Nacogdoches, TX, USA; ²Department of Biological Sciences, Alcorn State University, Lorman, MS, USA. **Matibur Zamadar**, ¹Aqeeb Ali, ¹Jacob R Herschmann, ¹Michele Harris, ¹Laken Simington ¹Bidisha Sengupta, ²Debarshi Roy.
- 013.051 U **pH Effects of Beta-2-microglobulin Misfolding.** Austin College, Sherman, Texas. **Miranda Galvan**, Hersh Patel, Georgia Burton, John Richardson
- 013.052 U **Phosphates for protection, not detection: Development of a non-radiolabeled strand exchange assay.** Wayland Baptist University, Plainview, TX. **Paxton Patterson**, Allison Alvarez-Garcia, Dr. Robert Moore
- 013.053 G **On the origin of potential inversion of folded bianthrone: a solution-state DFT computational and theoretical study.** University of Texas at El Paso, El Paso, Texas. **Peter Girnt**, Balazs Pinter
- 013.054 G **Techno-economical study of Produced Water (PW) valorization in Hydraulic Fracturing.** The University of Texas at El Paso, El Paso, Texas. **Ramon Sanchez**, Zacariah Hildenbrand.
- 013.055 U **Synthesis of Two Different Hydrogels for UTI treatment.** University of Texas Permian Basin, Odessa Texas. **Reagan Hudson**, Milka Montes, Ph.D.
- 013.056 U **The Effect of Carbon Quantum Dots on the Structure of Intrinsically Disordered Proteins.** The University of Texas at El Paso, El Paso, Texas. **Salvador A. Valdez Jr.**, Gyan Narayan, Dr. Mahesh Narayan
- 013.057 U **Thermodynamic studies of dyes' adsorption of magnetite-carbon nano-onions composites for environmental remediation applications.** Sam Houston State University, Huntsville, Texas. **Sandra Simmons**, Ariel Van-Sertima, Adrian Villalta-Cerdas
- 013.058 U **The Impact of Carbon Nano Materials on Nascent Proteins.** The University of Texas at El Paso, El Paso, Texas. **Sofia A. Delgado**, Kaleigh J. Love, Olivia Fernandez-Delgado, Luis E. Echegoyen, Mahesh Narayan
- 013.059 U **Synthesis, Characterization, and electronic structure calculation on new synthesized Strandberg-Type POM (Polyoxometalate) Structure.** Sul Ross State University, Alpine, Texas. **Thomas Levrie** and Hong Young Chang
- 013.060 G **Structural and Biochemical Studies on Neurodegenerative Disease Related Protein, Heat Shock Protein 27.** The University of Texas at El Paso, El Paso, Texas. **Zhaobo Li**, Bianka A Holguin, Ricardo A. Bernal
- Conservation Ecology Posters:**
- 013.061 U **Constructing a plant species checklist for Castner Range, Texas and identifying important species through species distribution models.** The University of Texas at El Paso, El Paso, Texas. **Aparna Mangadu**, Mingna Zhuang, Michael Moody
- 013.062 G **Lack of response in Carolina Chickadee to Predator Scents.** Sam Houston State University, Huntsville, TX. **David Farris**, Hannah McNeese, Diane Neudorf
- 013.063 U **Plant Diversity in a Huisache-Dominated Area on the Weston Ranch, Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Jacob Sagstetter**, Mark Gustafson, and Alan Lievens
- 013.064 U **Biodiversity of Native Bees in Grayson Co., Texas.** Austin College, Sherman, Texas. **Keegan Nichols**, Ben Berggren, Frank Goodavish, Dr. Loriann Garcia
- 013.065 U **Mycoremediation with *Pleurotus ostreatus* and *Pluteus cervinus*.** Howard Payne University, Brownwood, Texas. **Madison Marzullo**
- 013.066 G **Examining the role of trap color on pollinator attraction: A test using yellow vane and colorless traps.** The University of Rio Grande Valley, Edinburg, Texas. **Satinderpal Kaur**, Adegboyega Fajemisin, Alejandro V Vasquez, Alexis Racelis, Rupesh Kariyat
- 013.067 G **Terrestrial vertebrate community structure within a restored habitat and conservation easement for the federally threatened eastern massasauga rattlesnake.** Sam Houston State University, Huntsville, Texas. **Zander E. Perelman**, Howard K. Reinert, and William I. Lutterschmidt
- 014. Judging Poster Session 2**
5:30 pm – 7:00 pm, Recreation and Wellness Center, 2nd floor track area
- Freshwater Science Posters:**
- 014.001 G **Spatiotemporal Distribution of Microplastics in an IRES System.** University of Texas at San Antonio, San Antonio, Texas. **Andre Felton**, Jeffrey Hutchinson
- 014.002 G **Removal of Nonylphenol from water using Activated Carbon-Alginate (AlgC) beads.** University of Texas at El Paso, El Paso, Texas. **Angelica Araly Chacon** and Wen-Yee Lee

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- 014.003 U **Stop escargo in San Antonio: developing best methodology for detecting *Pomacea maculata* using environmental DNA (eDNA).** Southwestern University, Georgetown, Texas. **Cynthia Bashara**, Lillian Dolapchiev, Matthew Barnes, and Romi Burks
- 014.004 U **Evaluation of complex and defined media for isolating representative bacteria from tributaries to Galveston Bay.** University of Houston-Clear Lake. **Jackeline Rodriguez** and Michael G. LaMontagne
- 014.005 U **Keep Austin snail-free: ongoing removal of *Pomacea maculata* and evaluation by eDNA.** Southwestern University, Georgetown, TX. **Katherine Henderson**, Abigail White, Lillian Dolapchiev, Cynthia Bashara, David Christie, and Romi Burks
- 014.006 G **Assessing the prevalence of leech attachment in a population of the federally-endangered Houston toad (*Bufo houstonensis*).** Texas State University, San Marcos, Texas. **Lawrence Bassett**, Ferris Zughaiyir, Dennis Richardson, Charlotte Hammond, Chris McAllister, and Michael Forstner
- 014.007 G **Expression of Oxidative/Nitrative Stress Biomarker and Renin Enzyme During RoundUp Exposure in Goldfish.** University of Texas Rio Grande Valley. **Md Imran Noor** and Md Saydur Rahman
- 014.008 U **Effect of stormwater management on terrestrial invertebrate biodiversity.** The University of Texas at San Antonio, San Antonio, Texas. **Morgan Leach**, Erika Dyèr, Isaiah Hernandez, Isabella Pangilinan, Felipe Urrutia, Tom McKissick V, Brian Laub
- 014.009 U **Invertebrate environmental DNA is more concentrated in the water column than the sediment in a freshwater lake.** Texas Tech University, Lubbock, Texas. **Paton Willbanks** and Matthew A. Barnes

Geosciences Posters:

- 014.010 G **Geochemical Signatures of Martian Shocked Calcium Phosphate Minerals: Impacts and Implications.** University of Houston – Clear Lake, Houston, Texas. **Ane Slabić**, Daniel Bryant Imrecke
- 014.011 U **Satellite and Drone mapping of fossil collecting areas of the Weches Formation in Nacogdoches County, Texas.** Stephen F. Austin State University, Nacogdoches, Texas. **Jacob Moore**, Luke Whitenburg, James McDaniel, Rick Shaw, David Kulhavy, and Russell LaRell Nielson
- 014.012 U **Drone Mapping and Outcrop Modeling of the Ladonia Fossil Park area, on the North Sulphur River, Texas.** Stephen F. Austin State University, Nacogdoches, Texas. **James McDaniel**, Luke Whitenburg, Jacob Moore, Rick Shaw, David Kulhavy, Russell LaRell Nielson
- 014.013 G **Assessment of the Shannon information content of reflective solar hyperspectral radiances for cirrus cloud retrievals.** Texas A&M University, College Station, TX. **Jeffrey Mast**, Ping Yan
- 014.014 G **Analysis of Microplastics in Hailstones from Two Supercell Thunderstorms.** University of Texas at San Antonio, San Antonio, Texas. **Thomas Nordstrand**, Andre Felton, Stephen Ackley, Jeffrey Hutchinson, Yongli Gao

Marine Science Posters:

- 014.015 U **Superorder Batoidea (Skates and Rays) Biodiversity Along the Texas Gulf Coast.** Texas Tech University, Waco, Texas. **Alyssa Brooke Clay**, Camille Marie Gonzalez, Stephanie Anne Lockwood
- 014.016 G **Ocean Phytoplankton as an essential variable in climate system: An Earth System Model Study.** Texas A&M University, College Station, Texas. **Jian Wei**, Ping Yang
- 014.017 U **Handling of Sharks by Recreational Tournament and Nontournament Fishers on the Texas Gulf Coast: Differences in Shark Lengths, Injuries, and Illegal Species Captured.** Baylor University, Waco, Texas. **Maria Calcote**, Yunji Xu, and Dr. Susan Bratton
- 014.018 N **Hypoxia-induced cellular apoptosis, ssDNA/dsDNA breaks and DNA methylation in red snapper.** University of Texas Rio Grande Valley, Brownsville, Texas. **Md Saydur Rahman**
- 014.019 G **Effects of tributyltin on oxidative-nitrative stress, 8-OHdG and dsDNA expressions in the American oyster.** University of Texas Rio Grande Valley, Brownsville, Texas. **Mohan Kumar Dash** and Md Saydur Rahman
- 014.020 G **Genetic Ecology of the Dwarf Seahorse (*Hippocampus zosterae*) in Texas.** ¹University of Houston – Clear Lake, Houston, Texas, Environmental Institute of Houston, ²University of Houston – Clear Lake, Houston, College of Science and Engineering, ³U.S. Fish and Wildlife Service – Dexter, NM, Southwestern Native Aquatic Resources and Recovery Center, ⁴The Pew Charitable Trusts – Washington, District of Columbia. **William Greyson Dennis**^{1,2}, Steven Mussmann³, Nathan Fedrizzi⁴, Brian Stephens^{1,2}, Jenny Oakley¹, George Guillen^{1,2}

Mathematics and Computer Science Posters:

- 014.021 U **Supraventricular Tachycardia Study Using a Dynamic Computer-Generated Atrium.** Tarleton State University, Stephenville, Texas. **Gavin McIntosh**, Avery Campbell, Bryant Wyatt
- 014.022 U **Making Unbiased Maps to Pass the Eyeball Test via MCMC Redistricting.** Tarleton State University, Stephenville, Texas. **Vianey Rangel**, Cody Drolet, Scott Cook

Neuroscience Posters:

- 014.023 U **Optimizing 6-Hydroxydopamine Concentrations for induction of a Parkinson's Disease Like Behavior in Zebrafish.** University of Texas at Tyler, Tyler, Texas. **Adrian Romero**, Justin Hunt, Brent R. Bill, Ayman K. Hamouda

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Program Schedule

- 014.025 U **Ethanol tolerance in honey bees.** University of Texas Rio Grande Valley, Edinburg, Texas. **Angel Salinas**
- 014.026 U **Creation of a CRISPR/CAS9 Construct to Mutate *stox2* in Zebrafish.** The University of Texas at Tyler, Tyler, Texas. **Armando Sanchez**, Zoe Rain Williams, and Brent Roy Bill
- 014.027 U **CRISPR/CAS9 Generation for the Zebrafish, *ahdc1* Gene.** The University of Texas at Tyler, Tyler, Texas. **Bethany Marie Woolman** and Brent Roy Bill
- 014.028 U **Photoreception in the aquatic oligochaete, *Lumbriculus variegatus*.** University of the Incarnate Word, San Antonio, TX. **Emma Vequist** and Veronica Martinez Acosta
- 014.029 U **Expression of rhodopsin and opsin in late-stage epigeal and hypogean salamander embryos.** Texas State University San Marcos, Texas. **Evelyn Delcid-Morales**, Diana Emely Wiebe, Ruben Tovar, David M. Hillis, Dana M. Garcia
- 014.030 G **Investigating the mechanisms responsible for turnover of the ER stress sensing protein PERK.** University of Texas Health Science center, San Antonio, Texas. **Hema Manogna Gudlavalleti**, Brian Stoveken, Rathipriya Viswanathan, Srikanth Reddy Polusani, James Lechleiter
- 014.031 U **Changes in myelination during neural regeneration in *Lumbriculus variegatus*.** University of the Incarnate Word, San Antonio, TX. **Journie Gaeta** and Veronica Martinez Acosta
- 014.032 U **Changes in synaptic protein expression during neuronal regeneration.** University of the Incarnate Word, San Antonio, TX. **Kaelin Connolly** and Veronica Martinez Acosta
- 014.033 U **Efficacy of a transcranial photobiomodulation (PBM) light-emitting diode (LED) device on oxygenated hemoglobin and oxidized cytochrome c oxidase using broadband Near-Infrared Spectroscopy (bbNIRS).** The University of Texas at Austin, Austin, Texas. **Allan Frederick**, Roger Davis, Douglas W. Barrett, Patrick O'Connor, Turner Lime, and Francisco Gonzalez-Lima
- 014.034 G **Electrophysiological Effects of Transcranial Infrared Laser Stimulation.** University of Texas at Austin, Austin, Texas. **Dariella Fernandez**, Douglas W. Barrett, Laura Gamboa, Allan Frederick, Francisco Gonzalez-Lima
- 014.035 G **Beneficial effects of transcranial infrared laser stimulation on mitochondrial cytochrome c oxidase and cerebral oxygenation in older bipolar patients.** The University of Texas at Austin, Austin, Texas. **Douglas W. Barrett**, Courtney M. O'Donnell, Patrick O'Connor, and Francisco Gonzalez-Lima
- 014.036 G **Impacts of transcranial infrared laser stimulation (TILS) on prefrontal cortex functional connectivity and cognition in patients with bipolar disorder.** University of Texas, Austin, Texas. **Laura Gamboa**, Roger E. Davis, Douglas W. Barrett, Patrick O'Connor, Turner Lime, and Francisco Gonzalez-Lima.
- 014.037 G **Quantifying bilateral prefrontal photoneuromodulation via broadband near-infrared spectroscopy.** The University of Texas at Austin, Austin, Texas. **Patrick O'Connor**, Turner Lime, Douglas W. Barrett, and Francisco Gonzalez-Lima
- 014.038 G **Effects of transcranial infrared laser stimulation (TILS) on sustained attention in adults with attention deficit hyperactivity disorder (ADHD).** The University of Texas at Austin. **Roger Davis**, Zachary Wade, Douglas W. Barrett, and Francisco Gonzalez-Lima.
- 014.039 N **Determining the duration of effect of transcranial infrared laser stimulation with functional near-infrared spectroscopy.** The University of Texas at Austin, Austin, Texas. **Turner Lime**, Patrick O'Connor, Roger E. Davis, Douglas W. Barrett, Francisco Gonzalez-Lima
- 014.040 G **Metabolic mapping of rat brain activity after transcranial infrared laser stimulation.** The University of Texas at Austin, Austin, Texas. **Zachary S. Wade**, Douglas W. Barrett, Sindhu Venkat, F. Gonzalez-Lima
- Physics and Engineering Posters:**
- 014.041 U **Density Perturbation of the Early Universe.** University of Houston - Clearlake, Houston, Texas. **Aleisha Warren**, Dr. David Garrison
- 014.042 U **Effect of Weak Magnetic Fields on Protein Structure.** University of Houston - Clear Lake, Houston, TX. **Dillon Cline**, Kathryn Rutherford, and Samina Masood
- 014.043 U **PIG Pipe Cleaning Device.** University of Houston-Clear Lake, Houston, Texas. **Glenda Rubio**, Jaseem Muhammad, Aline Lira, Martin Demaret, Ryan Jarnagin, Ariful Bhuiyan
- 014.044 U **Ultrasonic Thickness Measurement - Telescoping Attachment Bracket.** University of Houston - Clear Lake. **Modesto Rojas**, James Colson, Reid Mills, Nancy Ainslie, Wagemee Fernando, Dr. Ariful Bhuiyan
- 014.045 U **Human Knee Joint Simulator.** University of Houston-Clear Lake, Houston, Texas. **Salvador Talavera-Mejia**, Daniel Ponce, Matthew Paine, Colton Picazo, Linda Jimenez, Miguel Guzman
- Plant Biology Posters:**
- 014.046 U **Patterns of Historical Migration in *Mentzelia thompsonii* (Loasaceae) Based on Climate Niche Reconstructions.** Abilene Christian University, Abilene, Texas. **Brianna Douglas**, Gracie Granados, Katie Howe, and Joshua Brokaw
- 014.047 U **DNA Barcoding of Plant Specimens in Poaceae from Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Crystal Rauschuber**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez

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- 014.048 U **DNA Barcoding of *Amaranthus* Plant Specimens from Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **JaMaurey Webster**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez
- 014.049 U **Induced Defenses in Sorghum Defense Mechanisms And their Effects on Aphid Growth and Reproduction.** University of Texas Rio Grande Valley. **Jessica Ayala**, Isabella Rodriguez, Rupesh Kariyat, Sajjan Grover, and Joe Louis
- 014.050 U **DNA Barcoding of Plant Specimens in Fabaceae from Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Mattison Young**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez
- 014.051 U **Geographic Patterns of Genetic Diversity in *Mentzelia thompsonii* (Loasaceae).** Abilene Christian University, Abilene, Texas. **Megan Howard**, Brianna Douglas, Katie Howe, and Joshua Brokaw
- STEM Education Posters:**
- 014.052 N **Learning through Writing: A Three-Phase Project to Improve the Performance of Student Lab Report Writing in Undergraduate Chemistry Lab Courses.** University of the Incarnate Word, San Antonio, Texas. **Alakananda Ray Chaudhuri**, Betsy Leverett, Kayla Brown, and Rafael Adrian
- 014.053 U **Chemical composition of copper-tin-aluminum alloys from a system of three equations in three variables via non-destructive sample analysis.** Sam Houston State University, Huntsville, TX. **Ariel Van-Sertima**, Raul Zablah-Vasquez, Sandra Simmons, Adrian Villalta-Cerdas
- 014.054 N **Learning through teaching: incorporating community engagement into biology classes.** Sam Houston State University, Huntsville, TX. **Diane Neudorf**
- 014.055 U **Teaching the Fourier Transform to senior students in Instrumental Analysis using Microsoft Excel.** Stephen F. Austin State University, Nacogdoches Texas. **Hailey Rene Marion**, Darrell Ray Fry
- 014.056 U **Understanding density and viscosity of aqueous solutions in the chemistry laboratory.** Sam Houston State University, Huntsville, Texas. **Raul Zablah-Vasquez**, Jacqueline Jimenez, Adrian Villalta-Cerdas
- Systematics and Evolutionary Biology Posters:**
- 014.057 G **The origin and evolution of beta-keratins.** The University of Texas at Tyler, Tyler, Texas. **Amanda R. Odom**, Matthew J. Greenwold
- 014.058 U **Pax6 expression among sighted and blind salamanders of the genus *Eurycea*.** Texas State University, San Marcos, Texas & The University of Texas, Austin, Texas. **Brittany Dobbins**, Emily Floyd, Muhammad Rehan, Emely Wiebe, Ruben Tovar, David Hillis, and Dana Garcia
- 014.059 U **Assessment of fossil rodent dentary elements found in Friesenhahn Cave (San Antonio, Texas).** Concordia University Texas, Austin, Texas. **Logan Eric Durrenberger** and Mary Kay Johnston
- 014.060 U **Skull Anatomy of a Gecko from Australia (*Ophidiocephalus*).** Sam Houston State University, Huntsville, Texas. **Makayla Hernandez**, Eric Pianka, Aaron M. Bauer, Juan D. Daza
- 014.061 U **Morphometric characterization of a hybrid gecko from Puerto Rico.** Sam Houston State University - Huntsville, TX. **Olivia Heide**, Alexandra Herrera-Martínez, Tony Gamble, Brendan Pinto, and Juan Diego Daza
- 014.062 U **Bioengineering Microbes Using Natural Selection to Terraform Mars.** Texas Lutheran University, Seguin, TX. **Spencer A. Lee**, Robert M. Jonas
- Terrestrial Ecology and Management Posters:**
- 014.063 G **Mechanical disturbances have differential effects on *Solanum elaeagnifolium*, making it a Super Weed Candidate by Improving Fitness and Defense Traits in the Lower Rio Grande Valley.** University of Texas Rio Grande Valley. **Alejandro Vasquez**, Jesus Chavana, S. Singh, B. O. Christoffersen, A. Racelis, and Rupesh Kariyat
- 014.064 U **Climate sensitivity and missing rings in Douglas fir (*Pseudotsuga menziesii*) tree-rings near Cloudcroft, NM.** Wayland Baptist University, Plainview, TX. **Bruna A. Moureira**, Matthew S. Allen
- 014.065 U **Interaction between co-occurring populations of raccoons (*Procyon lotor*) and Virginia opossums (*Didelphis virginiana*) in an urban ecosystem.** East Texas Baptist University. **Cameron Castles** and Troy A Ladine
- 014.066 U **Comparison of Bacteria Growth in Different Dog Bowls.** Howard Payne University, Brownwood, Texas. **Kaitlyn Drewniok**
- 014.067 U **Helminth parasites and body condition in brown-headed cowbirds (*Molothrus ater ater*).** Sam Houston State University, Huntsville, Texas. **Maria Hendrickson**, Tamara Cook, and Diane Neudorf
- 014.068 U **Effects of Huisache Removal in Areas of Blackland Prairie Restoration in Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Michael Anthony Lopez**, Mark Gustafson, and Alan Lievens
- 014.069 N **A global account of scale insects on grasses.** Texas A&M University-Kingsville (TAMUK), Kingsville, TX. **Richard James Wilson Patrock**

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014.070 U **Chigger Mite Prevalence in Texas Chirping Frogs Based on Citizen Science.** Southwestern University, Georgetown, Texas. **Sydney Cole**, Emma Kesterson, Claire Bason, Gina Ramirez, Benjamin Pierce

014.071 G **Efficacy of late summer prescribed burn and growing season grazing as a prairie restoration technique in south Texas.** University of Texas at San Antonio, San Antonio, TX. **Tom McKissick V**, Gwen Young, O. W. Van Auken, Brian G. Laub

Sponsor Presentations (Blue Origin and Halliburton) with pizza/drinks available, Recreation and Wellness Center, first floor
7:00 p.m. – 8:00 p.m.

SATURDAY, FEBRUARY 26, 2022

Meeting Registration

7:00 am – 10:00 am, Recreation and Wellness Center, main entrance

Past Presidents Breakfast

7:00 am – 8:00 am, Forest room, Bayou Bldg.

015-023. Oral Paper Session 2

8:00 am – 10:15 am, all rooms listed below are in Bayou Building

015. Biomedical Sciences Oral Section 2 and Section Meeting

8:00 am to 9:15 am, Room 1213

8:00 015.001 G **A Reliable SOP for Urine Biomarkers Within Storage and Sampling Analyses.** University of Texas at El Paso, El Paso, Texas. **Kiana Holbrook**, Wen-Yee Lee

8:15 015.002 U **Incapacitating Sars-Cov-2 Delta Variant (B.1.617) By Developing mRNA Vaccines Through EteRNA RNA Folding Software.** **Robert Klupka**, Robert Miranda

8:30 015.003 U **Biomedical Stereolithographic Structure Stiffness.** University of Houston Clear-Lake, Houston, TX. **Roman Sustaita**, Edgar Antonio Castillo, Dr. Ariful Bhuiyan

8:45 015.004 U **Novel Isolation Method and Characterization of Trabecular Meshwork Cells.** University of Houston-Victoria. **Thanh Le**, Karen Zuniga, Hope Figueroa, Colleen McDowell, Humberto Hernandez

9:00 **Biomedical Sciences Section Meeting**

016. Cell and Molecular Biology Oral Section 2 and Section Meeting

8:00 am to 9:30 am, Room 1324

8:00 016.001 U **Inhibition of Autophagy in Human Microvascular Endothelial Cells during Colorado Tick Fever Virus Infection.** Sam Houston State University, Huntsville, Texas. **Christian Miller**, Alyssa Russell, Jeremy Bechelli

8:15 016.002 G **Investigating the role of NOXA and PUMA during CTFV induced apoptosis in HMEC-1.** Sam Houston State University, Huntsville, Tx. **Sebastian Juarez Casillas**, Sarah Owen, Alyssa Russel, Jeremy Bechelli.

8:30 016.003 G **Development of a SYBR Green-Based RT-qPCR for the Detection and Quantification of Lone Star Virus.** Sam Houston State University, Huntsville, Texas. **Megan Burch**, Jeremy Bechelli

8:45 016.004 G **Colorado Tick Fever Virus Mediated Apoptosis in Human Endothelial Cells.** Sam Houston State University, Department of Biological Sciences, Huntsville, TX. **Sarah Owen**, Alyssa Russell, Jeremy Bechelli

9:00 016.005 G **Infection of Human Endothelial Cells with Colorado Tick Fever Virus Stimulates Cyclooxygenase 2 Expression and Vascular Dysfunction.** Sam Houston State University, Huntsville, Texas. **Stephanie Beane**, Luis Grado, Alyssa Russell, Jeremy Bechelli

9:15 **Cell and Molecular Biology Session Meeting**

017. Chemistry and Biochemistry Oral Section 2

8:00 am to 9:15 am, Room 1218

8:00 017.001 N **Using Density Functional Theory to compute the energetics of and analyze the excited- and ground state electron transfer processes of ruthenium(II) photoredox catalysts.** The University of Texas at El Paso, El Paso, Texas. **Balazs Pinter**

8:15 017.002 G **Rational design of the redox properties of homogeneous and heterogeneous Cu(I) photoredox catalysts.** University of Texas at El Paso, El Paso, Texas. **Christian Sandoval-Pauker** and Balazs Pinter

8:30 017.003 G **Tandem photoredox catalysis of [Ir(ppy)₂(dtb-bpy)]⁺: Identifying the co-catalyst by DFT.** University of Texas at El Paso, El Paso, Texas. **Daniel Gómez Bustos**, Balazs Pinter

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8:45 017.004 G **Computational Investigation of the Preferred Binding Modes of N₂O in Group 9 and 10 Metal Complexes.** Stephen F. Austin State University, Nacogdoches, Texas. **Cole Donald**, and John Brannon Gary

9:00 017.005 G **Killing the Switch that Controls Hsp60's Refolding Ability.** University of Texas at El Paso, El Paso TX. **Daniel von Salzen**, Alejandro Rodriguez, Jinliang Wang, Bianka Holguin, and Ricardo Bernal

018. Conservation Ecology Oral Section 1

8:00 am to 10:00 am, Room 1326

8:00 018.001 G **Do Anthropogenic Stressors Affect Distribution of Alligator Snapping Turtles (*Macrochelys temminckii*) In Texas?: Preliminary Study Design.** University of Houston-Clear Lake, Houston, Texas, ¹College of Science and Engineering, ²Environmental Institute of Houston, ³SWCA Environmental Consultants, Houston, Texas, ⁴Texas Turtles, Grand Prairie, Texas. **Kelly Garcia**¹, Mandi Gordon², Eric Munscher³, Arron Tuggle³, Carl Franklin⁴, Viviana Ricardez⁴, and George Guillen^{1,2}

8:15 018.002 G **Preliminary Analyses of Landscape-Scale Impacts on Western Chicken Turtles (*Deirochelys reticularia miaria*) in Texas.** University of Houston – Clear Lake, Houston, Texas. ¹College of Science and Engineering. ²Environmental Institute of Houston. **Danielle DeChellis**^{1,2}, Mandi Gordon², and Dr. George Guillen^{1,2}

8:30 018.003 G **Birds eye view: preliminary use of small unmanned aerial systems (sUAS) for aquatic turtle surveys.** University of Houston Clear Lake, Houston, Texas. **Jason Nagro**, Mandi Gordon, and Marc Mokrech, George Guillen

8:45 018.004 G **Floating treatment wetlands: A pilot-study of the stormwater treatment potential in urban catchments in a subtropical environment.** ¹Environmental Institute of Houston, University of Houston – Clear Lake, Houston, Texas, ²College of Science and Engineering, University of Houston – Clear Lake, Houston, Texas, ³Harris County Flood Control District, Houston, Texas. **Kaylei Chau**^{1,2}, Jenny Oakley¹, Roberto Vega³, George Guillen^{1,2}

9:00 018.005 G **Restoring native prairie species to a degraded habitat on UHCL campus – finding the most effective and the most cost-effective method.** University of Houston Clear Lake, Houston, Texas. **Rowena McDermid**, Wendy Reistle, and Cindy Howard

9:15 018.006 G **Comparison of Species Presence Found using Physical Specimens Collected versus using eDNA Methods.** University of Texas at Tyler, Tyler, Texas. **Schi-Lee Smith**, Joshua Banta, Nathan Schubert, Katrin Kellner

9:30 018.007 G **The population genetics of Mississippi Kites (*Ictinia mississippiensis*) within the Great Plains.** Angelo State University, San Angelo, TX. **Brittanie Loftin**, Dr. Ben Skipper

9:45 018.008 G **Investigating the role of cover-cash crop rotations on arthropod community dynamics in Lower Rio Grande Valley.** University of Texas Rio Grande Valley, Edinburg, Texas. **Adegboyega Fajemisin**, Satinderpal Kaur, Alexis Racelis, Rupesh Kariyat

019. Marine Science Oral Section and Section Meeting

8:00 am to 9:45 am, Room 1217

8:00 019.001 N **Estimating and Defining Environmental Flow Needs for Texas Estuaries: new information and approaches.** University of Houston Clear Lake, Houston, Texas. **George Guillen**

8:15 019.002 G **Estimating abundance of microplastics in surface waters and sediments of the Galveston Bay watershed.** ¹University of Houston – Clear Lake, Houston, Texas, Environmental Institute of Houston, ²University of Houston – Clear Lake, Houston, College of Science and Engineering, ³Turtle Island Restoration Network – Galveston, Texas. **Emily Cox**^{1,2}, Joanie Steinhaus³, Kimber De Salvo Anderson³, George Guillen^{1,2}

8:30 019.003 N **Extensive Field Effort Using a Novel Gear Type to Detect Recruitment of American Eel (*Anguilla rostrata*) in Texas.** ¹Environmental Institute of Houston, University of Houston – Clear Lake, Houston, Texas, ²College of Science and Engineering, University of Houston – Clear Lake, Houston, Texas, ³Texas Parks and Wildlife Department, River Studies Team, San Marcos, Texas. **Jenny Oakley**¹, Justin Hansen^{1,2}, Tito Molina^{1,2}, Stephen Curtis³, George Guillen^{1,2}

8:45 019.004 G **Relationship between Seagrass and Dwarf Seahorse (*Hippocampus zosterae*) Abundance and Distribution in Texas.** University of University of Houston – Clear Lake, Houston, Texas, ¹College of Science and Engineering, ²Environmental Institute of Houston. **Story Leshner**^{1,2}, Jenny Oakley², George Guillen^{1,2}

9:00 019.005 G **Teleost and Elasmobranch Diversity Along the Texas Coastline: eDNA and Metabarcoding.** Texas Tech University, Lubbock, Texas. **Madelyn Knauss**, Stephanie Lockwood

9:15 019.006 N **Effects of salinity on distribution and epidermal integrity of bottlenose dolphins (*Tursiops truncatus*) in Galveston Bay, Texas.** Environmental Institute of Houston, University of Houston Clear Lake, Houston, Texas. **Kristi Fazioli** and Vanessa Mintzer

9:30 **Marine Science Section Meeting**

020. Mathematics and Computer Science Oral Section and Section Meeting

8:00 am to 10:00 am, Room 1135

8:00 020.001 G **Modeling Volcanic and Earthquake Data with A 3-Component Superposed Ornstein-Uhlenbeck SDE driven by a Lévy process.** University of Texas at El Paso, El Paso, Texas. **William Kubin**, Peter Kwadwo Asante, Osei Kofi Tweneboah, Maria Christina Mariani

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- 8:15 020.002 G **Bio-medical Signals: Cantor Detrended Fluctuation Analysis.** University of Texas at El Paso, El Paso, Texas. **William Kubin**, Peter Kwadwo Asante, Joe Guthrie, Osei Kofi Tweneboah, Maria Christina Mariani
- 8:30 020.003 U **Improving Recombination MCMC For Texas Political Redistricting.** Tarleton State, Stephenville, Tx. **Cody Drolet**, Vianey Rangel, Dr. Scott Cook
- 8:45 020.004 G **Understanding Social Determinants of Health using Machine Learning Algorithms.** Tarleton State University, Stephenville, Texas. **Brandon Phillip Amerine**, Nicholas Alexander Petela, and Jesse Crawford
- 9:00 020.005 G **Fourier Series in the Complex Plane.** Stephen F. Austin State University, Nacogdoches, TX. **Cadey Widacki**, Dr. Jonathan Mitchell
- 9:15 020.006 U **Using DonkeyCar to Conduct Feasibility Tests on Models Trained in a Simulator for Autonomous Driving.** University of the Incarnate Word, San Antonio, Texas. **Natalie Myers**, Srikanth Vemula, Dr. Michael Frye
- 9:30 020.007 U **Arithmagic Squares.** Wayland Baptist University, Plainview, Texas. **Emily Franklin**, Levi Kasner, Dr. Chris Thornhill
- 9:45 **Mathematics and Computer Science Section Meeting**

021. Geosciences Oral Section and Section Meeting

8:00 am to 10:00 am, Room 1211

- 8:00 021.001 G **Identification of the Pleistocene Fauna from McFaddin Beach, TX.** Sam Houston State University, Huntsville, Texas. **Deanna Flores**, William Godwin, Christopher J. Bell, and Patrick J. Lewis
- 8:15 021.002 N **A re-estimate of the total length of the holotype of the Pliocene bowhead whale *Baleana ricei*.** Lamar University, Beaumont, Texas. **James Westgate**
- 8:30 021.003 N **Distribution and Significance of Ripple Marks on the Beach Face in Sea Rim State Park, Texas.** Stephen F. Austin State University, Nacogdoches, Texas. **Russell LaReil Nielson**
- 8:45 021.004 U **Thermodynamic and Kinetic Promoters/Inhibitors for Nucleation of Gas Clathrates: Halogenation in the Presence of Salts Combined with Carbon Dioxide Injection.** Stephen F. Austin State University, Nacogdoches, Texas. **Kason Malone**, Julie Bloxson, and Russell Nielson
- 9:00 021.005 G **Shape Factor Parameterizations of the Edge Effect Correction Using the Debye Series for Super-spheroids to Represent Convex Particles.** Texas A&M University, College Station, Texas. **Nancy Okeudo**, Jiachen Ding, Ping Yang, Ramalingam Saravanan
- 9:15 021.006 N **A microphysics-based snow optical parameterization scheme for the Community Radiative Transfer Model.** Texas A&M University, College Station, TX. **Tong Ren**, Jiachen Ding, James Coy, Ping Yang
- 9:30 021.007 U **Geologic and Geomorphological Interpretation of the Mare Orientale Impact Basin Region of Earth's Moon.** Department of Geology, Stephen F. Austin State University, Nacogdoches, Texas. **Kyla S. Gray**, Melinda S. Faulkner
- 9:45 **Geosciences Section Meeting**

022. STEM Education Oral Section 1

8:00 am to 10:00 am, Room 1313

- 8:00 022.001 N **Career paths of STEM biomedical minority students in an undergraduate research program at a large HIS.** University of Texas at El Paso, El Paso, Texas. **Angelica Monarrez**, Aleida Ramirez, Danielle Morales, Lourdes Echevoyen, and Amy Wagler
- 8:15 022.002 N **How a Hispanic Serving Institution is building scholars to increase diversity in the biomedical research workforce.** University of Texas at El Paso, El Paso, Texas. **Angelica Monarrez**, Clarissa Valles, Lourdes Echevoyen, Danielle Morales, and Amy Wagler
- 8:30 022.003 N **Texas Academy of Science and the new Texas Science and Engineering Practices.** Texas State University, San Marcos, TX. **Sandra West Moody**
- 8:45 022.004 N **Revision of the Texas Science Standards: A Perspective of a Texas State Board of Education Member.** Texas State University, San Marcos, TX. **Matt Robinson**, Sandra West
- 9:00 022.005 N **The Revision of the K-12 Science TEKS: Texas Science Education Leadership Association.** Texas State University, San Marcos, TX. **Joey Belgard**, Sandra West
- 9:15 022.006 N **Academic community supports undergraduate success, especially during the isolation of a pandemic.** University of the Incarnate Word, San Antonio, TX. **Julian Davis** and Rachell Booth (co-PIs)
- 9:30 022.007 N **University Retention, Graduation and Success. Intervention in years 1 and 2 Crucial.** The University of Texas at El Paso, El Paso, Texas. **Keith H. Pannell** and Denise Carrejo
- 9:45 022.008 N **STEM Majors Experiencing K-8 Lesson Plan Development & Implementation.** Lamar University, Beaumont, TX. **Mamta Singh**

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023. Systematics and Evolutionary Biology Oral Section 1

8:00 am to 9:30 am, Room 1215

8:00 023.001 G **Comparative eye development during late-stage embryogenesis in divergent *Eurycea* species.** The University of Texas at Austin, Austin, TX. **Ruben U. Tovar**, and David M. Hillis

8:15 023.002 G **Investigating signal color polymorphism in the desert lizard, *Urosaurus ornatus*.** The University of Texas at Austin, Department of Integrative Biology, Austin, Texas. **Britt White** and David Hillis

8:30 023.003 G **Two New Species of *Pyrgulopsis* Springsnails Found in the Rio Grande Watershed.** The University of Texas Rio Grande Valley, Edinburg, Texas. **Houston Glover**, Manuel Spor Leal, Benjamin Hutchins, Benjamin Schwartz, Rebecca Chastain, Kathryn Perez

8:45 023.004 N **Sorting out the “tall” aquifer and cave snails from Central Texas.** University of Texas Rio Grande Valley, Edinburg, Texas. **Kathryn E. Perez**, Pete Diaz, Randy Gibson

9:00 023.005 G **A preliminary review of the distribution of the freshwater algal species *Sheathia involuta* (Rhodophyta: Batrachospermales) from the southwestern U.S. and northern Mexico.** Angelo State University, San Angelo, TX. **Bethany Skye Guajardo**, Ned Strenth

9:15 023.006 U **Comparative Genomic Analysis of Cryptophyte Algae Plastid Genomes.** The University of Texas at Tyler, Tyler, Texas. **Prabhat Kattel**, Matthew J. Greenwold

024. Coffee Break 2

10:15 am – 10:30 am, Atrium 2, Bayou Building

025-030. Oral Paper Session 3

10:30 am – 12:45 am, all rooms listed below are in Bayou Building

025. Chemistry and Biochemistry Oral Section 3 and Section Meeting

10:30 am to 11:45 am, Room 1218

10:30 025.001 G **Catalytic Studies of the Oxidation of Organic Substrates Using Iron-Tetradentate Amine Complexes.** Stephen F. Austin State University, Nacogdoches, Texas. **Grace Milem**, and John Brannon Gary

10:45 025.002 G **Progress toward the design, synthesis, and analysis of paired coiled-coil peptidic molecular building blocks exhibiting controlled self-assembly.** The University of Texas at Tyler, Tyler, Texas. **Jason DiStefano**, Dustin Patterson, Sean C. Butler

11:00 025.003 G **Exploration of perfluoro surface modifying agents for super-hydrophobic applications.** The University of Texas at Arlington, Arlington, Texas. **Oluchukwu Virginia Igboenyasi**, Frederick MacDonnell.

11:15 025.004 N **Lanthanide coordination polymers with interstitial solvent molecules.** Angelo State University, San Angelo, Texas. **Ralph Zehnder**

11:30 **Chemistry and Biochemistry Section Meeting**

026. Conservation Ecology Oral Section 2 and Section Meeting

10:30 am to 12:45 pm, Room 1326

10:30 026.001 U **Monitoring the Increase in Biodiversity of Urban Forests by Observing Aves and Vegetation: Oak Point Nature Preserve Plano, TX.** Collin College, Plano, TX. **Katelyn Danielle Perkins**, Tamara Basham

10:45 026.002 U **Nestling begging behaviors and body condition of the Carolina wren in a rural and an urban environment.** Sam Houston State University, Huntsville, Texas. **Sara Moore**, Dr. Diane Neudorf

11:00 026.003 U **Chemical Analysis of Volatile Organic Compounds in Urine of Multiple Canid Species.** Hardin-Simmons University, Abilene, TX. **Adrianna Simpson** and Wendi Wolfram

11:15 026.004 U **The Effect of Chinaberry (*Melia azedarach*) Leaves and Bark on Texas Native Crayfish.** Schreiner University, Kerrville, TX. **Halli Lovell**, Noah Hawkins, Giovanna Barragan, and Rachel Rompel, and Chris Distel

11:30 026.005 G **Modeling the potential impact of climate change on range expansion in *Eleutherodactylus cystignathoides* and *E. planirostris* (Anura).** The University of Texas Rio Grande Valley, Edinburg, Texas. **Rebecca T. Chastain**, Gisel Garza, Drew R. Davis, & Teresa Patricia Feria Arroyo

11:45 026.006 U **Snake Fungal Disease Caused by the Fungal Pathogen *Ophidiomyces Ophidiocola* in East Texas.** The University of Texas at Tyler, Tyler, TX. **Lezley Hart**, Michele Nolen, Joseph Glavy, and Alan Lizarraga

12:00 026.007 G **Dietary analysis of the imperiled Rio Grande cooter (*Pseudemys gorzugi*) from west Texas, with an examination of its isotopic niche relative to the syntopic red-eared slider (*Trachemys scripta elegans*).** Texas State University, San Marcos, Texas. **Lawrence Bassett**, Weston Nowlin, Daniel Foley, Ivana Mali, and Michael Forstner.

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12:15 026.008 N **Nose to the Ground: Using Detector Dogs to Sniff Out the Cryptic Western Chicken Turtle (*Dierochelys reticularia mearnsi*).** ¹Environmental Institute of Houston, University of Houston-Clear Lake, Houston, Texas, ²SP8 Ecoservices, Jefferson, Texas. **Mandi Gordon**¹, Laura Speight², and Ashley Collins²

12:30 **Conservation Ecology Section Meeting**

027. Neuroscience Oral Section and Section Meeting

10:30 am to 11:15 am, Room 1135

10:30 027.001 G **Global Proteomic Analysis Reveals a Novel Pathway Regulated by PERK, an ER Stress Sensor.** UT Health San Antonio, San Antonio, Texas. **Rathipriya Viswanathan**, Brian Stoveken, Sammy Pardo, Dana Molleur, Hema Gudlavalleti, Susan Weintraub, James Lechleiter

10:45 027.002 G **Correlation between Cerebrospinal Fluid Biomarkers and Cognitive Decline in Alzheimer's Patients and Classification of Stages with Artificial Neural Network.** University of Texas at Tyler. **Vivek Kumar Tiwari**, Premananda Indic and Shawana Tabassum

11:00 **Neuroscience Section Meeting**

028. Physics and Engineering Oral Section 2 and Section Meeting

10:30 am to 12:15 pm, Room 1217

10:30 028.001 G **Nano-Electrocatalysts for the *In-Situ* H₂O₂ Production for Space Applications.** The University of Texas El Paso, El Paso, Texas. **Armando Peña-Duarte** and Carlos R Cabrera

10:45 028.002 N **Silicon Building Silicon: Dynamic Modeling of Dust Crystal Formations in a Complex Plasma using NVIDIA GPUs.** Tarleton State University, Stephenville, Texas. **Bryant Wyatt**

11:00 028.003 G **Magnetic structures of sawtooth olivines Mn₂SiX₄ (X = S, Se) determined through neutron powder diffraction.** University of Texas at El Paso, El Paso, Texas, Idaho National Laboratory, Idaho Falls, ID, Department of Chemistry and Biochemistry, University of Oklahoma, Norman, Oklahoma, Neutron Scattering Division, Oak Ridge National Laboratory, Oak Ridge, TN. **Melaku Sisay Tafere**, K. Gofryk, B. Saparov, Q. Zhang, H. Nair

11:15 028.004 G **Boron-doped alumina for smart lubricants: Density functional theory study.** ¹University of Texas at El Paso, El Paso, TX, ²University of Nevada – Reno, Reno, NV. **Nicholas Wilson** ¹, Ashish Kasar ², Pradeep Menezes ², Eunja Kim ¹

11:30 028.005 U **Mechanical Wire Separator using bladed rollers at desynchronized phases.** University of Houston – Clear Lake, Houston TX. Richard Mann, Ross Orsino, Tony Cao, Jessica Cruz, Oscar Ochoa Perez, **Jose Ortiz**. Mentored by Ariful Bhuiyan.

11:45 28.006 U **A Journey from Present into Past of Future.** Kumaun University, Rudrapur, Uttarakhand, India. **Yash Taneja**

12:00 **Physics and Engineering Section Meeting**

029. STEM Education Oral Section 2 and Section Meeting

10:30 am to 12:30 pm, Room 1313

10:30 029.001 U **Virtual Learning Environments and Their Impact on Education.** University of Houston – Clear Lake, Houston, Texas. **Eric Washington**, Maxxfield Smith, Prashanth Gatreddi, Datta Soma

10:45 029.002 N **Teaching During Pandemic: A Potential Package for Organic Chemistry Remote Teaching.** University of the Incarnate Word, San Antonio, Texas. **Ashok Khanal**

11:00 029.003 N **Teaching aquatic science without any water: challenges and opportunities for integrating intermittent and ephemeral streams into environmental science curricula.** The University of Texas at San Antonio, San Antonio, Texas. **Brian Laub**

11:15 029.004 N **Using Human Rights Issues to Engage Students in STEM Courses.** Lone Star College – Kingwood. **Brian Robert Shmaefsky**

11:30 029.005 N **Indirect Evidence – Imaging a Body, A New Take on an Old Lab.** Stephen F. Austin State University, Nacogdoches, Texas. **Joseph Alan Musser**

11:45 029.006 N **Construction of an engaging non-majors microbiology course.** University of Mary Hardin-Baylor, Belton, Texas. **Joni Ylostalo**

12:00 029.007 U **pH Analysis and Comparison of Cola Products.** Stephen F. Austin State University, Nacogdoches, Texas. **Heather Smith**, Alyx Frantzen

12:15 **STEM Education Section Meeting**

030. Systematics and Evolutionary Biology Oral Section 2 and Section Meeting

10:30 am to 12:00 pm, Room 1215

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- 10:30 030.001 U **Life history evolution in a clade of freshwater mussels revises taxonomy and reveals synchronous diversification with host fish.** The University of Texas at Austin, Texas. **Sakina Neemuchwala**, Chase Smith
- 10:45 030.002 U **Evolution of body size in four species of lizards (Family Phrynosomatidae) across an east-west gradient in the American Southwest.** The University of Texas, Austin, Texas. **Sora Michelle Sunby**, Travis James LaDuc
- 11:00 030.003 G **Soft tissue preservation of lizards in amber allows for inference of ancestral scale traits across squamate reptiles.** Sam Houston State University, Huntsville, TX. **Daniel Doucet**, Juan Diego Daza
- 11:15 030.004 G **Cranial Characteristics in the Genus *Zygaspis*.** Sam Houston State University, Huntsville, TX, University of Texas at Austin, Austin, TX. **Antonio Meza**, Christopher J Bell, and Patrick J Lewis
- 11:30 030.005 G **Context and evolution of Abrocomidae (Rodentia: Octodontoidea) and unexpected genetic distances in the endangered *Abrocoma boliviensis*.** Texas Tech University, Lubbock, Texas. **Daniela Arenas Viveros**, Jorge Salazar Bravo
- 11:45 **Systematics and Evolutionary Biology Section Meeting**

Lunch

12:45 pm -1:45 pm, Recreation and Wellness Center, first floor

Business Meeting

1:45 pm – 2:00 pm, Recreation and Wellness Center, first floor

031. Graduate Student Oral Presentation Competition

2:00 pm – 3:40 pm, Recreation and Wellness Center, first floor

032. Coffee Break 3

3:40 pm – 4:00 pm, Recreation and Wellness Center, first floor

Section Chair Post-Session Meeting

4:00 pm – 5:00 pm, Garden room, Bayou Bldg.

033. Science Jeopardy

4:00 pm – 5:00 pm, Recreation and Wellness Center, first floor

034. Outstanding Texas Educator Award and Lecture

5:00 pm – 5:30 pm, Recreation and Wellness Center, first floor

035. Distinguished Texas Scientist Award and Lecture

5:30 pm – 6:00 pm, Recreation and Wellness Center, first floor

Removal of all Posters in Recreation and Wellness Center, second floor track area

06:00 p.m. – 06:30 p.m.

036. Reception and Awards Banquet

7:30 pm – 9:30 pm, Recreation and Wellness Center, first floor

SUNDAY, FEBRUARY 27, 2022

Geology of Bolivar Peninsula Field Trip

8:00 am – 1:00 pm, Meet at registration desk in Recreation and Wellness Center (main entrance)

Space Center Houston Visit

9:00 am – 1:00 pm

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PRESENTATION ABSTRACTS

003-010. Oral Paper Session 1

1:00 pm-3:15 pm, all rooms listed below are in Bayou Building

003. Anthropology Oral Section and Section Meeting

1:00 pm to 2:15 pm, Room 1135

1:00 003.001 G **Mobility among ancient aboriginals of the Canary Islands: A case study using ten adult skeletons from the funerary deposit of Lomo Maspalomas, Gran Canaria, Spain.** Texas A&M University, College Station. **Paloma Cuello del Pozo**
Archaeology uses interdisciplinary methods to understand the lifestyles of ancient human populations around the globe, and the application of stable isotope analyses (SIA) is one of them. Borrowed from the field of geochemistry, SIA of strontium ($^{87}\text{Sr}/^{86}\text{Sr}$) is utilized as an ecological fingerprint to assess the origin of both humans and domesticated species. Via the ingestion of food and water, mammals incorporate $^{87}\text{Sr}/^{86}\text{Sr}$ into their skeleton often preserved in archaeological sites. For the purpose of understanding birth and residence localities, archaeologists sample teeth and bone separately for SIA. The reason for this duplicity is because tooth formation among humans begins in utero and finalizes in adolescence and bone remodeling takes place throughout a lifetime. Thus, isotopic values from teeth will measure mobility patterns throughout childhood and bone isotopic ratios record provenance throughout adulthood. For this project, I have focused on the application of $^{87}\text{Sr}/^{86}\text{Sr}$ as a continuation effort that compares previously obtained biologically available (bioavailable) $^{87}\text{Sr}/^{86}\text{Sr}$ baseline results from the islands of Tenerife and Gran Canaria (Canary Islands) to those from prehistoric humans. Concretely, I have sampled ten adult human skeletons from the funerary deposit of Lomo Maspalomas in the coastal region in the south of Gran Canaria Island and compared it to bioavailable values collected locally and from the neighboring Tenerife Island. To compare childhood versus adulthood mobility, I have measured $^{87}\text{Sr}/^{86}\text{Sr}$ from both teeth and bone. Additionally, I have measured zooarchaeological remains from sheep/goats and pigs contemporaneous to the populations interred at Lomo Maspalomas in order to obtain proxy measurements and a more precise range to identify locality.

1:15 003.002 G **Variability in Skeletal Body Mass Estimation Formulae across Ecogeographically Diverse Human Groups.** University of North Texas Health Science Center, Fort Worth, Texas. **Alexa P. Kelly, Scott D. Maddux**
In the last three decades, the anthropological literature has seen a dramatic increase in mathematical methodologies for accurately predicting living human body mass from skeletal material alone. However, few studies have investigated the comparability of different estimation methods, especially with regards to how various formula perform across populations from diverse climatic regions. In this study we compared four of the most commonly cited body mass estimation formulae (Ruff et al. 1991; McHenry 1992; Ruff 1994; Grine et al. 1995) across a large sample of modern humans (total n = 434) from five globally dispersed geographic areas: Arctic Circle, East Africa, North Africa, Europe, and Oceania. Three prediction methods employ femoral head diameter (FHD), while the Ruff 1994 formula employs bi-iliac breadth (BIB). Body mass predictions between formulae varied by 0.48 to 12 kg within each group; with the Ruff 1994 formula consistently producing the highest and the McHenry 1992 formula producing the lowest predicted values. However, all estimated values were consistent with theoretical expectations for climatically adaptive body masses of living populations from different geographic regions, with higher latitude Arctic (60.22 - 67.8kg) and European (58.6 - 68.7kg) groups returning higher overall body mass estimates than lower latitude East African (50.5 - 55.6kg) and Oceanic (49.9 - 61.8kg) groups. Our results suggest, that despite variability between formulae, each method is likely internally consistent and capable of broadly predicting actual differences in body masses known to exist across globally diverse human populations. However, given the differences between estimation formulae, our results suggest that caution is warranted in the use of multiple formulae in experimental design, particularly estimates of body mass derived from different skeletal measurement (FHD vs BIB).

1:30 003.003 U **Taphonomic analysis of rodent postcranial remains from Botswanan barn owl (*Tyto alba*) roosts.** ¹Department of Anthropology, Baylor University, Waco, Texas; ²Department of Biological Sciences, Sam Houston State University, Huntsville, Texas. **Garrett Cooper Croley¹, Noah Wingate¹, Monte Thies², Patrick John Lewis², Timothy Lee Campbell¹**
In this study, we present results from a taphonomic analysis of modern rodent micromammal (<500g) skeletal remains from barn owl (*Tyto alba*) pellets collected in Botswana. Prey remains from owl pellets can produce dense assemblages of microfaunal material which can then enter the fossil record. Moreover, micromammals are often used to reconstruct past environments in paleontological and archaeological settings. Taphonomic analyses of modern prey assemblages can thus be informative in establishing characteristic patterns for identifying the accumulating agent of fossil material. In this study we examined 91 pellets recovered from Bone Cave and Leopard Cave in the Koanaka Hills, Northwestern Botswana, which yielded a minimum number of individuals (MNI) of 226 rodents. Data were collected on cranial, postcranial appendicular, and girdle elements using a breakage schema modified from previous studies. Breakage patterns and skeletal element presence expressed as proportions of elements expected based on the MNI were calculated along with correlations across sites reported in literature. Previous studies have classified long bones as complete even in the absence of epiphyses, and we present an additional measure of completeness with these elements included. Results from our analysis show that relatively few rodent long bones retain their epiphyses (<11.2%) in this assemblage, and thus should not be expected in the fossil record. Comparisons of skeletal part proportions across sites yielded positive yet weak correlations [$r=0.157$ to 0.631], suggesting that caution is warranted when using these data to infer barn owls as accumulating agents. As our site comparisons included owl assemblages from both Europe and Africa, community composition in prey taxa differs which may influence skeletal part proportions and breakage patterns. Thus, future work should concentrate on regional assemblages for cross-site correlations.

1:45 003.004 U **Evaluation of Human Cremated Remains From an Etruscan Urn.** Baylor University, Waco, TX. **Kaylee Hogness**
The goal of this study is to determine the temperature used to cremate the remains found in an Etruscan urn that was recovered in situ from the site of San Giuliano, Italy. A total of 190g of cremains were found in the urn. A set of 200 bone fragments (131.1g) from this were labeled, weighed individually, and examined to determine the bone fragment color, and also to look for bone fractures and percussion marks. The Munsell soil chart was used to standardize the assessment of bone color. Seventy-five percent of the bones were determined to be white in color indicating that they were burned at a temperature above 1000°C. The transverse fractures observed across 19.5% of the fragments suggest that the bone was still green when burned indicating that the individual was cremated soon after death. This means that the person was not first interred in a tomb but was immediately cremated after death. In addition, there were no percussion marks seen on the fragments. This is interesting because the fragments are very small in size, which typically takes extra processing after cremation in order to achieve this level of fragmentation. The average weight of cremated remains of a modern Italian adult is around 1.8-2.7kg depending on sex, so there are not enough cremains to represent an entire person in the urn. In the future using technology like X-ray fluorescence and X-Ray diffraction, will help learn more about Etruscan cremation practices.

2:00 **Anthropology Section Meeting**

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004. Biomedical Sciences Oral Section 1

1:00 pm to 2:30 pm, Room 1213

1:00 004.001 U **Dynamics of Eastern Equine Encephalitis Infection Rates: A Mathematical Approach.** ¹Tarleton State University, Stephenville, Texas, ²Centers for Disease Control and Prevention, Fort Collins, Colorado. **Aurod Ounsinegad¹**, Dr. Nicholas Komar², Dr. Christopher Mitchell¹

The Eastern Equine Encephalitis Virus (EEEV) is an erratic and deadly neurological disease that spans across the northeastern coast of the United States. To determine the rate at which the virus is spread between the Black-Tailed Mosquito (*Culiseta melanura*) and select avian species we began by analyzing the migration patterns of both the mosquito and the avian species. It was found that certain species of avians shared similar, or even identical, flight patterns with the Black-Tailed Mosquito. Through this research, we develop and analyze a system of Ordinary Differential Equations (ODEs) to gain insight into how and when transmission of the virus to avians is at its highest. We incorporate a host stage-structured model where the avian host group is split into two categories, adults and young-of-the-year birds (YOY). Using this we explored the extent to which fluctuations occurred in transmission rates according to host/vector abundances, mosquito biting rate, and type of host. We evaluate the hypothesis that YOY avians are more readily exposed to the mosquito vector as they lack a defense mechanism, unlike their adult counterpart using the compartmental model.

1:15 004.002 U **Supraventricular Tachycardia Study Using a Dynamic Computer-Generated Atrium.** Tarleton State University, Stephenville, Texas. **Avery Campbell**, Gavin McIntosh, Bryant Wyatt

The leading cause of death globally is heart disease, followed by strokes. Supraventricular Tachycardia (SVT), though not in itself deadly, is a leading cause of strokes, heart attacks, and heart failure. Therefore, one could argue that SVT is indirectly a leading global killer. SVT is a term used to describe all events where the atria beat too rapidly or out of sync with the ventricles. This out-of-sync beating between the atria and the ventricles can cause blood to pool in the atria creating clots that can then travel to the brain or coronary arteries resulting in a stroke or heart attack. SVT events also greatly reduce the stroke volume of the heart, and if they persist for extended periods of time they can cause a permanent reduction in ejection fraction, possibly resulting in congestive heart failure. In a normally functioning heart, the sinus node acts as an orchestra conductor and methodically sends out a periodic electrical impulse. This electrical pulse starts a chain reaction throughout the heart causing the heart muscles to rhythmically contract and produce an orchestrated beat. Rogue electrical impulses can cause chain reactions to occur at the wrong place and at the wrong time, disrupting the sinus rhythm. The beating heart is a multi-dimensional nonlinear dynamical system that is sensitive to initial conditions. Hence, SVT events can produce chaotic outcomes that are impossible to predict with great accuracy. Doctors and researchers need a computer-generated dynamical model of the atria that they can perform experiments on. This research creates such a model. The model beats in real-time and can be adjustable down to the individual muscle level. This will allow researchers to create initial conditions that will produce SVT events that they can attempt to eliminate with simulated ablations. This work will greatly increase our understanding of what causes SVT events and how to eliminate them.

1:30 004.003 U **A mathematical model for Onchocerciasis and Resistance in Treatment.** Tarleton State University Stephenville TX. **Dashon Mitchell**, Kaylee Terrell, Dr. Christopher Mitchell

Neglected tropical diseases are diseases that affect mainly developing countries and in turn are poorly funded and under researched. Onchocerciasis is a neglected tropical disease that exists primarily in Sub-Saharan Africa and South America. This is because the black flies that spread this disease are common to these regions and since these flies bite humans they can infect humans at a noticeable rate. When the black fly bites you it can pass a parasite called filarial nematode, or *Onchocerca volvulus*, which is transmitted solely by black flies during blood feeding. Some people do not experience symptoms while infected with Onchocerciasis, however as the larvae can migrate through the human body without provoking a response from the immune system. But many people do have symptoms, which include itchy skin rashes, nodules under the skin, and vision changes. Onchocerciasis is currently being treated with ivermectin through mass drug administration. The goal of our research project is to find out the optimal way to distribute the treatment to eradicate the disease and to find if the current approach will eventually lead to drug resistance. Our focus was to model this situation and data fit our model to the country of Cameroon. Our research showed that the current treatment plan of Onchocerciasis may never completely eradicate the disease from the population due to resistance. We also found evidence that there may already be resistance in the population.

1:45 004.004 U **Detection of *Sin Nombre Virus* and other *Orthohantaviruses* on Wild Caught Rodents across the State of New Mexico.** University of New Mexico, Albuquerque, New Mexico. **Gilberto Ian Lares**, Samuel Melvin Goodfellow, Robert Anthony Nofchissey, and Steven Blake Bradfute

In 1993, a team of highly specialized CDC epidemiologists identified the *Sin Nombre Virus* (SNV) a member of the *Orthohantavirus* genus, and causative agent of the four corners outbreak of Hantavirus Cardiopulmonary syndrome (HCPS). As of 2018, 779 cases of HCPS have been diagnosed in the United States. Since the highest incidence of HCPS has localized in New Mexico (117 cases), this research paper will address the screening of wild caught rodents using RT-qPCR in areas where no cases of HCPS have been reported. The hypothesis is that since no cases of HCPS have been identified in Valencia County and eastern New Mexico, no positive results for any *Orthohantavirus* should be found in mice from these areas. To address the possibility that rodents in New Mexico carry non-SNV orthohantaviruses, we also screened all samples to detect a wide variety of Orthohantavirus strains. Viral RNA from mice lung-tissue samples was extracted and analyzed using two-step RT-qPCR. Two sets of primers, PANHS8 and SNV, were designed to detect whether SNV was present in the sample (SNV primer) or other sequences from a wide variety of orthohantavirus strains (PANHS8 primer) was present. A total of 52 samples of wild caught rodents across Eastern New Mexico and Valencia County were tested. Twenty-three samples were positive for SNV primers, five samples were positive using PANHS8, and eight samples were positive using both primers. Overall, the initial hypothesis was found to be null as our results suggest that SNV and other *Orthohantaviruses* were found in areas of New Mexico where HCPS cases have not been documented. In the future, we would like to Sanger sequence the positive results for other *Orthohantaviruses* to determine whether the rodents positive for other non-SNV orthohantaviruses are hosting novel variants or strains.

2:00 004.005 U **Defining the role of short-chain fatty acids in primary open-angle glaucoma.** University of Houston-Victoria, Victoria, Texas. **Jose Ramirez**, Thanh Le, David Keyser, Tori McCoy, Humberto Hernandez

Purpose: Glaucoma is one of the leading causes of irreversible blindness worldwide. With many therapeutics failing to target the site of pathogenesis at the trabecular meshwork (TM), new molecular targets are greatly needed. Many studies have linked ocular diseases to dysbiosis (most commonly known as microbial imbalance). Short-chain fatty acids (SCFA) are byproducts of the fermentation of dietary fiber by anaerobic commensal bacteria (also known as our gut microbiome). It is possible that glaucoma patients do not have the necessary microbes in their gut to protect them from ocular diseases. Our central hypothesis is that metabolites (acetate, butyrate, and propionate) from our microbiome could be used as a therapeutic agent to lower fibrosis in the TM. Methods: It is widely accepted that Transforming Growth Factor Beta-2 (TGFβ2) levels are significantly elevated in the aqueous humor of primary open-angle glaucoma patients. In this study, we treated characterized mouse TM cells with (TGFβ-2, 5ng/mL) and butyrate (a by-product of commensal bacteria) and evaluated the expression of extracellular matrix proteins fibronectin and collagen-1. Conclusions: Our preliminary studies indicate that TM cells are protected from fibrotic insults by lowering the expression of extracellular matrix proteins. These important findings provide a novel role for butyrate and may pave the way for developing innovative molecular targets.

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2:15 004.006 U **Characterization of a novel tick gene in *Amblyomma Americanum*.** Stephen F. Austin State University, Nacogdoches, Texas. **Kathy Li** and Lindsay Porter

The number and diversity of tick-borne diseases in the United States have been on the rise since 2004. Among pathogens transmitted by ticks, bacteria form the majority. However, a complete understanding of how the tick immune system is defeated by pathogens is still under investigation. In this study, we characterized a novel, putatively immune-related, lipocalin-like gene in *Amblyomma americanum*. Lipocalins are an extremely diverse group of proteins, serving numerous roles in arthropod physiology, including immune response. Previously, we showed that the lipocalin-like gene was only expressed during infection. In this study, we analyzed both uninfected and infected male and female ticks for additional expression analysis. For this, ticks were infected with *E. coli* subsequent to lipocalin-like gene silencing and then sampled at 3-, 24-, and 48 h post-infection for analysis of gene expression by PCR. Expression profiles between females and males were variable. We also quantified hemocyte response before and after infection of silenced ticks. Our results show no significant difference between experimental groups indicating that lipocalin does not specifically influence hemocyte proliferation during infection. Follow-up studies clarifying the impact of the lipocalin-like gene on the expression of other genes are necessary to understand its potential function. Identifying immune genes in vectors is a key step in understanding how these pathways are subverted during pathogen infection.

005. Cell and Molecular Biology Oral Section 1

1:00 pm to 2:45 pm, Room 1324

1:00 005.001 U **A quantitative and qualitative investigation on the effects of feeding and aging on α -latroinsectotoxin in *Latrodectus geometricus*.** Stephen F. Austin State University, Nacogdoches, TX. **Eleanor J. Penhallegon** and Lindsay M. Porter
The brown widow, *Latrodectus geometricus*, is a non-native species widely distributed in North America. Widow spiders are well known for their highly toxic venom that includes a variety of proteins. Among these is the insect-specific toxin α -latroinsectotoxin (α -LIT) which is used to immobilize prey and may be used to avoid predation. Previous studies have shown that all life stages express toxins including α -LIT. However, there is little data that investigates the effects of feeding and aging on α -LIT expression. In this study, we qualitatively and quantitatively analyzed the expression of α -LIT in individual spiderlings both before and immediately (1 h) after feeding. The data collected indicate that expression of this toxin does not vary between fed and unfed spiderlings and therefore variability in expression of this toxin appears to be related to some other stimulus. In addition, we investigated the effect of aging on α -LIT expression with *L. geometricus* males that were 5 months old. Although these males were towards the end of their lifespan, our data show that they continued to express α -LIT. Males stop consuming prey once reaching sexual maturity so it is interesting that they continue to express α -LIT. Production of α -LIT is energetically expensive due to its high molecular weight and continued expression of this toxin likely serves an important, but as-yet undefined role in widow biology. Our results further the existing knowledge of these insect-specific widow toxins in widow biology and provide further insight into their utility for biopesticide development.

1:15 005.002 G **Sequencing and functional characterization of *Latrodectus geometricus* defensin, Lg-defensin.** Stephen F. Austin State University, Nacogdoches, TX. **Jacklyn Thompson**, Dr. Lindsay Porter
All living things encounter harmful microbes, such as bacteria, and must rely on mechanisms that are present even before infection occurs to prevent chronic illness, such as the synthesis of antimicrobial peptides (AMPs). Many AMPs have yet to be discovered, especially in understudied organisms like spiders. Of particular interest is the AMP defensin, a cyclic peptide capable of antibacterial and antifungal activity that can aid in the fight against antibiotic-resistant bacteria. In this study, we used homology-based methods to resolve and bioinformatically characterized a defensin in the brown widow spider. Using the resolved open reading frame, we selected a target region to silence via RNAi. The impact of defensin silencing was assessed by quantifying bacterial load in silenced spiders for both gram+ and gram- infections. The ORF of Lg-defensin was found to be 261 bp, containing a defensin 2 superfamily conserved domain. In addition, the amino acid sequence was found to be 61 aa long with seven cysteine residues. Comparative analysis with other arthropod defensins and effects of silencing are discussed in the context of spider defensin utility in medical applications. Overall, Lg-defensin can contribute to the pool of AMPs capable of aiding in the fight against antibiotic-resistant bacteria.

1:30 005.003 G **Sequence Resolution and Bioinformatic Analysis of Defensin from Black Widow Spider, *Latrodectus mactans*.** Stephen F. Austin State University, Nacogdoches, Texas. **Kaleth Salazar** and Lindsay Michelle Porter
The use of human medicine in combating infections & disease has faced recent challenges that include tolerance resistance and the lack of effectiveness. Continued research in additional alternative medicines is needed due to the persistent challenge of resistance development, raising the possibility of pursuing the development of new antimicrobial drugs. The immune system of spiders is a topic of interest due to peptides that have antimicrobial properties and their potential use as drugs against pathogens. To accomplish this, the first step is the sequencing and bioinformatic characterization of the antimicrobial peptide. In this study, the *Latrodectus mactans* defensin (LmDef) sequence was fully resolved using homology-based *in silico* probing of transcriptome libraries for PCR primer design paired with stepwise Sanger sequencing. The corresponding region for other arachnid species such as *Parasteatoda tepidariorum*, *Caerostris extrusa*, and *Stegodyphus mimosarum* that have publicly available sequence data were compared to our resolved LmDef sequence. These defensins are variable in domain size and arrangement throughout the protein. The protein similarities between three arachnid species displayed an identity similarity ranging from 58.33% to 66.67%. Information in this study contributes to the understanding of defensin evolution throughout different arachnid species, and the sequence resolution of the LmDef allows for follow-up studies that can empirically characterize the function of LmDef in the immune response and antibiotic development.

1:45 005.004 U **Phenotypic Analysis of Cancer Cell Lines Following PA28 γ Reduction Through CRISPR/Cas9.** Austin College, Sherman, TX. **Jessica Hoffman**, Lance Barton
PA28 γ is a proteasome activator that is overexpressed in several cancer types and positively correlated with cancer severity. Moreover, PA28 γ deficient mice treated with a tumor inducing agent form fewer and smaller tumors as compared to wild type mice, further suggesting that PA28 γ might play an important role in tumorigenesis. Additionally, PA28 γ may interact with p53 to contribute to chemotherapy resistance in tumorigenic cells. In order to determine whether the overexpression of PA28 γ is essential to maintaining tumorigenic properties within cells, the CRISPR/Cas9 genome editing tool was utilized to engineer partial heterozygous deletions of the *psme3* gene, which encodes for PA28 γ , in the A9 murine tumorigenic cell line. The main goal of this project focuses on phenotypic analysis of reducing PA28 γ expression in cell clones to understand how PA28 γ contributes to tumor formation. Early evidence suggests that reducing PA28 γ expression inhibits both growth and migration in tumorigenic cells as demonstrated through MTS assays and wound healing assays respectively. Results from apoptosis assays are less conclusive regarding the relationship between PA28 γ , p53 and chemotherapy resistance. Overall, these findings indicate that PA28 γ may be crucial for maintaining tumorigenic properties within cells.

2:00 005.005 G **Genetic characterization of the *Oct82R* gene among Amitraz-resistant *Varroa destructor* mites.** Stephen F. Austin State University, Nacogdoches, Texas. **Jordy Sloan**
Since their discovery and relatively recent spread across the globe, *Varroa destructor* mites represent a growing threat to *Apis mellifera* honeybees. Common techniques to manage *Varroa* infestations include acaricide treatments of infested hives. Amitraz, the most commonly used acaricide for

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Varroa management, is neurotoxin to *V. destructor*. As an agonist of the beta-adrenergic-like octopamine receptor, overstimulation by amitraz induces tremors and leads to death. However, resistance to amitraz among *V. destructor* populations has been growing in recent years, and the mechanism of resistance remains an active area of study. Here we determine the allelic frequency of two *Octβ2R* mutations associated with amitraz resistance across East Texas. Previous research has associated these mutations, N87S and Y125H, with amitraz resistance. Allelic frequency was determined by a TacMan qPCR assay. Furthermore, further sequencing of the *Octβ2R* from field samples was performed and we have found several novel mutations. *V. destructor* mites with these novel mutations were characterized by amitraz resistance relative to wild type organisms. We anticipate our survey of novel *Octβ2R* mutations, as well as the determination of the allelic frequency of N87S and Y125H, to be the beginning of a comprehensive genetic characterization of the *V. destructor Octβ2R* gene. The identification of variable and conserved regions across the *Octβ2R* gene may present a target for the development of novel acaricides.

2:15 005.006 U **Identification and characterization of novel genes in *Drosophila's* retinal development utilizing a transcriptomics approach.** Sam Houston State University, Huntsville, TX. **Sequoia Smith, Mardelle Atkins**

All cells in a multicellular eukaryotic organism contain a complete genome. However, these organisms possess different cell types with diverse morphologies and functions; thus, highlighting the importance of the regulation of gene expression. Transcriptome data analysis is used to understand an organism's developmental mechanisms. Today, numerous genome projects frequently add gigabytes of nucleotide sequence data to public databases. The exploration of gene function should begin with this resource. Our research seeks to repurpose existing datasets to increase their public value while generating discoveries. The *Drosophila melanogaster* imaginal discs are a proven model system to perform genetic screens and analyze neural phenotypes, including axon growth and guidance. We overlapped normal and diseased transcriptomes and effectively filtered for genes enriched for eye development regulators. This strategy produced a list of 221 candidates out of the >15,000 genes in the genome. Here we report that eye genes comprise more than 10% of the target list, demonstrating proof of concept. Next, we "quality tested" our target list using gene ontology (GO) enrichment analysis. The GO enrichment analysis indicated enrichment for: compound eye cone cell fate commitment 2.48E-04, central nervous system formation 3.04E-04, and regulation of synaptic activity 5.83E-04. We then filtered our gene set to identify genes that had not been previously characterized for an eye function. This process yielded a candidate list of 47 genes. Our research analyzes datasets from the Gene Expression Omnibus database to predict novel genes required for *Drosophila's* retinal development, thereby adding value to this public resource. Initial characterization of 3 genes from the list has identified a new gene required for head formation and a new gene required for axon guidance, thus supporting that this was a highly effective strategy for identifying candidate genes.

2:30 005.007 U **Identification and Characterization of Tango6 in Development.** Austin College, Sherman, Texas. **Sydney Versen, Hannah Herron, and Kelli Carroll**

The Undiagnosed Disease Network (UDN) is a collection of clinicians and researchers that utilize modern technology to help diagnose individuals with rare or previously uncharacterized diseases. One of the genes that the UDN predicted as causal in developmental disease was Tango6, as a UDN participant with multiple point mutations in Tango6 presented with heart and brain abnormalities. Tango6 was originally discovered in *Drosophila*, where it was predicted to play a role in Golgi body organization; it is also required in murine development. In order to understand the role that Tango6 plays in development, we utilized embryonic zebrafish to analyze the quantitative and spatial expression of Tango6. Here we show that Tango6 is expressed at low levels between 24 and 120 hours post fertilization (hpf). In situ hybridization demonstrated that Tango6 is expressed in a bilateral tube in the hindbrain beginning at 48 hpf and by 120 hpf, it is present in the gastrointestinal system in addition to the brain. Preliminary data of mosaically edited Tango6 knockouts generated using CRISPR have found an accumulation of blood in the gut by 96 hpf, suggesting defects in gut morphogenesis or function. In total, these data suggest that Tango6 is involved in brain and gut development, and further analysis of knockouts and spatial expression patterns is underway to determine the precise role of Tango6 in development and disease.

006. Chemistry and Biochemistry Oral Section 1

1:00 pm to 2:30 pm, Room 1218

1:00 006.001 N **Electrochemically Driven Biofilms for Drug-metabolic and Inhibition Assays.** University of Houston Clear Lake, Texas. **Charuksha Walgama**

The time to develop a pharmaceutical drug and bring it to the market takes on average 12.5 years and billions of dollars of expenditure in preclinical and clinical screening because careful examination of the metabolic fate of drugs inside the human body is an essential part of the drug development process. Drug metabolic reactions are mainly governed by membrane-bound liver enzymes such as cytochrome P450s (CYPs) and cytochrome P450 reductases (CPRs). Presently, these in-vitro studies are carried out using hepatic (liver) cells or purified liver enzyme-based biological assays. Longer incubation times, the lower yield of drug metabolites, the use of expensive NADPH cofactor and purified enzymes, and tedious purification protocols are some practical issues integrated with these conventional biological assays. As an alternative approach, we investigated the possibility of immobilizing liver bio-films (human liver microsomes) onto various electrodes to perform drug metabolic reactions under an applied potential by activating the enzymes in the bio-film. We observed the CYP-specific bioactivity on the electrode by monitoring the electrocatalytic conversion of model drugs such as testosterone and diclofenac. In this presentation, we share our findings on electrocatalytic signatures of membrane-bound liver enzymes under various electrode conditions including some nanostructure modifications. We hope these findings will have successful implications in the pharmaceutical industry to design one-step electrochemical bioreactors to perform drug activity and inhibition assays which immensely aid in the preclinical drug development process.

1:15 006.002 G **Advancements in High Performance Liquid Chromatography (HPLC) Methods for Quantifying Anticancer Drugs and Metabolites in Human Biological Samples: A Literature Review.** University of Houston-Clear Lake, Houston, Texas. **Amey Gonzalez, Leopoldo Romero, Charuksha Walgama**

Monitoring anticancer drugs in human biological samples is an important part of the pharmaceutical development process, not only to establish doses or measure toxicological effects in patients but also to understand various metabolic pathways they undergo. Therefore, developing new analytical methods for therapeutic anticancer drug monitoring has an immense importance. To date, the most powerful analytical technique for separating and quantifying anticancer drug byproducts, metabolites, and inactive drug substances in human biological samples is HPLC, because of its advantages of small sample size, high resolution separation, and sensitivity. In this presentation, we will be talking about various HPLC sample preparation methods for human biological samples such as blood, serum, urine, tissue, saliva, and cerebral spinal fluid (CSF). In addition, we will be focusing on advancements in various types of HPLC detectors: Ultraviolet (UV-Vis), photodiode array (PDA), Fluorescence, Mass spectrometry (MS) and Tandem mass spectrometry (MS-MS) which have been intensively utilized in anticancer drug and metabolite analysis. Furthermore, some challenges on recovering metabolic racemic mixtures and separating enantiomers using HPLC will also be discussed. Taken together, from this literature survey, we have identified that selecting a suitable detector for the HPLC analysis plays a major role in developing a successful quantification method for anticancer drug and metabolite analysis.

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- 1:30 006.003 G **Examination of the Toxicity and Localization of HK-97 Virus-Like Particles in Zebrafish.** The University of Texas at Tyler. **Andrea Hernández Irias**, Brent Roy Bill, Dustin Patterson
The development of novel therapeutic delivery methods is a major target in biotechnology and medicine, especially methods that reduce the therapeutic dosages required through site-specific drug targeting. Protein cages derived from viral capsids, termed virus-like particles (VLPs), are of interest due to their ease of production, well-characterized molecular assembly and architecture, and biocompatibility. The VLP derived from Escherichia coli bacteriophage HK97 is a potentially unique VLP platform for use in drug delivery applications due to its unique structural morphologies and reported selective cell entry properties. Experimental results have shown that HK97 VLP constructs penetrate the cell-membrane if they are externally engineered and decorated with the addition cell-targeting peptides, such as the tripeptide Arg-Gly-Asp (RGDs), which mediates cell membrane binding. In order to determine the toxicity and localization of HK97 VLPs, Danio rerio (zebrafish) was used as an in vivo model system to examine the toxicity and localization of HK97 VLPs. Pilot studies suggested no significant difference of toxicity between fluorescently labeled HK97 vs RGD-targeted fluorescently labeled HK97- fluorescein when applied via soaking at 2 days post-fertilization. Our work will confirm toxicity results and determine if RGD targeting limits VLP localization in a tissue-specific manner.
- 1:45 006.004 N **Comprehensive Structural and Compositional Investigation of Maya Pottery Sherds from Lake Petén Itzá, Guatemala, Central America.** Stephen F. Austin State University, Nacogdoches, Texas. **Kefa K. Onchoke**
Maya pottery samples collected from various sites in Guatemala were investigated for their elemental composition, mineral crystalline phases, particle size, and thermogravimetric properties. The samples were analyzed by using scanning electron microscopy-energy dispersive spectroscopy (SEM/EDX), FT-IR, ICP-OES, and powder X-ray diffraction (XRD). Investigations showed the presence of aliphatic C-H, C-C, and C=O functional groups in samples. The SEM/EDX results revealed samples contain approximate %w/wt elemental concentrations C (3.4), O (54.8), Mg (0.45), Al (7.25), Si (11.2), K (0.3), Ca (21.3 w/w %), and trace amounts of Mn, Cu, S, Na, Ti. The ICP-OES examination further confirmed the composition and concentrations of macro-elements Al, Ca, Fe, K, Mg, Na, P, S and microelements Ba, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Se, Zn, and V. Powder XRD analysis determined that the major mineral crystalline phases in the samples were bassanite, quartz, aluminite, alunogen, andalusite, borax, gypsum, hexahydrate, hornblende, laumontite, mirabilite, palygorskite M, talc, and vermiculite. This investigation revealed the conservative nature of the technology and materials used in the preparation of pottery among the Maya people.
- 2:00 006.005 U **Spectroscopic and Electrochemical studies of dibenz[a,h]anthracene (DBaA): an environmental mutagen.** Stephen F. Austin State University, Department of Chemistry & Biochemistry, Nacogdoches, TX. **Karl Allen K. Vedan**, Kefa K. Onchoke
The polycyclic aromatic compound dibenz[a,h]anthracene (DBaA) is a carcinogen and mutagen that's formed from diesel emission exhausts. Spectroscopic (fluorescence, FT-IR, NMR, UV-Vis) and electrochemical properties of DBaA were investigated. Cyclic voltammetric (CV) studies in a 0.10 M tetrabutylammonium hexafluorophosphate-acetone solution on a platinum electrode yielded well defined cathodic and anodic peaks. The cyclic voltammogram $n < 1000$ mV/s indicated a non-diffusion controlled process. DBaA exhibited discernible oxidation peaks at 1.60 V and 2.24 V. The UV-Vis spectral peaks were observed at 296, 288 and 222 nm. The fluorescence quantum yields (F_f) in heptane vi-a-vis benzantracene was 1.64 times at $\lambda_{exc} = 280$ nm and $\lambda_{em} = 290$ nm. This data is important for identification of DBaA's presence in gas emissions and gas pollution matrices. In addition, the data presented in this can be used in biological samples and studies.
- 2:15 006.006 G **Computational Analysis of Channel Reactions Between Dimethylmercury and the Cl⁻ radical.** University of Houston at Clear Lake, Houston, Texas, **Betzaida Aponte Hernández**, Cody J. Perry, and Yi Su
Organic Mercury contaminants are extremely toxic substance and can be commonly found in air and water in mostly in the form of methylmercury (MeHg) and dimethylmercury (DMM). Methylmercury and dimethylmercury both pose a serious threat to human and wildlife health. In addition, studies have suggested that dimethylmercury is one of the pathways that leads to MeHg. However, very little is currently known about the mechanisms of DMM formation and degradation in the natural environment. In this work, the interaction between dimethylmercury and the naturally found Cl⁻ radical is studied in order to better and fully understand the chemistry and fate of DMM in the natural environment. Mechanism and rate constants for three thermodynamically possible channels of the gas phase reaction between dimethylmercury (DMM) and Cl⁻ radical were studied by computational chemistry using Gaussian 09 and Gaussian 16. Geometries of reactants, transition states and products were optimized by density functional theory (DFT) M06-2x and *ab initio* methods. Rate constants for each channel were determined and compared to each other and available experimental values.
- 007. Freshwater Science Oral Section and Section Meeting**
1:00 pm to 2:45 pm, Room 1211
- 1:00 007.001 G **Distribution and habitat use of Kisatchie Painted Crayfish in northeast Texas with investigation of multi-scale environmental influences on crayfish community structure.** Texas Tech University. **Hayden C. Hays** and Matthew A. Barnes
The Kisatchie painted crayfish (*Faxonius maletae*) is known to occur in only a few localities of the Big Cypress Creek drainage in northeast Texas. Aside from basic presence data, very little is known about this species' distribution, habitat use, and general ecology, leading to its designation as Data Deficient by the International Union for Conservation of Nature. Lack of sufficient population and habitat data, compounded with increased anthropogenic encroachment and the impacts of global climate change, decrease the likelihood of success for any management strategies. Therefore, we conducted comprehensive surveys across northeast Texas, both within the historically known range as well as novel sites, coupled with an assessment of corresponding habitat variables and congeneric species to inform conservation plans for the species. Specifically, in spring and summer 2021, we surveyed crayfish using seine nets and trapping at 74 sites across 11 Texas counties (i.e., Camp, Cass, Franklin, Gregg, Harrison, Marion, Morris, Titus, Upshur, and Wood). At each survey site, we also collected habitat data including dominant substrate, canopy cover, mean depth, thalweg depth, flow velocity, riparian habitat characterization, conductivity, dissolved oxygen, turbidity, and water temperature. We encountered ten *F. maletae* individuals across six sites (8.1%), five of which were historical locations. We also encountered seven additional crayfish species, four of which co-occurred with *F. maletae*. Together, these data will help identify characteristics of suitable habitat and increase understanding of *F. maletae* distribution. This understanding will provide the basis for future management action to protect critical habitat for this poorly studied species.
- 1:15 007.002 U **Snail (*Pomacea maculata*) Days of Summer: Associations between reproductive output, snail removal efforts, and environmental DNA (eDNA) concentration.** Southwestern University, Georgetown, Texas. **Cynthia Bashara**, Lillian Dolapchiev, Romi Burks, Chris Vaughn, and Matthew Barnes
Higher temperatures during summer likely lead to heightened metabolic activity in organisms. This activity increases the production of environmental DNA (eDNA) in warm conditions. eDNA provides an additional means of detecting the presence of invasive species through water samples. *Pomacea maculata*, an invasive apple snail species, shows heightened reproductive activity as summer temperatures rise. Recently, *P. maculata* invaded the San Antonio River in 2019. We followed eDNA concentration during peak activity season of *P. maculata* alongside intensive removal effort conducted by the San Antonio River Authority (SARA). Our colleagues at SARA collected water samples over a six week period from three riverwalk stretches (King Williams, Museum Reach, and Downtown). We sought to analyze how the abundance of *P. maculata*, as indicated by eDNA, related to targeted removal efforts of both snail and egg clutches. We first collected eDNA samples from a site with a high abundance of apple snails to confirm we could establish

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their presence using eDNA. We received 72 water samples (6 weeks x 4 sites x 3 replicates), filtered samples using 1.2 µm millipore filters, and performed chloroform extractions. Our research allows us to analyze patterns of *P. maculata* activity by comparing successful eDNA detections from early summer to late summer. We expect a decline in eDNA concentration despite the peak season because of the increase in removal efforts. We also highlight the importance of collaborating with local authorities to limit the spread of *P. maculata*, as well as using eDNA as an effective tool in monitoring the presence of apple snails.

1:30 007.003 U **Filter me...if you can: using size fractionation to separate, measure, and determine the size of *Pomacea maculata* eDNA.** Southwestern University. **Lillian Dolapchiev**, Cynthia Bashara, Matthew Barnes, and Romi Burks
Detection of environmental DNA (eDNA) shows immense potential to aid conservation, but many details about the state (e.g., shape and size) of eDNA-bearing particles in the environment remain unknown. For example, we can use eDNA to detect the invasive apple snail species, *Pomacea maculata*, but not enough comparative data exist to determine the optimum filter size for maximum eDNA collection. We first confirmed eDNA presence of *P. maculata* in the San Antonio River in June 2021 using 1.2 and 5 µm filters. Next, to describe the size distribution of apple snail eDNA, we returned in October 2021 at a site upstream of where we previously detected snails and collected 1 L water samples (N = 8). We then employed size fractionation by sequentially filtering the water samples from largest to smallest filter size of six different-sized filters (12 µm, 8 µm, 5 µm, 3 µm, 1 µm, and 0.2 µm) followed by ethanol precipitation. We will determine the amount of eDNA present in each size class using quantitative PCR. Our research goal includes comparing our results with other published size fractionation experiments to draw general conclusions about the nature of eDNA in aquatic systems. These results build on our previous investigations of different methodological details (e.g., filter types, sizes, and extraction methods) for collecting eDNA. Identification of the filter size that generates the greatest collection of *P. maculata* eDNA will help guide future sampling efforts to monitor the spread of this non-native invasive species in Texas and beyond.

1:45 007.004 G **Pesticide cocktail affects free-swimming behavior and induces oxidative and nitrate stress in goldfish, (*Carassius auratus*).** University of Texas at Rio Grande Valley. **Esmirna Cantu**, Michelle Rivera, Brittney Lacy, and Md Saydur Rahman
Aquatic ecosystems, particularly the freshwater ecosystems, are exposed to environmental pollutants. Anthropogenic activities, including agriculture, introduce ever-increasing variety and volume of chemical contaminants. These include compounds such as pesticides (more aptly called biocides) and contribute to a wide variety of stressors vitiating aquatic ecosystems perniciously influence the life and behavior of aquatic organisms. In this study, we examined dose-dependent and time-dependent effects of pesticide mixtures (metalachlor, linuron, isoproturon, tebuconazole, acifluorfen, atrazine, pendimethalin, and azinphos-methyl) (exposure at 22°C for 5 days) on the free-swimming behavior of goldfish (*Carassius auratus*), a model teleost species). Behavioral analysis showed a dose-dependent, time-dependent, decrease in distance swam and the prolonged time they stayed in each region of the tanks. Collectively, these results indicate that pesticide concoction influences behavior and negatively impacts natural swimming patterns in teleost species.

2:00 007.005 G **Stream Metabolism and Microbial Diversity of a Wastewater Effluent dependent Stream Ecosystem.** University of Texas at San Antonio, **Fabiola Estrada** and Allison Veach
Nutrient enrichment in freshwater ecosystems is a rapidly growing environmental crisis. In the United States, the most frequent source of nutrient pollution in urban centers is human sewage which contributes ~12% of riverine nitrogen input. Excess supply of these nutrients results in the increase of algal biomass production and the disruption of important ecosystem functions. In this study, we collected rocks within 3 study sites in the Cibolo Creek (Boerne, TX, USA) with different influences of wastewater discharges (1 control site upstream of discharge, 1 site immediately below discharge sites, 1 site ~500-m downstream of discharge within a nature preserve) from May 2021 to September 2021. During sampling collection, sites were divided into 6 transects and 5 replicate rocks per transect were collected perpendicular to flow. In addition, dissolved oxygen, water temperature, and photosynthetic active radiation loggers were deployed in order to measure stream metabolism. Preliminary results indicate that algal biomass and biofilm organic matter do not differ among control and wastewater-fed sites ($p > 0.1$). These data indicate that wastewater effluent in this ecosystem does not impact microbial biomass or microbial growth at the beginning of the growing season. Additional work will include whole-ecosystem stream metabolism analysis and microbial community sequencing (16S rRNA genes) to acquire a comprehensive understanding on how wastewater effluents affect overall stream ecosystem health.

2:15 007.006 N **Vegetation analysis in the upper reach of an ephemeral creek in San Antonio, Texas.** University of Texas at San Antonio. **Jeffrey T. Hutchinson**
Ephemeral creeks contain multiple isolated pools of various sizes with hydroperiods from 1-2 weeks to > 12 months. The upper reach of Leon Creek in San Antonio experiences infrequent over-the-bank floods 3-6 per year in which flow is continuous within the dry creek bed. With increased urbanization and impervious structures, greater surface runoff results in higher discharge, increased erosion, and potential changes in vegetation. In this study, the understory vegetation along a 1.2 km segment in an upper segment of Leon Creek was analyzed using line transects across the dry creek bed and pools ($n = 12$) from March-May, 2020. The native vegetation in the dry creek and pools was hypothesized to represent vegetation suitable for xeriscape landscape and utilization in low impact development structures. A second hypothesis was the most dominant vegetation found in the dry creek and pools would be dominated by non-native species due to adjacent urbanization and disturbances by floods. Dominance curves were plotted to determine the most frequently occurring species. Analyses of vegetation patterns between the dry creek bed and pools was compared statistically for richness, evenness, diversity, similarity indices, and native and non-native species. The results from the study will be presented at the meeting.

2:30 **Freshwater Science Section Meeting**

008. Plant Biology Oral Section and Section Meeting

1:00 pm to 2:00 pm, Room 1439

1:00 008.001 U **Identification of bacteria in symbiosis with *Vachellia farnesiana*.** University of Mary Hardin-Baylor, Belton, Texas. **Caleb Shackelford**, Kathleen Wood

The ability of *Vachellia farnesiana* to survive under a variety of conditions has allowed for its gradual migration into many regions of central Texas and Bell county. To discover components of this migration, research identifying rhizobia colonizing *Vachellia farnesiana* was conducted. Stratification of 30 *Vachellia farnesiana* seeds presented 18 seedlings. Seedlings were transferred to soil samples collected from two sites inhabited by *Vachellia farnesiana* in Belton, TX. Once seedlings reached 12 inches in height, two were uprooted to observe nodulation. Nodules were then sterilized, crushed, and plated onto YMA-CR. Isolated colonies were used to make broth cultures for PCR and inoculation of new seedlings to verify nodulation. These techniques will potentially allow identification of bacteria capable of forming symbiotic relationships with *Vachellia farnesiana*. Currently research has provided information regarding *Vachellia farnesiana* root nodulation time, nodulation phenotypes, as well as plate growth times and colony phenotypes of the nodulating bacteria. The ultimate goal is to identify the bacterial strains associated with *Vachellia farnesiana* in Bell county.

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1:15 008.002 U **Molecular Identification of *Oenothera* plant specimens collected from Guadalupe County, Texas.** Texas Lutheran University, Seguin, TX. **Jesse Ramos**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez
The Onagraceae (primrose family) consists of 18 genera and over 600 species. Because some morphological identifications still challenge botanists, DNA barcoding can be used to supplement dichotomous keys. DNA Barcoding uses small segments of DNA to differentiate between species in a genus. These segments of DNA code for genes and have high interspecies variance and low intraspecies variance. These segments may include those in the chloroplast plastid, such as *maturase K (matK)* and *ribulose-1,5-bisphosphate carboxylase large subunit (rbcL)*, or in nuclear regions, such as *internal transcribed spacers (ITS)*. The project sought to support or challenge morphologically-identified Texas Lutheran University Herbarium specimens using DNA barcoding. Using the Takara Nucleospin Plant II Kit, DNA was extracted from 10-20mg of dried plant tissue and purified through a series of buffers and column centrifugation. Extracted DNA was processed by PCR with either a set of *ITS2* and *matK* primers. For samples that showed a successful PCR via an electrophoresis gel, Sanger sequencing was carried out. BLAST results of the PCR consensus sequences showed that both *ITS2* and *matK* on their own could only discriminate to the genus level. Specimens were placed into groups with others that had identical *ITS2* and *matK* sequences and morphological identification was revisited. Seven groups were formed, and within these groups, the specimens identified included *Oenothera suffulta* (Engelm) W.L. Wagner & Hoch, *Oenothera patriciae* W.L. Wagner & Hoch, and *Oenothera sinuosa* W.L. Wagner & Hoch. Though morphological identification and DNA Barcoding have their strengths, this project supported the strategy of using both methods in order to accurately identify *Oenothera*.

1:30 008.003 G **Anatomy and morphology of the seed coat in the Texas species of *Argemone* (Papaveraceae).** Texas State University, San Marcos, Texas. **Shelby L. Conway**, David E. Lemke
Argemone is one of the largest genera within Papaveraceae, comprising 32 species of annual, biennial, or perennial herbs. The most recent complete taxonomic revision of the Texas species of *Argemone* is the work of Ownbey, dating back to 1958, who recognized eight species occurring in the state: *A. aenea*, *A. albiflora*, *A. aurantiaca*, *A. chisosensis*, *A. mexicana*, *A. polyanthemos*, *A. sanguinea*, and *A. squarrosa*. Ownbey used a variety of morphological characters to delimit species within the genus, including petal, latex, stamen and stigma color; presence/absence of clasping leaves; shape of the bud and capsule; presence of prickles on foliage bracts or on stems; and seed dimensions, and most treatments of the genus in published Texas floras have been based on Ownbey's work. Several authors, however, have noted that Ownbey's taxonomic distinctions are not necessarily always clear due, at least in part, to the largely continuous morphological variation seen in many of these characters. Because studies of seed coat morphology have often proven useful in the delimitation of taxa (including other genera in Papaveraceae) and in providing data for the generation of phylogenetic hypotheses, we chose to study whether or not morphological and anatomical features of the seed coat would prove useful for distinguishing among the Texas species of this genus. Seed morphology was examined using light and scanning electron microscopy, while standard botanical histological procedures were used to study development of the seed coat. Although the seeds of all Texas species of *Argemone* are similar in gross morphology, consistent differences in seed size and shape, surface microsculpturing patterns, relative prominence of the hilum, raphe, and chalazal umbo, and certain anatomical features appear to provide characters useful for species delimitation.

1:45 **Plant Biology Section Meeting**

009. Physics and Engineering Oral Section 1

1:00 pm to 3:00 pm, Room 1217

1:00 009.001 U **Effect of Repeated Alcohol-Based Hand Rub Disinfectant Treatments on the Mechanical Integrity of Disposable Nitrile and Latex Exam Gloves.** ¹ Occupational Safety and Health Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX, ² Mechanical Engineering Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX. **Jonathan Patterson**², John Cuadros Olave¹, Robert Phalen¹, Youssef Hamidi²
Medical exam gloves are essential to preventing the spread of diseases such as Ebola and SARS-CoV-2 (COVID-19). A significant vector for infection is the spread of fomites by close contact with infected individuals. Due to the glove shortage during the COVID-19 pandemic, the US Centers for Disease Control and Prevention (CDC) provided strategies to conserve and extend the use of disposable gloves via repeated disinfection. Similarly, the World Health Organization (WHO) suggested extending the use of exam gloves during shortages with disinfection treatments. The CDC provided guidance for using alcohol to disinfect gloves, up to 6 cycles of treatment, but scientific evidence to support these recommendations is limited. One study indicated that six treatment cycles may not be appropriate for nitrile gloves. The purpose of this study has been to identify the effect of repeated Alcohol-Based Hand Rub (ABHR) treatments on the elastic modulus of disposable nitrile and latex exam gloves. Surgiglove nitrile and powder-free latex exam gloves were tested under control conditions (n=6) and after each treatment regimen of ABHR (n=6), in accordance with the ASTM D882-10. Tensile testing was performed after 3, 6, 10, 20, and 40 repeated treatments of ABHR adhering to the CDC recommended procedure. Nitrile gloves were more affected by the application of ABHR than latex gloves. The results for all nitrile glove tests beyond three treatments showed significant ($p \leq 0.05$) decreases in elasticity. The change in elastic modulus for nitrile gloves ranged from -19.8 % (10 treatments) to -41.2 % (40 treatments). The results for latex were only statistically significant at 40 treatments (-33.6% change). Therefore, the treatment of nitrile gloves by ABHR is not recommended beyond three treatments, and the maximum number of recommended treatment cycles for latex is twenty.

1:15 009.002 U **Effect of Multiple Decontaminations on Tensile Properties of Disposable Vinyl Exam Gloves.** ¹ Occupational Safety and Health Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX, ² Mechanical Engineering Program, College of Science and Engineering, University of Houston-Clear Lake, Houston, TX, **Jonathan Patterson**², Robert Phalen¹, Youssef Hamidi², Joseph Kuates¹
In the face of the shortage of supplies caused by the SARS-CoV-2 (COVID-19) pandemic, some nations are unable to provide sufficient medical exam gloves to health care workers. This situation is expected to worsen in the future. The World Health Organization (WHO), has recommended, when necessary, extended use of personal protective equipment (PPE) paired with sanitation treatments. Decontamination of medical exam gloves presents an opportunity to allay these concerns. However, there is limited evidence on the effects of repeated decontamination on the integrity of the gloves, particularly vinyl gloves. The goal of this study is to determine how 3 different treatment methods affect the elastic modulus of vinyl exam gloves. This study examined the effects of treatments by bleach, alcohol-based hand rub (ABHR) and soap and water on the elasticity of vinyl exam gloves of three brands (Ammex, Basic, and Med Pride), adhering to the ASTM standard method D412 (ASTM, 2002). Per CDC treatment regimen, gloves were treated with either six treatments of an ABHR (n=6) or ten treatments with bleach (n=6) or soap and water (n=6). The overall result showed that only Ammex showed significant change with the ABHR (33.5% increase, $p \leq 0.001$) and all three brands were significantly affected by bleach (11-21% increase, $p \leq 0.04$). Changes with soap and water treatment were significant for the MediPride (15% increase $p \approx 0.03$). With regard to the CDC regimen, six cycles of ABHR may not be appropriate and ten treatments for bleach may also not be appropriate. This study indicates that the treatment of the vinyl gloves using these methods be inappropriate since their use may lead to a premature failure.

1:30 009.003 N **Light Scattering Computation for Dielectric Spheroidal Particles.** Texas A&M University, College Station, Texas. **Jiachen Ding**, Ping Yang
A spheroid has rotational symmetry, a smooth surface, and only one more parameter (aspect ratio) than a sphere. Therefore, as a tradeoff of complexity and accuracy, a spheroidal shape is widely used to approximate optical properties of a nonspherical particle, such as a dust aerosol, in atmospheric

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remote sensing and climate modeling studies. The single-scattering properties of a spheroid include extinction efficiency, single-scattering albedo and scattering phase matrix. A spheroidal particle can be simply parameterized by size parameter (spheroid major semiaxis divided by incident wavelength and multiplied by 2π) and aspect ratio, and numerical computation of its optical properties is relatively less demanding than for other nonspherical shapes. However, numerically accurate computation methods, such as the Discrete Dipole Approximation and T-matrix methods, are only applicable for a size parameter less than 100, which is smaller than typical dust aerosols in visible and UV wavelengths. For extreme refractive indices or aspect ratios, their maximum applicable size parameter is even smaller. For size parameters larger than several hundred, the geometric optics approximation can be accurate with acceptable errors. Previously, there was no reliable method applicable to a moderate size parameter between 100 and about 500. In this study, we combine the invariant imbedding T-matrix (IITM) method and a physical geometric optics method (PGOM) to accurately compute the single-scattering properties of dielectric spheroidal particles in the entire moderate size parameter range.

1:45 009.004 G **Convergence and truncation criteria in Invariant-Imbedding T-Matrix method for non-spherical particles.** Texas A&M University, ¹Department of Atmospheric Sciences, Texas A&M University, College Station, TX, ²Department of Mathematics, Texas A&M University, College Station, TX. **Yuheng Zhang**¹, Jiachen Ding¹, Ping Yang¹, and Richard Lee Panetta^{1,2}

The Invariant-Imbedding T-Matrix method (IITM) is a numerical method developed for computations of the single-scattering properties of non-spherical, dielectric particles. Though it has been proved to be powerful and effective, the accuracy and stability of the code is not satisfying. While IITM is formulated as an infinite series, the calculation must be truncated with a finite truncation order, but the computer time increases approximately exponentially with an increasing truncation order. To ensure both efficiency and satisfactory accuracy of IITM, we study the truncation of the vector spherical wave function (VSWF) expansion, aiming to find out an optimal truncation order of VSWF. Because the diagonal elements of T-matrix can be viewed as generalized Lorenz-Mie coefficients, its truncation can be analogous to Lorenz-Mie coefficient series truncation. In this study, we investigate the effect of particle size parameter, refractive index and particle shape on T-matrix truncation accuracy. We propose an improved empirical formula to determine the optimal truncation order of VSWF for IITM. The formula is reliable in applications to determine optical properties of atmospheric ice crystals and irregular dust particles.

2:00 009.005 U **Guidance and Navigation Controls for Drone Swarm Applications.** University of the Incarnate Word, San Antonio, Texas. **Charles Beck**, Jovany Avila, Michael Frye Ph.D

In recent years, a multitude of industries have incorporated drones into their methodology such as infrastructure, agriculture, and most recently with deliveries, with each drone providing a unique and specific solution to a task. The latest drone research and projects have been analyzing ways to fly multiple drones in a controlled manner, referred to as drone swarms. Such research has been applied to various problems seen in many fields but mainly in industries dealing with data collection and exchange. Maintaining a controlled flight of one drone by itself does not demand a great amount of processing power or storage, but after adding additional drones, ground vehicles, or agents, the required processing power begins to increase exponentially. When the drones start to maneuver while collecting and sending data to other drones or back to the workstation, storage space and processing power of the drones start to become a major concern. In this study we developed a way to fly multiple drones synchronously, utilizing MATLAB/Simulink with the QUARC toolbox and Quanser QDrones. The first challenge to overcome is providing two drones with a simultaneous mission, our goal for this step is to have the drones safely fly in a various formations similar to Airplanes. Once we develop a way to maintain two drones flying at the same time, we propose that we can then expand to a greater number of drones and additional ground vehicles. Once the drones can consistently perform safe flights with efficient, accurate movement, and coordination, more vigorous tasks could be performed such as: intelligence gathering, autonomous flights, or neural network thinking through a swarm of drones. This paper provides an overview of the process and workflow needed to conduct drone swarm flights through a central hub navigational system. The funding for this project was provided by ONR and ARO grants.

2:15 009.006 U **Use of Unmanned Aerial Systems in Infrastructure Inspections – A Close Look at Advanced Skyranger R70 Payloads.** University of the Incarnate Word, San Antonio, Texas. **Orion Jones**, Jovany Avila, Michael Frye, Ph.D.

The SkyRanger R70 designed and manufactured by Teledyne FLIR is an advanced unmanned aerial system (UAS), developed for use by the United States military. University of the Incarnate Word (UIW) has acquired this system in an effort to improve infrastructure inspections workflow, included with the system are several sensor arrays that are utilized for this purpose: HDZoom 30, an electro-optical (EO) sensor that delivers high-definition images and object tracking up to 5km away; EO/IR Mk-II a combination high definition electro-optical & infrared (IR) sensor array; and StormCaster a long wave infrared camera with 30x zoom. Together these sensors allow for UIW to have unique capabilities that are being leveraged by local power companies to inspect their infrastructure in a more timely and accurate manner than could previously be achieved. This paper will provide an overview of the R70 along with its sensors and how these systems allow for an advanced inspection platform. One of the challenges electrical infrastructure organizations face is the ability to identify damage before the damage manifests itself into disruption to the power delivery grid. Damage to electrical equipment can be identified by measuring the temperature at junctions and contact points and identifying abnormal temperature signatures. This has been difficult to achieve reliably due to rudimentary handheld infrared imaging equipment and the limitations therein. The R70's StormCaster provides a unique ability by imaging large areas simultaneously and doing so from a distance of up to 2 miles away. The IR sensor is far more reliable than previous handheld methods. These factors taken together allow for less personnel inspecting a larger set of data points. This paper will detail the workflow developed by UIW's AVS Labs' flight team and lessons learned when conducting these inspections with power delivery organizations. The funding for this project was provided by an ONR grant.

2:30 009.007 G **Particle Interactions in Compact Objects and the Early Universe.** University of Houston-Clear Lake. **Faiz Khan**, Samina Masood

We show there is an effect of an extremely large magnetic field in highly dense media that has not been explored in prior work. We discuss the renormalizability of QED in such a medium. These extreme situations are found in the exotic environment of compact objects, especially neutron stars. It is found that the renormalization constants of QED are significantly modified in stellar media due to an additional B dependent term that appears due to the very high magnetic field in a star. The newly computed renormalization constants can be used as effective parameters of QED to study the particle processes in hot and dense stars with a strong magnetic field. We propose to use modified parameters to analyze astrophysical data and investigate the structure and composition of stars.

2:45 009.008 G **A Machine Learning Approach for Long-Term Prediction of Power Plant Alloys.** The University of Texas at El Paso, El Paso, Texas. **Md Abir Hossain**, Calvin Maurice Stewart

This study outlines a machine learning approach for long-term stress-rupture (SR) prediction of power plant alloys. Traditional methods of lifetime estimation and alloy design employed for power plant application rely mostly on repeated testing, prior experience, and trial-and-error approach, which is laborious, time-intensive, and costly. Recent advances in the machine learning approach offer an accelerated technique of development of constitutive creep laws, superior alloy designs, and reliable long-term performance prediction. To that end, a machine learning approach is explored in this study for long-term stress-rupture prediction. GPTIPS, a biologically inspired genetic programming (GP) toolbox for building an accurate and intrinsically explainable non-linear regression model is employed in this study. GPTIPS randomly sampled tree structures, mutate, and cross over the best performing trees to create a new sample. The process iterates until the best solution is found based on criteria set by the user. Herein, the stress-rupture data of 18Cr-8Ni stainless steel, divided into 70% training and 30% test data irrespective of heat grades are fed into GPTIPS. The GPTIPS is iterated

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based on the number of genes, tournament size, tree depth, and nodes. The generated SR constitutive models are ranked according to goodness-of-fit and model complexity. The best-ranked models are compared with the experimental data and found to be free of inflection points at higher isotherms. Post audit validation is performed by fitting the model blindly against an extended database of 18Cr-12Ni-Mo stainless steel. Based on the goodness-of-fit, the best-ranked models are investigated for future application, limitations, and the resultant capability of effective prediction. In the future, the ability of GPTIPS will be leveraged to develop minimum-creep-strain-rate models, alloy design based on chemical composition, potential sources of uncertainty, and their implications on the outcomes.

010. Terrestrial Ecology and Management Oral Section and Section Meeting

1:00 pm to 2:15 pm, Room 1215

1:00 010.001 G **Examining variation in vegetation density within Texas Tortoise (*Gopherus berlandieri*) home ranges in Cameron County, Texas.** Texas State University, San Marcos, Texas. **Daniel Guerra**, Joseph Veech

The Texas Tortoise (*Gopherus berlandieri*) is an understudied species compared to federally protected *G. agassizii* and *G. polyphemus*. *G. berlandieri* likely faces many of the same threats. Research is needed to better understand its basic ecology and inform conservation efforts. In south Texas, *G. berlandieri* inhabits Tamaulipan scrublands. Individuals in coastal populations occur on *lomas*, low relief clay ridges with thick mesquite scrub typically surrounded by salt prairie grasslands. Our study examines seasonal patterns in *G. berlandieri* habitat use at Palo Alto Battlefield National Historical Park, a protected natural area in Cameron County, Texas. Twelve tortoises were outfitted with GPS loggers which recorded location once an hour from March 2020 to present. We used three different metrics to delineate home ranges of individual tortoises: 100% Minimum Convex Polygon (MCP), 95% Kernel Density Estimate (KDE), and 50% KDE. We then examined the density of vegetation within each tortoise's home range by calculating the average Normalized Difference Vegetation Index (NDVI) for a given time period. Average NDVI was calculated for each three-month season (winter, spring, summer, and fall), year (2020 and 2021), and for the overall study period using satellite imagery downloaded from Planet (<https://www.planet.com>). Average seasonal NDVI within home ranges of individual tortoises were compared to determine if tortoises experienced significant changes in vegetation density over the study period. Average yearly NDVI was similarly analyzed to assess yearly variation in vegetation density. For each season, we also compared vegetation density among home ranges. For some home ranges, vegetation density varied with season and there were some differences among the home ranges of individual tortoises. Measurement and analysis of NDVI provides a detailed characterization of habitat. This could be important to conservation planning and habitat management for the Texas Tortoise.

1:15 010.002 G **Nest microclimates impact on parental behavior in Carolina Wrens.** Sam Houston State University, Huntsville, TX. **David Farris** and Diane Neudorf

Nest boxes are often used to supplement or replace lost natural cavities. Although nest boxes are a common tool in conservation, the microclimates can be different from natural tree cavities and may be less insulative than natural cavities. For birds using potentially hotter and drier artificial cavities may influence their incubation, feeding behavior, and fitness. This effect can be further exacerbated in habitats with less canopy cover such as urban and suburban areas. By comparing nest boxes used by *Thryothorus ludovicianus* (Carolina Wren) nesting in a suburban and a rural habitat, we hoped to better understand how nest-box microclimates can affect incubation behavior. We also set up one control box in each habitat to examine the microclimates in boxes without a nest. We monitored internal and external temperature and humidity of the nest boxes with active wren nests. Video recordings of incubation behavior and feeding behaviors were taken during morning and afternoon sessions for two-hour periods. We will discuss variation in microclimates for nest boxes in both habitats and differences in wren incubation and feeding behaviors. This talk is for the grant received during the 2020 meeting.

1:30 010.003 G **Genetic Analysis of Beaver Reintroductions in Texas.** Sam Houston State University, Huntsville, Texas. **Drew R. Neyland**, Alexandra Herrera-Martinez, Juan D. Daza, Christopher P. Randle, William Godwin, Monte L. Thies

The restoration of *Castor canadensis* in Texas is one of the state's greatest conservation success stories. By 1900, overexploitation by fur trappers decimated beaver numbers in the state and the species was thought to be extirpated from east Texas. Between 1939 and 1942, 129 beavers were translocated from source populations along the South Llano River of Edwards and Kimble Counties in southwest Texas into 27 eastern counties. It is unknown the extent to which this extirpation and subsequent reintroductions has impacted the genetic composition of present-day beaver populations. Given the local extirpation in east Texas prior to 1900, our working hypothesis is that current east Texas populations are wholly connected genetically to populations from southwest Texas. To address this question, our current study is using mitochondrial DNA and microsatellite markers to determine the genetic effect of this bottleneck and connect present day populations to relict populations. To make this determination, we have obtained samples from wildlife services, live trapping, incidental finds, and museum specimens from various regions across the state. DNA samples are currently being processed. Once completed, haplotype network analyses will be used to reconstruct gene-flow patterns and historical events of current Texas populations. Genetic diversity indices will also be determined from the microsatellite markers. Field collection methods and preliminary results will be presented.

1:45 010.004 N **Interaction of domestic dogs (*Canis lupus familiaris*) with selected medium-sized and large mammals in an urban system.** East Texas Baptist University, Marshall, TX. **Troy A Ladine**

From 14 October 2014 through 1 November 2021 trail cameras were used to assess the impact of domestic dogs (*Canis lupus familiaris*), in conjunction with three extraneous variables (hours of dark, lunar cycle and lunar illumination) on selected wild mammals in an urban system. Mammals investigated include white-tailed deer (*Odocoileus virginianus*), wild cats (bobcats, *Lynx rufus*, and mountain lions, *Puma concolor*), wild canids (coyotes, *Canis latrans*, red wolves, *C. rufus*, and coyote-red wolf hybrids), raccoons (*Procyon lotor*), and Virginia opossums (*Didelphis virginiana*). The study site was located within the city limits of Marshall, TX (3233'N, 9422'W). I hypothesized the presence of domestic dogs would decrease the activity (number of pictures) of wild mammals. My findings were supported for wild cats. White-tailed deer, raccoons and Virginia opossums exhibited a non-significant decrease in activity. The wild canids exhibited an increase in activity. The presence of domestic dogs exhibited similar interaction effects with the target species and lunar cycle. However, domestic dogs were less active with increasing nocturnal hours. The interaction of domestic dogs with the wild mammals in the area may be important in predator-prey interactions with white-tailed deer and over-browsing of forests if domestic dogs are present.

2:00 **Terrestrial Ecology and Management Section Meeting**

015-023. Oral Paper Session 2

8:00 am – 10:15 am, all rooms listed below are in Bayou Building

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015. Biomedical Sciences Oral Section 2 and Section Meeting

8:00 am to 9:15 am, Room 1213

8:00 015.001 G **A Reliable SOP for Urine Biomarkers Within Storage and Sampling Analyses.** University of Texas at El Paso, El Paso, Texas. **Kiana Holbrook**, Wen-Yee Lee

Based on the traditional serological uses to obtain diagnoses of cancer and biopsy techniques, cancer detection could be not only invasive but also expensive. Some tests are also unreliable. As of today, urine is one of the most frequently used and collected specimens in the clinical diagnoses. While the area of urinalysis metabolomic profiling has received interest in the top clinical research, there are limited components to the validity, specificity, as well as the sensitivity of endogenous urine substrates to detect early stages of cancers. Although there is research showcasing that urine is impacted by age, cancer type, geographical location, and diet, there is a substantial gap in knowledge as to how these variables affects the metabolic excretion process, as well as the urine's specific profile. The purpose of this study is to evaluate the volatile organic compounds (VOCS) from urine of healthy volunteers and renal cancer patients, to study the change in biomarkers amongst populations and to detect reliable renal cancer biomarkers. These urine samples will be analyzed using Stir Bar Sorptive Extraction coupled with thermal desorption in combination with gas chromatography mass spectrometry (TD-GC/MS). The VOC profile stability will be tested for various factors such as storage time and thaw freeze cycle; as well as the analytical variables of time of urine collection, stream collection, and fasting versus non-fasting. The TD-GC/MS method is projected to enhance and validate the previous literature deeming the technique as a viable analysis for detecting target compounds in urine for cancer screening and diagnoses. The developed method will be adopted for the analysis of renal patient samples. Our method has the potential to identify target odor volatiles resulting from various environmental and biological factors.

8:15 015.002 U **Incapacitating Sars-Cov-2 Delta Variant (B.1.617) By Developing mRNA Vaccines Through EteRNA RNA Folding Software.** Robert Klupka, Robert Miranda

The SARS-CoV-2 regional variant B.1.617 (AKA Delta variant) contains spike protein mutations which theoretically contribute to its high transmissibility, potentially resulting in re-infections and the need for new mRNA vaccines. Previous studies concluded that humans outperform supercomputer algorithms when concerning visual RNA design, so the crowd-sourced RNA folding software, EteRNA was created. EteRNA allows world-wide users to design RNA molecules for biomedical research (e.g., B.1.617 mRNA vaccines). Designing viable mRNA vaccines quickly is vital during a crisis, and an RNA-folding software such as EteRNA may be a solution. This study contributes to the EteRNA citizen science campaign, OpenVaccine B.1.617 Sprint with the goal of designing a viable mRNA vaccine against the SARS-CoV-2 regional B.1.617 variant. Specifically, the research aims to design an mRNA molecule with the longest possible half-life and lowest total free energy metrics by mutating individual bases without changing the amino acid sequence coding for this variant spike protein. Designed mRNA molecules are submitted to Stanford University School of Medicine where eight will be selected for potential vaccine testing. This study designed and submitted three mRNA molecules due to their increased half-life metric, with 0.3402 hours being the longest predicted half-life produced. Overall, our results may contribute to the development of an mRNA vaccine to the SARS-CoV-2 regional variant B.1.617 through the use of EteRNA software for designing stabilized mRNA molecules.

8:30 015.003 U **Biomedical Stereolithographic Structure Stiffness.** University of Houston Clear-Lake, Houston, TX. **Roman Sustaita**, Edgar Antonio Castillo, Dr. Ariful Bhuiyan

For the stereolithographic experiment, tests of 3D structures were conducted to determine if the porosity of an object, the orientation of the structure's print, and resin type affected the stiffness under compression. There were three orientations in focus for these structures: 0° where the structure was printed vertically and tested from the top, 45° where the structure was printed at a 45° angle on the platform and tested on the top angle, and a 90° orientation was printed the same as the vertical orientation but tested from the side instead of the top. The three resins used were dental, medical clear, and surgical. The experiment produced three results: the solid structures were stiffer than the porous structures, the orientation did affect stiffness in the structures, and the resin types had different stiffnesses. All the solid block structures were above the porous stiffnesses around a scale multiple of 10. The elastic modulus of 0° to 90° prints from medical resin and surgical to medical resin had p-values of 0.02% and 0.05%— each below 5%, which signified a statistical difference. This information is crucial to spinal fusion applications in creating and modifying structures to satisfy different loading requirements.

8:45 015.004 U **Novel Isolation Method and Characterization of Trabecular Meshwork Cells.** University of Houston-Victoria. **Thanh Le**, Karen Zuniga, Hope Figueroa, Colleen McDowell, Humberto Hernandez

Purpose: Primary open-angle glaucoma is one of the leading causes of blindness worldwide. Current therapeutics do not target the pathogenesis at the Trabecular Meshwork (TM). With many mouse models available to study the biology of the TM, there is a great need for new methods of TM cell isolation. There are many challenges to isolate TM cells, including facilities, expertise, etc. Methods: We have previously developed a method for TM cell isolation using a novel bead-based method. In this study, we characterized mouse TM cells from different mouse strains (C3H/HeOuJ, C3H/HeJ, B6;129S1-Bambi^{tm1.1Jan/J}, and 129-Smad3^{tm1Par/J}) and evaluated the expression of the extracellular matrix, and responsiveness to Transforming Growth Factor Beta-2 (TGFβ-2, 5ng/mL) and Dexamethasone (DEX, 500uM). Results: Our results indicate that wild-type TM cells (C3H/HeOuJ and B6;129S1-Bambi^{tm1.1Jan/J}) upregulate Fibronectin, Collagen-1, and Toll-Like Receptor 4 (TLR4) while C3H/HeJ (TLR4 mutant) do not. Conclusions: Our primary TM cells respond similar to well characterized TM cells. This new method of TM isolation will be very useful to the field of glaucoma as it will allow greater use of mouse TM cells.

9:00 **Biomedical Sciences Section Meeting**

016. Cell and Molecular Biology Oral Section 2 and Section Meeting

8:00 am to 9:30 am, Room 1324

8:00 016.001 U **Inhibition of Autophagy in Human Microvascular Endothelial Cells during Colorado Tick Fever Virus Infection.** Sam Houston State University, Huntsville, Texas. **Christian Miller**, Alyssa Russell, Jeremy Bechelli

Colorado tick fever virus (CTFV) is the responsible agent for the acute febrile illness Colorado tick fever (CTF) can manifest mild to severe symptoms in humans including meningitis, encephalitis, and bleeding disorders. Despite the clinical significance, the understanding of mechanisms that induce CTFV pathology remains largely unknown. Transcriptomics analysis of CTFV infected human microvascular endothelial cells (HMEC-1's) showed increases in total mRNA expression of autophagy-associated genes including p62/SQSTM1 and BECN1, and downregulation of genes including ULK1 and WIP12, which suggested an interaction between CTFV infection and autophagy in HMEC-1's. Further investigation at the protein level through Western Blot analysis showed a reduction in the ratio of light chain 3 form II (LC3-II) to light chain 3 form I (LC3-I) and a significant increase in p62, highlighting an overall decrease in autophagosome formation and inhibition of degradative autophagy. Data also showed increased protein expressions of pAkt (Ser473), mTOR (Ser2448), and pp70S6K (Thr389), which highlighted a potential pathway by which CTFV downregulates autophagy through modulation of Akt/mTOR/p70S6K signaling. Cell viability analysis utilizing 3-MA and chloroquine (CQ), known inhibitors of autophagy, showed a decrease in cell survival during CTFV infection. Furthermore, rapamycin, a known inducer of autophagy, showed an increase in cell viability when

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compared to infection with autophagy inhibitors as well as infection alone. Collectively, our data suggest that autophagy is downregulated in response to CTFV infection in HMEC-1's to subvert the cellular innate immune response and avoid degradation.

8:15 016.002 G **Investigating the role of NOXA and PUMA during CTFV induced apoptosis in HMEC-1.** Sam Houston State University, Huntsville, Tx. **Sebastian Juarez Casillas**, Sarah Owen, Alyssa Russel, Jeremy Bechelli.
Colorado Tick Fever Virus (CTFV) is the type species of the genus Coltivirus of the family Reoviridae and the causative agent of Colorado tick fever (CTF). Symptoms of CTF include biphasic fever and leukopenia associated with a recent tick bite. While typically self-limiting, the illness can progress to encephalitis, haemorrhagic fever, and death in some cases. There is currently no known cure or vaccine for CTFV. Our previous work has shown that CTFV infected HMEC-1 cells undergo apoptosis early during infection, though the exact mechanism of apoptosis induction is unknown. At least two broad signaling pathways lead to apoptosis: the intrinsic and the extrinsic pathway of apoptosis. The intrinsic pathway begins at the intracellular level with the BCL2 class of proteins (Pro-survival) and BH3 class of proteins (Pro-apoptotic). The intrinsic pathway also involves the mitochondrial release proteins that lead to caspase-3. The intrinsic and extrinsic pathways are often interconnected, leading both pathways to initiate apoptosis. We performed transcriptome analysis using RNA-seq in the human microvascular endothelial cell line HMEC-1. Gene enrichment and KEGG pathway results suggested that there are several genes involved in the induction of the apoptosis pathway. KEGG analysis revealed an increase in apoptosis, cell cycle, and TNF signaling. Specifically, genes PAMIP1 (NOXA) and BBC3 (PUMA) are upregulated at 24 hpi. Quantitative PCR was used to validate the transcriptomics data and showed an increased expression of genes encoding for NOXA and PUMA 24 hpi. Furthermore, results from Western blotting demonstrate an increase in proteins NOXA and PUMA up to 24 hpi. Further research will include analyzing mediators of the apoptotic pathway including cytochrome c and caspase activation. This work contributes new knowledge about Coltivirus-host interactions and establishes a foundation for future studies to define mechanisms of CTFV induced pathology.

8:30 016.003 G **Development of a SYBR Green-Based RT-qPCR for the Detection and Quantification of Lone Star Virus.** Sam Houston State University, Huntsville, Texas. **Megan Burch**, Jeremy Bechelli
Lone Star virus (LSV) is a newly characterized tick-borne *bandavirus* with pathogenic potential as indicated by infection and cytopathic effect in human and non-human primate cell cultures. However, there are no detection methods available to identify and monitor LSV *in vitro*. Here we describe the development of a SYBR green-based RT-qPCR assay for the detection and quantification of LSV. Primers were developed for the M segment of the tri-segmented genome and were initially tested for amplicon formation and non-specific binding. Portions of the LSV genome were cloned into a plasmid and propagated in competent *Escherichia coli* to obtain the template for a standard curve. Amplicon formation of the developed primers indicated that a single product was formed of the expected size of 152 base pairs with a consistent melting temperature (T_m) of 82°C. The limit of detection for the assay was fewer than ten copies/ μ l of the viral genome. Specificity testing revealed slight cross-reactivity with four related viruses (Heartland virus, La Cross virus, Jamestown virus, Crimean-Congo Hemorrhagic Fever virus); however, the T_m for the related viruses was either below the threshold or dissimilar to the previously indicated T_m for LSV. Standard curve analysis showed the efficiency of the primers was 96.3%-102% with an R^2 value of 0.992-0.996 and a slope of 3.276-3.363. For reproducibility analysis, the interassay coefficient of variation (CV) was 0.471%-1.108%, and the intra-assay CV was 0.110%-4.203%. This data suggests that the SYBR green-based RT-qPCR assay for the M segment of LSV is highly sensitive, specific, and reproducible. This assay will aid in discerning the ecological and pathogenic significance of LSV through rapid, sensitive, and specific detection of the virus *in vitro*.

8:45 016.004 G **Colorado Tick Fever Virus Mediated Apoptosis in Human Endothelial Cells.** Sam Houston State University, Department of Biological Sciences, Huntsville, TX. **Sarah Owen**, Alyssa Russell, Jeremy Bechelli
Colorado tick fever virus (CTFV), the causative agent of Colorado tick fever (CTF), is a member of the Family Reoviridae and genus Coltivirus. Symptoms of CTF are characterized by sudden biphasic fever, headache, myalgia, petechial rash, and photophobia, while severe forms of the disease can include meningoencephalitis, hemorrhagic fever, and death in children. However, the mechanisms underlying CTFV induced pathology and severe complications remain unknown. Our previous work indicated that CTFV induces apoptosis in HMEC-1 cells. To gain a better understanding of CTFV-induced apoptosis, we investigated the mechanisms of apoptosis initiation in HMECs during CTFV infection. We first analyzed the expression of key death receptors and ligands during CTFV infection in HMECs by qPCR and observed significant increases in gene expression for TRAIL and its receptors, DR4 and DR5, at 24 hours post infection (hpi). We then analyzed the protein expression of TRAIL in infected cells by western blot and observed a significant increase of protein expression at 24 hpi. We also analyzed the protein expression of BID and observed a decrease in full length BID at 24 hpi, indicating BID activation. This data suggests that the extrinsic pathway is activated during CTFV infection in HMEC-1 cells. Next, we analyzed the protein expression of caspase-9 by western blot and observed a decrease in full length caspase-9 at 48 hpi, indicating caspase-9 activation. Overall, our data suggests that both pathways are activated to initiate apoptosis during CTFV infection in HMEC-1 cells. Further studies will examine if inhibition of these pathways will reduce CTFV-induced apoptosis in HMEC-1 cells.

9:00 016.005 G **Infection of Human Endothelial Cells with Colorado Tick Fever Virus Stimulates Cyclooxygenase 2 Expression and Vascular Dysfunction.** Sam Houston State University, Huntsville, Texas. **Stephanie Beane**, Luis Grado, Alyssa Russell, Jeremy Bechelli
Colorado tick fever virus (CTFV), a tick-borne double-stranded RNA virus, is the causative agent of Colorado tick fever (CTF). CTF is generally self-limiting; however, severe manifestations can include meningitis, hemorrhagic fever, and meningoencephalitis. The mechanism of CTFV mediated pathology is currently unknown, including mechanisms underlying CTFV infection-associated vascular damage. Cultured human endothelial cells are highly susceptible to infection and respond by altering regulatory cytokines, and ultimately undergoing apoptosis. Cyclooxygenase-2 (COX-2) is a known mediator of inflammation and facilitates the synthesis of prostaglandins. In this study, infection of HMEC-1s showed robust induction of COX-2 but no effect on COX-1 using transcriptomics and qPCR. Additionally, cell viability measured during infection with COX inhibitors showed an increase in cell survival when treated with indomethacin, a potent non-selective inhibitor of cyclooxygenase enzymes. Angiotensin-1 (ANG-1) and angiotensin-2 (ANG-2) are biomarkers produced during vascular dysfunction during infections; Tie-2 is an endothelial receptor involved in inflammation and vascular leakage. qPCR analysis showed an increased ANG-2/ANG-1 ratio and Tie-2 expression at 12- and 24- hours post-infection (hpi). Current data suggests CTFV induces pathological characteristics of vascular activation and dysfunction evidenced by enhanced COX-2 expression and skewed ANG-2/ANG-1 ratio, and cyclooxygenase may be important during CTFV infections through increased cell viability with cyclooxygenase inhibition. Furthermore, infection of primary human umbilical vein endothelial cells demonstrates upregulation of COX-2 protein at 4-, 12-, and 24-hpi. In this study, we uncover specific biomarkers for CTFV-induced vascular dysfunction and inflammatory responses, highlighting potential therapeutic markers for the treatment of this neglected tick-borne disease.

9:15 **Cell and Molecular Biology Session Meeting**

017. Chemistry and Biochemistry Oral Section 2

8:00 am to 9:15 am, Room 1218

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- 8:00 017.001 N **Using Density Functional Theory to compute the energetics of and analyze the excited- and ground state electron transfer processes of ruthenium(II) photoredox catalysts.** The University of Texas at El Paso, El Paso, Texas. **Balazs Pinter**
Ruthenium photoredox catalysts are ruthenium-polypyridine and phenylpyridine complexes that become exceptionally strong reductants and simultaneously also oxidants when irradiated by light. The absorption of photon induces a characteristic metal-to-ligand charge transfer (MLCT) process in these complexes generating a low-energy hole on the metal and a high-energy electron on the ligand. The long lifetime (~ 1 ms) of the MLCT triplet state formed after rapid vibrational/structural relaxation and intersystem crossing allows the excited state to participate in bimolecular outer-sphere electron transfers, which are used nowadays in energy-demanding transformations. While computing reduction potentials and modeling excited states of transition metal complexes are challenging in general, our recently developed computational protocol based on Density Functional Theory (DFT) in combination with implicit solvation provide accurate energetics for the different quenching cycles of these complexes allowing the calculation and prediction of ground- and excited state reduction potentials to high accuracy (typically within 0.15 V). In this study we present our novel *in silico* approach, which directly accounts for the Gibbs free energy of the triplet metal-to-ligand charge transfer state (³MLCT), allowing the simulation of excited state electron transfer thermodynamics of photoredox catalysts accurately. We augment the reduction potential analysis with electron density difference map (EDDM) studies and Effective Oxidation States (EOS) analyses to characterize the electronic structure changes upon photoabsorption and subsequent redox events along the oxidative and reductive quenching cycles of ruthenium(II) systems. EDDMs and EOS analyses provide unique and intuitive insights into the characteristic metal- and ligand-centered reductions and oxidations, revealing ligand non-innocence, multiligand delocalization in homoleptic complexes and localization in heteroleptic systems, etc.
- 8:15 017.002 G **Rational design of the redox properties of homogeneous and heterogeneous Cu(I) photoredox catalysts.** University of Texas at El Paso, El Paso, Texas. **Christian Sandoval-Pauker** and Balazs Pinter
Photoredox catalysis has been renewed as a promising tool to transform solar energy into chemical energy through particularly exothermic photoinduced electron transfer processes, thus facilitating energy-demanding redox reactions. Octahedral ruthenium (Ru) and iridium (Ir) transition metal photoredox catalysts (TMPRCs) represent the workhorses of the field, however, availability, sustainability and costs limit their sustainable and long-term industrial scale application. In the last decade, the development of TMPRCs based on cheaper and more abundant first-row transition metal complexes has been the focus of intense research. In particular, copper (I) TMPRCs have been found to facilitate several photoredox transformations. Cu(I) complexes are the most promising molecular systems to replace traditional TMPRCs, albeit their performance is still far from Ru and Ir complexes. The operating mechanism of TMPRCs lies in the promotion of an electron, upon absorption of a photon of light, from a metal-centered orbital to a ligand-centered π^* orbital achieving a triplet metal to ligand charge transfer (³MLCT) state (after internal conversion and intersystem crossing) which is both a strong reductant and oxidant. It is well known that the photoelectrochemical properties of transition metal complexes can be profoundly modulated by altering the properties of the corresponding redox-active ligands. Our approach is to develop rational design principles of redox-active ligands guided by chemical concepts that are derived from a large-scale computational study, thus allowing the full understanding of the MLCT and ligand-centered electron transfer processes in homoleptic and heteroleptic Cu(I) TMPRCs. We established and validated a protocol for the calculation of ground and excited state reduction potentials of these systems. Besides, we used various computational techniques to characterize the different electron transfer events of the photoredox cycle (and the species involved).
- 8:30 017.003 G **Tandem photoredox catalysis of [Ir(ppy)₂(dtb-bpy)]⁺: Identifying the co-catalyst by DFT.** University of Texas at El Paso, El Paso, Texas. **Daniel Gómez Bustos**, Balazs Pinter
Photoredox catalysts are substances that are capable to harvest light, convert it to chemical energy and drive otherwise unfeasible or energy-demanding chemical reactions. The metal-ligand charge transfer triplet excited state formed after photon absorption in transition metal-based photoredox catalysts has a long lifetime to participate in bimolecular reactions and extreme redox properties to generate radical active species. In 2019, Conell et al. reported the discovery of a tandem photoredox catalytic cycle in which the catalyst [Ir(ppy)₂(dtb-bpy)]⁺ (**1**⁺) is involved. When irradiated in a triethylamine (TEA) solution, the subsequent reaction of excited state **1**⁺ with TEA generated a previously unknown complex (**2**), which acted as a co-catalyst in the catalytic cycle. This reaction would involve the addition of hydrogens to the dtb-bpy ligand. In absence of a crystal structure for **2**, a neutral three-hydrogen derivative of **1**⁺ was put forward based on instrumental measurements. Using a benchmarked density functional theory based (DFT) protocol that allows the accurate calculation of reduction potentials in ground and excited states, we computed the redox properties of **1**⁺ and **2** in acetonitrile. While the computed redox potentials of **1**⁺ were in excellent agreement with experimental data, the deviation between experiment and theory for **2** was significant and the nature of electron transfer also mismatched suggesting a misidentified structure for **2**. We analysed a set of closely related plausible molecular structures for the co-catalyst and studied each one at the DFT level, including reduction potential calculations and wavefunction analyses. Only one of these structures, a four-hydrogen addition derivative of **1**⁺, exhibits redox properties matching with experimental data, identifying the real co-catalyst **2**. With this study, we also showcase the ability of realistic DFT calculations to be a useful asset in structure elucidation in the field of photoredox catalysis.
- 8:45 017.004 G **Computational Investigation of the Preferred Binding Modes of N₂O in Group 9 and 10 Metal Complexes.** Stephen F. Austin State University, Nacogdoches, Texas. **Cole Donald**, and John Brannon Gary
Nitrous oxide (N₂O), a common greenhouse gas, is a thermodynamically powerful and ecologically-friendly oxidant that makes it an appealing target for metal center activation. N₂O is a notoriously poor ligand, and its coordination chemistry has been limited to a few terminal, end-on k-N complexes despite its potential utility as an oxygen-atom transfer reagent for transition metals. As a result, nitrous oxide is still being studied as a potentially "green" oxidant in inorganic and organometallic systems. Despite its attraction as an oxidant, N₂O's practical utility is limited by its high kinetic stability. Due to a high activation barrier (ca. 59 kcal/mol), breaking down N₂O into its constituents, N₂ and O₂, requires considerable temperatures (400°C) in the absence of catalysts. Using computational chemistry, this presentation will highlight the energy differences between new potential N₂O binding modes. Insights into the comparison between the k-N and k-O versus the newly reported h²-NN and proposed h²-NO binding modes will be discussed. Given the limited knowledge of the coordination of N₂O to metal centers, these binding mode comparisons can be used in the development of N₂O as a "green" oxidant.
- 9:00 017.005 G **Killing the Switch that Controls Hsp60's Refolding Ability.** University of Texas at El Paso, El Paso TX. **Daniel von Salzen**, Alejandro Rodriguez, Jinliang Wang, Bianka Holguin, and Ricardo Bernal
Molecular chaperonins are large protein complexes responsible for the refolding of misfolded substrate in an ATP dependent manner. In humans, heat shock protein 60 (Hsp60) along with its co-chaperonin Hsp10 is involved with maintaining protein homeostasis within the mitochondrial matrix. Structural analysis has identified the major functions of each domain within the Hsp60 monomer. However, very little is known about Hsp60's intrinsically disordered C-terminal tail. All that is known is that it plays a significant role in the chaperonin's refolding ability. It is speculated that the function of the C-terminal tail is to shuttle protein into the chaperonin's inner cavity. However, we hypothesize that the C-terminal tail has a secondary role where it acts as a switch to initiate ATP hydrolysis. We have investigated the effects that truncations of the C-terminus have on Hsp60's ability to refold denatured malate dehydrogenase in protein refolding assays performed *in-vitro*. We found that removal of the C-terminal tail results in loss of Hsp60's refolding ability and ATP hydrolysis activity without disrupting complex formation *in vitro*. Importantly, Cryo-Electron Microscopy of the C-terminal tail deletion mutant along with denatured malate dehydrogenase, shows the presence of the ATP football complex. The presence of this complex is only seen when denatured substrate is present and suggests that the substrate can still be encapsulated but cannot be refolded due to inhibited ATP hydrolysis that results from the removal of the C-terminal tail.

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018. Conservation Ecology Oral Section 1

8:00 am to 10:00 am, Room 1326

8:00 018.001 G **Do Anthropogenic Stressors Affect Distribution of Alligator Snapping Turtles (*Macrochelys temminckii*) In Texas?: Preliminary Study Design.** University of Houston-Clear Lake, Houston, Texas. ¹College of Science and Engineering, ²Environmental Institute of Houston, ³SWCA Environmental Consultants, Houston, Texas, ⁴Texas Turtles, Grand Prairie, Texas. **Kelly Garcia**¹, Mandi Gordon², Eric Munsch³, Arron Tuggle³, Carl Franklin⁴, Viviana Ricardez⁴, and George Guillen^{1,2}

Anthropogenic disturbances are responsible for an array of ecological issues and it is imperative to understand their impact on sensitive species in order to mitigate declining populations and biodiversity loss. The alligator snapping turtle (AST; *Macrochelys temminckii*) is the largest freshwater turtle species in North America and is currently listed as threatened in Texas owing to poaching, habitat loss, pollution, and a lack of baseline population data. Due to the need for extended population assessments range-wide, ASTs have been suggested for inclusion on the Endangered Species Act in a recent Species Status Assessment released by the U.S. Fish and Wildlife Service. Though ASTs are known to exist in Gulf drainages ranging from northwest Florida in to Texas, their current distribution in Texas is unclear. The current objectives of this study are to: assess the current distribution and population demographics of ASTs in Texas and identifying potential anthropogenic stressors. To date, 65 ASTs have been captured from 17 sites located within 5 east Texas river basins with surveys expected to continue through early 2023. Data collected via this study will be incorporated into future models to assess landscape-scale anthropogenic influences and identify potential stressors on AST populations in Texas. The results of this study will provide updated data on AST distribution, population status, and identify potential anthropogenic stressors. Data compiled through this study will aid resource managers in making final decisions towards conserving the species range-wide.

8:15 018.002 G **Preliminary Analyses of Landscape-Scale Impacts on Western Chicken Turtles (*Deirochelys reticularia miaria*) in Texas.** University of Houston – Clear Lake, Houston, Texas. ¹College of Science and Engineering. ²Environmental Institute of Houston. **Danielle DeChellis**^{1,2}, Mandi Gordon², and Dr. George Guillen^{1,2}

Understanding landscape-scale impacts of environmental and anthropogenic processes on abundance and distribution of cryptic species is important for conservation planning. Freshwater turtles include some of the most at-risk taxa largely due to habitat loss and degradation from urbanization, agriculture, and road development. The Western Chicken Turtle (WCT, *Deirochelys reticularia miaria*) is a cryptic wetland dwelling species and is currently a candidate for inclusion on the Endangered Species Act. The WCT exhibits a discrete nesting season, depends on ephemeral wetlands, and may occur in smaller and more widespread populations than conspecific species; factors that lead to a possible perception of rarity. The goals of the current study are to: determine the distribution and habitat associations of WCT in Texas, and assess relationships of WCT occurrence with landscape-level factors. Environmental DNA (eDNA) sampling is being used to increase detectability of WCT for the current study along with photo-verified citizen-science based reports via an ArcGIS Online based Reporting Tool. To date, ten locations across east Texas have been identified for inclusion into statistical models to evaluate relationships between WCT ecology and environmental data. The current study will focus on three models: 1) a species distribution model of WCT habitat suitability, 2) an analysis of the largest drivers of current and future habitat loss or fragmentation, and 3) an analysis of habitat heterogeneity within the estimated range of WCT. We hypothesize that WCT are associated with relatively undeveloped patches of freshwater emergent wetlands with direct access to terrestrial corridors and that combined effects of land cover changes reducing these features are the largest threats to WCT population viability in Texas. Final results and data from this study will be integral to resource and conservation managers considering future conservation measures and listing decisions for the WCT.

8:30 018.003 G **Birds eye view: preliminary use of small unmanned aerial systems (sUAS) for aquatic turtle surveys.** University of Houston Clear Lake, Houston, Texas. **Jason Nagro**, Mandi Gordon, and Marc Mokrech, George Guillen

Small unmanned aerial systems (sUAS) technology has expanded rapidly in recent years and has been proven an effective and efficient method for wildlife conservation research. By using this unique, non-invasive method in the field, researchers can document species presence, estimate population size, determine habitat quality, and/or create spatial data. For successful sUAS surveys, site parameters and weather conditions need to be evaluated prior to flight. In 2021, we compared different sUAS platforms (DJI Phantom 4 Multispectral; DJI Mavic 2 Enterprise Dual) for detecting aquatic turtles, using: 1) video, 2) static (RGB-spectrum), 3) thermal, and 4) multi-spectrum imagery. All sUAS flights were dispatched alongside standardized binocular assisted visual surveys (BAVS) to compare these survey techniques. Over 9+ hours of video and 25,500 photos with 522 aquatic turtle observations have been collected by sUAS while 34+ hours of BAVS yielded 357 aquatic turtle observations at 7 sites in East Texas from March thru July in 2021. An observation can have multiple turtles, but only of the same species. More observations of aquatic turtles were recorded by sUAS than BAVS at 5 sites (71.4%). The most frequently observed turtle species were sliders (*Trachemys* sp., 70.4%) and softshells (*Apalone* sp., 1.8%). Red, red-edge, and near-infrared band multi-spectrum imagery aided in detecting and identifying turtles that were under water. Thermal imagery proved inefficient for detection, however, sensor limitations should be addressed. Also, preliminary analyses suggest that thermal imagery may provide useful data about habitat structure. These preliminary results show the practicality of sUAS surveys for detecting aquatic turtle species by using an improved point of view when compared to traditional methods. Additional surveys will be conducted in 2022 to evaluate the efficiency of multi-spectrum and thermal applications in understanding their execution with aquatic turtles.

8:45 018.004 G **Floating treatment wetlands: A pilot-study of the stormwater treatment potential in urban catchments in a subtropical environment.** ¹Environmental Institute of Houston, University of Houston – Clear Lake, Houston, Texas, ²College of Science and Engineering, University of Houston – Clear Lake, Houston, Texas, ³Harris County Flood Control District, Houston, Texas. **Kaylei Chau**^{1,2}, Jenny Oakley¹, Roberto Vega³, George Guillen^{1,2}

Stormwater runoff from developed land is one of the leading causes of water pollution. Heavy metals, nutrients, oil and grease, suspended sediments, and bacteria represent some of the more common pollutants that end up in urban waterways from stormwater runoff. Current technologies to reduce pollutants like traditional water treatment facilities are expensive and require land development. Emergent wetlands have been shown to effectively remove contaminants from water, but are difficult to implement at a large scale in urban catchments due to the inherently dynamic water levels and topology which can limit establishment of emergent vegetation. Floating treatment wetlands (FTWs) are a novel technology that have been shown to reduce stormwater pollutants and enhance water quality of surface waters. FTWs are artificially created islands with (preferably native) wetland plants, grown hydroponically, where the roots are suspended in the water column. These extensive roots act as a physical filter of suspended sediments and as the mechanism for pollutant uptake by the plants. The benefit of FTWs is that they can be retrofitted to existing urban catchment sites such as stormwater detention ponds or other impaired perennial waterbodies. In 2020, EIH working in partnership with the Harris County Flood Control District, initiated this pilot-study which examined the potential for FTWs to reduce pollutants of concern from two ponds which received stormwater runoff from a university campus, located in the Armand Bayou watershed in Harris County, Texas. Three types of modular FTWs were constructed and evaluated based on selected water quality criteria, as well as durability, ease of construction, and required maintenance. This study also compared the treatment efficiency of two understudied species of wetland vegetation: Virginia iris (*Iris virginicum*) and Swamp Lily (*Crinum americanum*). Preliminary results indicate that FTWs enhanced water quality while adding wildlife habitat.

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9:00 018.005 G **Restoring native prairie species to a degraded habitat on UHCL campus – finding the most effective and the most cost-effective method.** University of Houston Clear Lake, Houston, Texas. **Rowena McDermid**, Wendy Reistle, and Cindy Howard
The decline and loss of many insect and bird species is attributed primarily to habitat loss. Prairies that are not lost to development or farming can be lost by degradation due to the influx of invasive species, over-mowing, or the lack of any grazing or fire. Aerial photography from the 1940s shows that what is now a woodland on the UHCL campus used to be prairie or Post Oak savannah. Some of the Post Oaks still survive, as do the mima mounds on which they grow, but *Celtis laevigata* (Sugar hackberry), *Ilex vomitoria* (Yaupon holly), *Triadaca sebifera* (Chinese tallow), and *Ligustrum spp* (Privet) have filled in where prairie no longer exists. There is very little research published about prairie habitat restoration on the Gulf Coast where less than 1% of the original prairie remains. This region poses challenges to restoration not experienced elsewhere in the country. Our long growing season gives invasive species an advantage and a site can be taken over by these species before the native species have a chance to establish. The first step in a multi-phase project to restore this lost habitat is to conduct a pilot study. Two acres, comprising four half acre sites will be treated using several different restoration techniques, comparing mechanical removal of smaller trees and shrubs by mulching or by fire, comparing the removal of mulch or leaving it in place, and comparing the success of introducing seed or relying on an existing seed bank in the soil. A baseline vegetation survey has been undertaken and shows that although a few remnant prairie plants exist on the edges of the woodland, none are growing under the canopy cover, and that the majority of emerging plants are non-native which minimizes their value to native wildlife. The results of the pilot study will inform how we approach the rest of the habitat restoration.

9:15 018.006 G **Comparison of Species Presence Found using Physical Specimens Collected versus using eDNA Methods.** University of Texas at Tyler, Tyler, Texas. **Schi-Lee Smith**, Joshua Banta, Nathan Schubert, Katrin Kellner
Conservation sciences rely upon precise species counts to better protect and map organisms. Crayfish, like many small organisms, can be hard to obtain for study, which is important as they can be health indicators of their ecosystems. All organisms shed DNA and the collection of this environmental DNA (or eDNA) as opposed to physical collection methods could make the conservation and study of crayfish and other species much easier. However, it is yet unknown how accurate eDNA is when compared to physical species collection. Comparing the species found using both eDNA filters and specimens, we hope to show that using eDNA filters will give us either DNA identical to using physical methods, similar data, or entirely different data. Once the DNA is extracted and the genetic sequences are found, we will be able to compare the species presence using both methods. These results could mean that, if the presence is identical when using both methods, using eDNA filtration methods would be just as accurate, if not more so, than physical methods, which would mean a much simpler field research technique could be used when possible. However, the results we find could also mean that it would be necessary to use both methods to accurately describe the species presence in an area, if both methods show the presence of different organisms. This study could potentially help to aid in future research methods encompassing water features and aquatic organisms, as it would allow for more research to be done in a shorter time and with less effort. This could also allow for citizen-added data, like many other disciplines use, as the Smith-Root company, who produces the eDNA filters, sell pumps and filters for use by anyone, and allow for them to send their filters off for testing. This could be as much of a boon to freshwater conservation as the citizen birding groups are to ornithology and the iNaturalist app is to many other different researchers and fields, if shown to be effective.

9:30 018.007 G **The population genetics of Mississippi Kites (*Ictinia Mississippiensis*) within the Great Plains.** Angelo State University, San Angelo, TX. **Brittanie Loftin**, Dr. Ben Skipper
During the mid-1900's, Mississippi kites (*Ictinia mississippiensis*) expanded their breeding range from the southeastern coastal plains and Mississippi Valley into the Great Plains. At the landscape scale, Mississippi kites appear to breed abundantly throughout the southern Great Plains; however, at a finer scale, the breeding range is disjunct with kites breeding only in cities and exurban patches of trees with expanses of unsuitable landcover stretching between. As such, the breeding landscape for this species is essentially a series of islands, each with its own breeding population. Given that site-fidelity is high, founder populations are small, and the evidence of short natal dispersal in kites, I hypothesize that kites will exhibit a localized genetic population structure across this landscape. Kites will be captured at selected nest sites after eggs hatch in late June and throughout July 2020 and 2021, using dh-gaza nets with a model great horned owl as a lure. After capture, kites will have blood drawn via venipuncture or have feathers taken. DNA will be extracted from all samples and a subset of samples will be sent to Admera Health Labs to identify single nucleotide polymorphisms (SNPs). The SNP data will then be sent back to me and will be analyzed to identify distinct populations of kites throughout the southern Great Plains.

9:45 018.008 G **Investigating the role of cover-cash crop rotations on arthropod community dynamics in Lower Rio Grande Valley.** University of Texas Rio Grande Valley, Edinburg, Texas. **Adegboyega Fajemisin**, Satinderpal Kaur, Alexis Racelis, Rupesh Kariyat
Recent studies have shown that shifting to ecologically based farming improves not only the sustainability but also the resilience of the agroecosystem. The management of the habitat surrounding agricultural systems can provide a suitable environment that aid in the propagation of beneficial arthropod communities such as natural enemies including predators, parasitoids, and pollinators. Cover crops provide a potentially cost-effective method of improving habitats to increase the populations of beneficial arthropods and thus reduce pest incidence. However, the impact of cover crops on the arthropod community dynamics in the management of pest populations is poorly understood. To address this, we have designed a four-year field experiment in the Lower Rio Grande Valley to evaluate the impact of cover crops such as cowpea, sorghum sudangrass, sunn hemp, and radish during the summer seasons followed by cash crops in the winter. The objective of this study is to examine the role of cover-cash crop rotations on arthropod community dynamics. We hypothesized that cover crop treatments would attract beneficial insects like parasitoids, pollinators, and natural enemies leading to the reduction or repulsion of herbivores, thereby benefitting the subsequent cash crop. Initial arthropod community has been evaluated in four fields in the Lower Rio Grande Valley five days after planting cover crops using pitfall traps, sticky traps (blue and yellow), and vane traps installed in both the cover crops and control field plots. A total of 6,615 arthropods were collected and classified to their orders. Our preliminary results show that there is a significant difference in the population of arthropods based on their feeding guild and taxonomic order, suggesting that cover crops mediate insect-plant interactions with possible consequences for agroecosystem sustainability and resilience- areas we will continue to explore.

019. Marine Science Oral Section and Section Meeting

8:00 am to 9:45 am, Room 1217

8:00 019.001 N **Estimating and Defining Environmental Flow Needs for Texas Estuaries: new information and approaches.** University of Houston Clear Lake, Houston, Texas. **George Guillen**
Water allocation in Texas uses the "prior appropriation system" in which the oldest water rights have first claim on available water. Through this process the state can grant perpetual water permits to individuals and organizations. Historically, the water needs of fish and wildlife had been ignored during water allocation. In 2007 Texas adopted Senate Bill 3 (SB3), to develop environmental flow standards. The SB3 process involved the establishment of Basin and Bay Expert Science Teams (BBEST) in 7 major watersheds. The duties of each BBEST included reviewing literature, and past monitoring data. The BBEST used these data to define historical and suitable ranges of freshwater inflow that were needed to support a "healthy ecosystem". This process implicitly required defining a "healthy ecosystem". This was attempted by measuring various candidate bioindicators and matching amounts of freshwater inflow both seasonally and spatially that would support higher levels of bioindicators. Unfortunately matching historical information on biological indicators and physicochemical data was largely lacking. Most data were collected at different temporal and spatial scales making it difficult to

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develop statistical models. The majority of biological indicator data was obtained from TPWD which consisted of nekton collected with bag seines and trawls. More sensitive biological indicators that were considered including more sensitive non-motile benthic organisms and communities found in specific regions (e.g. upper Trinity Bay *Rangia cuneata* and eel grass), oyster predators and pathogens. I summarize and compare existing BBEST recommended bioindicators and the response of other important estuarine organisms and approaches (water trading and application of freshwater to specific areas of the estuary) that we evaluated based on analysis of more recent data and studies. These resources should be carefully considered when developing environmental flow regimes in the future.

8:15 019.002 G **Estimating abundance of microplastics in surface waters and sediments of the Galveston Bay watershed.**

¹University of Houston – Clear Lake, Houston, Texas, Environmental Institute of Houston, ²University of Houston – Clear Lake, Houston, College of Science and Engineering, ³Turtle Island Restoration Network – Galveston, Texas. **Emily Cox**^{1,2}, Joanie Steinhaus³, Kimber De Salvo Anderson³, George Guillen^{1,2}

Marine debris is a global issue, and research on plastic pollution has greatly expanded recently as the negative impacts become better understood. Demand has driven plastic production to exceed 300 million metric tons annually and is expected to continue to increase. Plastics never fully degrade, but environmental conditions weaken larger plastics, which are fragmented into progressively smaller pieces, including microplastics (<5 mm in length). Microplastics are ubiquitous in the environment and pose many ecotoxicological risks to contacted organisms. Heavily urbanized estuarine ecosystems are particularly vulnerable to microplastic pollution, although research of plastic pollutants in such ecosystems is sparse. While studies have been conducted in areas of the Gulf of Mexico, the distribution and concentration of microplastics in Galveston Bay is not fully understood. Here we will estimate the concentration of microplastics found in surface waters and sediments within the lower portion of the Galveston Bay watershed. Microplastics floating in surface waters will be collected from five shoreline sites and five open bay sites in Galveston Bay using replicate water grabs. Floating microplastics will also be collected using replicate neuston net tows at open bay sites. Replicate sediment samples will be collected from open bay waters using an Ekman dredge, and from subtidal regions along the shoreline. Water samples will be vacuum filtered and sediment samples will be processed through a density separator before examining and enumerating the number of microplastics per sample under a microscope. This research will provide the first comprehensive baseline for the microplastic pollution levels in Galveston Bay, and facilitate future research on topics such as toxin adherence and biota interactions.

8:30 019.003 N **Extensive Field Effort Using a Novel Gear Type to Detect Recruitment of American Eel (*Anguilla rostrata*) in Texas.**

¹Environmental Institute of Houston, University of Houston – Clear Lake, Houston, Texas, ²College of Science and Engineering, University of Houston – Clear Lake, Houston, Texas, ³Texas Parks and Wildlife Department, River Studies Team, San Marcos, Texas. **Jenny Oakley**¹, Justin Hansen^{1,2}, Tito Molina^{1,2}, Stephen Curtis³, George Guillen^{1,2}

The American Eel (*Anguilla rostrata*) is a facultative catadromous fish. Data are lacking related to juvenile (glass eel and elvers) recruitment along the continental shelf and into the bays and estuaries of the Gulf of Mexico. American Eel are considered a Species of Greatest Conservation Need by the Texas Parks and Wildlife Department (TPWD). The study goal was to determine the distribution, abundance, and habitat associations and recruitment timing of glass and elver eel in Texas. Small-mesh fyke nets, specifically designed and deployed to select for small-bodied organisms that display a net upstream movement, were used to sample for juvenile American Eel. There were two phases of the field work, the first was a year-round broad spatial scale monitoring effort (August 2018-July 2019); the second phase focused on a sub-set of sites with a finer temporal monitoring scale (March-July 2020). The cumulative effort in total soak time was 6,851.77 hours. There was a total of 130,860 fishes collected representing 71 fish species from 34 families. While no American Eel were captured during the study, other Elopomorphs, [Speckled Worm Eel (*Myrophis punctatus*), and Ladyfish (*Elops saurus*)] were collected. Habitat and water chemistry variables were examined for correlation to Elopomorph catch per unit effort and presence. Water temperature, salinity, dissolved oxygen, secchi depth, and the total percent cover of in-stream cover were all significant variables in predicting the detection of Elopomorphs during a sampling event. These findings suggest that fyke nets are effective at capturing the early life stages of Elopomorphs as they ingress and settle. It is likely that if American Eel juveniles were present in high abundances during the dates and locations surveyed, we would have been able to detect their ingress. Continued year-round monitoring is suggested to increase the likelihood of detecting even highly sporadic recruitment events.

8:45 019.004 G **Relationship between Seagrass and Dwarf Seahorse (*Hippocampus zosterae*) Abundance and Distribution in Texas.**

University of Houston – Clear Lake, Houston, Texas, ¹College of Science and Engineering, ²Environmental Institute of Houston. **Story Leshner**^{1,2}, Jenny Oakley², George Guillen^{1,2}

The Dwarf Seahorse (*Hippocampus zosterae*) is one of the smallest species of seahorse and resides in shallow waters throughout the Gulf of Mexico, Atlantic Coast of Florida, and Caribbean. They rely on seagrass beds for feeding, spawning, and refuge, rarely traveling far from the bed in which they were spawned. Dwarf Seahorse are currently a candidate species for listing under the Endangered Species Act. Information on density, distribution, and habitat associations in Texas is needed to address knowledge gaps and inform a listing decision. We evaluated seagrass beds along the Texas Coast to determine what factors influenced Dwarf Seahorse presence and density. Dwarf Seahorse (n=79) were captured at 29 of 80 (36.3%) sites from Galveston Bay to the Lower Laguna Madre. They were detected in all sampled bay systems except Galveston Bay. Dwarf Seahorse were found in association with all seagrass species found in Texas. Variables significantly influencing Dwarf Seahorse presence included average seagrass biomass, turtle grass (*Thalassia testudinum*) percent cover, and nekton species abundance, evenness, and richness. Variables significantly influencing Dwarf Seahorse density included number of seagrass species present, turtle grass presence, and nekton species evenness and richness. Nekton species associated with the presence of Dwarf Seahorse included grass shrimp (*Palaemonetes* spp.), Penaeid shrimp, Code Goby (*Gobiosoma robustum*), and Rainwater Killifish (*Lucania parva*). Data from this study can be used to develop a habitat suitability index, which will help inform resource management and decisions on the federal listing of this species.

9:00 019.005 G **Teleost and Elasmobranch Diversity Along the Texas Coastline: eDNA and Metabarcoding.**

Texas Tech University, Lubbock, Texas. **Madelyn Knauss**, Stephanie Lockwood

Environmental DNA (eDNA) metabarcoding, the process of extracting and amplifying DNA from environmental samples and then sequencing the DNA, has proven to be the new technique for identifying taxa in freshwater and marine environments. Metabarcoding utilizes primers that target specific gene regions and references expansive databases of genome files to identify amplified DNA sequences. Traditional methods such as visual counts and trapping can vary in accuracy due to visual misidentifications and the elusive behavior of many marine species. In this study, we analyzed shed DNA in seawater samples using the MiFish Universal primers targeting the 12S rRNA gene to illuminate the biodiversity of Texas' coastal waters. Preliminary results yielded 351,812 raw sequence reads, with 165,136 filtered reads that identified approximately 40 unique teleost species and 2 elasmobranch species. The most common bony fish were mullet, shad, menhaden, and gar; elasmobranchs such as the smooth dogfish shark and bluntnose stingray were also detected. Additionally, we address overcoming contaminants encountered in environmental samples and discuss the efficacy of the MiFish Universal primers for identifying elasmobranchs and teleosts. We aim to create a baseline of coastal marine biodiversity using eDNA to provide a foundation for future conservation and management plans that account for elusive species.

9:15 019.006 N **Effects of salinity on distribution and epidermal integrity of bottlenose dolphins (*Tursiops truncatus*) in Galveston Bay, Texas.**

Environmental Institute of Houston, University of Houston Clear Lake, Houston, Texas. **Kristi Fazioli** and Vanessa Mintzer

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Wildlife that inhabit urban estuaries like Galveston Bay, Texas, are exposed to multiple anthropogenic and natural stressors. For long lived estuarine species, such as common bottlenose dolphins (*Tursiops truncatus*), these stressors accumulate, leading to potential individual and population health consequences. Therefore, it is imperative to understand key environmental variables that make the Galveston Bay estuary suitable habitat for this protected species. The Galveston Bay Dolphin Research Program has conducted monthly photo identification surveys of bottlenose dolphins in upper Galveston Bay (UGB), Texas, since 2015. Herein we present findings on the effects of salinity on bottlenose dolphin distribution and quantify the prevalence and body coverage extent of skin lesions on dolphins exposed to a major flood event. Using a multiple linear regression model, we found that encounter rates were significantly positively correlated to salinity. An exodus of dolphins from the study area occurs with depressed salinity levels, regardless of the time of year. During the freshwater flood associated with Hurricane Harvey in 2017, salinity levels in the bay declined rapidly from an average of 14ppt to <1ppt, altering aquatic habitat for weeks following the storm. Most dolphins left UGB, but both prevalence and extent of visible skin lesions, caused by degeneration of the epidermis, significantly increased in those that remained. As salinity recovered, extent of lesions decreased, while prevalence remained elevated for at least four months. Reductions in salinity pose an increasing stressor to the dolphins in Galveston Bay and should be closely monitored. With the predicted rise in the frequency and intensity of major storms due to climate change and planned storm management infrastructure projects in Galveston Bay, it may be necessary to manage access to habitats where dolphins could find refuge during prolonged freshwater events.

9:30 **Marine Science Section Meeting**

020. Mathematics and Computer Science Oral Section and Section Meeting

8:00 am to 10:00 am, Room 1135

8:00 020.001 G **Modeling Volcanic and Earthquake Data with A 3-Component Superposed Ornstein-Uhlenbeck SDE driven by a Lévy process.** University of Texas at El Paso, El Paso, Texas. **William Kubin**, Peter Kwadwo Asante, Osei Kofi Tweneboah, Maria Christina Mariani
Earthquakes, landslides, and volcanic eruptions are all known to be devastating calamities that result in massive loss of life and property. Scientists continue to enhance models in these areas as a result of extensive research, in order to accurately foresee future catastrophic incidents. One such model that has been used is the Ornstein-Uhlenbeck (OU) equation, which has the advantage of being able to capture the stochastic nature of these events. Unlike the traditional formulation of the model, which assumes a Gaussian background driving process, research in these areas has revealed that these occurrences deviate from normal behavior in the vast majority of situations. Thus, they are best modeled with non-Gaussian processes. In addition, there's evidence that by increasing the number of components in the OU-process, we are able to improve the model performance. This work involves modeling time series data with a 3-Component superposed stochastic differential equation of Ornstein-Uhlenbeck type driven by an Inverse-Gaussian process. Our model results are obtained from simulations with real data from volcanic and earthquake events. We show that by replacing the Gaussian process with a Lévy process and increasing the number of components in the OU-process we improve the forecast accuracy of the OU model by observing the root mean squared errors (RMSE). In this work, we assumed an Inverse-Gaussian process as the background driving Lévy process (BDLP), further investigation could be performed with a different Lévy process, such as the Gamma process to compare the performance of each model.

8:15 020.002 G **Bio-medical Signals: Cantor Detrended Fluctuation Analysis.** University of Texas at El Paso, El Paso, Texas. **William Kubin**, Peter Kwadwo Asante, Joe Guthrie, Osei Kofi Tweneboah, Maria Christina Mariani
A ternary Cantor set is a set built by removing the middle part of a series when divided into three parts and repeating this process with the remaining shorter segments. It is the prototype of a fractal, where a geometric object has similar statistical properties to itself on all scales. In this work, we propose a modification of the Detrended Fluctuation Analysis (DFA) algorithm, called the Cantor DFA (CDFA). The CDFA uses the Cantor set theory of base 3 as a scale for segment sizes in the DFA. Comparison of Hurst exponents of the CDFA to that of the DFA using real bio-medical time series is investigated in this work. By comparing these Hurst exponents with the scaling parameter of the Truncated Lévy Flight (TLF), we observe that the CDFA technique helps to reduce the overestimation problem of the Hurst exponent of the DFA while correctly predicting the memory behavior of the time series.

8:30 020.003 U **Improving Recombination MCMC For Texas Political Redistricting.** Tarleton State, Stephenville, Tx. **Cody Drolet**, Vianey Rangel, Dr. Scott Cook
Political gerrymandering is a complex and pressing threat to our system of government. Release of 2020 Census results triggered the once-per-decade process of redrawing the boundaries of election districts. This highly charged political process profoundly affects elections for the following decade and invariably brings accusations of gerrymandering, where a party gains disproportionate political advantage by manipulating district boundaries. How can the degree of gerrymandering in a proposed districting plan be quantified? One option is to statistically compare it against a large ensemble of alternative districting plans. Generating such an ensemble is a difficult task for which mathematicians have developed powerful Markov Chain Monte Carlo (MCMC) based algorithms. Recombination MCMC (Recomb) developed by Tufts/MIT Metric Geometry and Gerrymandering Group improves convergence and coverage properties of earlier Single-Flip MCMC. However, the Gerry Chain implementation of Recomb was not able to accommodate extreme population imbalances created by 2020 Census results, the need to create 2 new US Congressional districts in Texas, nor the Texas House's "county-line" rule. We present improvements to Recomb that solved these problems and allowed real-time mathematical analysis of newly proposed Texas redistricting plans.

8:45 020.004 G **Understanding Social Determinants of Health using Machine Learning Algorithms.** Tarleton State University, Stephenville, Texas. **Brandon Phillip Amerine**, Nicholas Alexander Petela, and Jesse Crawford
Social determinants of health (SDoH) are environmental and social factors influencing health outcomes that are generally divided into five domains: economic stability; educational access and quality; health care access and quality; neighborhood and built environment; and social and community context. This presentation explores associations between SDoH and health care outcomes for emergency department and inpatient visits with the aid of machine learning algorithms. As one of the leading causes of adult disability and death in the U.S., complications arising from ischemic stroke are of particular interest among these outcomes. The analysis begins by applying dimensionality reduction techniques to the SDoH, including principal components analysis (PCA), nonlinear PCA with optimal scaling, and hierarchical clustering. We then present a predictive model of health care outcomes based on the transformed social determinants. Random forests are especially useful for this objective, as they provide variable importance plots aiding in model interpretation.

9:00 020.005 G **Fourier Series in the Complex Plane.** Stephen F. Austin State University, Nacogdoches, TX. **Cadey Widacki**, Dr. Jonathan Mitchell
Fourier Series expresses any real periodic function as a series of sinusoids, and it is an important part of many Calculus II or Physics Applications courses. It is well known that the complex form of the Fourier series can be used to approximate to order N a real valued function with countably many discontinuities. We show that the Fourier series of a parametric function of the form $f(t) = g(t) + ih(t)$ for real functions $g(t)$ and $h(t)$ is the sum of the Fourier expansions of each function. Because each term in the complex Fourier expansion can be represented by a vector that rotates at a speed and direction corresponding to its harmonic, we plot the sum of the vectors and compare it to the given function $f(t)$ (for a variety of types of functions). We use

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MATLAB to animate our results by plotting the curve and the vectors over the time interval $[0, 1]$. We are able to illustrate our results for either a given function rule $f(t)$ or a set of discrete (and possibly imperfect) data points (t, z) where $z=x+iy$.

9:15 020.006 U Using DonkeyCar to Conduct Feasibility Tests on Models Trained in a Simulator for Autonomous Driving.

University of the Incarnate Word, San Antonio, Texas. **Natalie Myers**, Srikanth Vemula, Dr. Michael Frye

This paper presents the feasibility of model compatibility between a highly sophisticated analytical model trained within a simulator for autonomous driving and a small-scale ground vehicle known as a DonkeyCar. This feasibility study utilized a machine learning algorithm to train a model using data collected within an autonomous driving simulator and deploying that model onto a physical car. Currently, most machine learning models for autonomous cars are developed and trained utilizing datasets of specific physical locations, but these datasets often limit the application of the model to operate at only those locations without the benefit of generalization. Through our research, we show that it is possible to overcome this barrier by integrating datasets from a simulated environment, training the model, and then deploying that model onto the DonkeyCar. By using a nine-layered convolutional neural network to train the model, we hypothesized that our machine learning algorithm would allow for a seamless transition between virtual and physical environments, but the limitations of using only simulator training led to some complications with the deployment of the model on the DonkeyCar. However, by loading datasets into the neural network from both the physical and virtual environments and implementing a transfer learning system into our training mechanisms, results were drastically improved and demonstrated the capability of applying simulated data into physical applications. The funding for this project was provided by an ARO grant. This paper will provide an overview of the utilization of machine learning, lessons learned and future applications.

9:30 020.007 U Arithmagic Squares. Wayland Baptist University, Plainview, Texas. **Emily Franklin**, Levi Kasner, Dr. Chris Thornhill

A magic square is an $n \times n$ square with integer entries such that the sums of each column, row, and diagonal all equal the same number called the magic sum. The body of research on magic squares is ancient and extensive. We define an arithmagic square as an $n \times n$ square with integer entries such that the sums of each column, row, and diagonal make up an arithmetic progression. Up to this point, no other research exists on arithmagic squares, but we can take questions concerning magic squares and apply them to this new field. Thus, based on magic square research, we discover properties about the set of arithmagic squares, including operations on the set and equivalence classes within the set. Through these findings, we completely classify all 2×2 and 3×3 arithmagic squares. We also computer generated an exhaustive list of all equivalence classes of 3×3 arithmagic squares.

9:45 Mathematics and Computer Science Section Meeting

021. Geosciences Oral Section and Section Meeting

8:00 am to 10:00 am, Room 1211

8:00 021.001 G Identification of the Pleistocene Fauna from McFaddin Beach, TX. Sam Houston State University, Huntsville, Texas.

Deanna Flores, William Godwin, Christopher J. Bell, and Patrick J. Lewis

McFaddin Beach (MB) is an archeological (41JF50) and paleontological locality extending 20 miles along the beach of Jefferson County, Texas. The fossils wash up on the beach from an unknown offshore location(s). The locality is well-known for lithics attributed to several Paleoindian groups. Taxa found at MB, such as *Bison* spp. and *Smilodon fatalis*, indicate a Rancholabrean fauna of late Pleistocene age. The MB material is held in many private collections throughout Texas because it is a popular site for amateur collectors. In recent years, several important collections were donated to Sam Houston State University. Our goal is to determine a current taxonomic list for MB and to interpret the fauna in the broader context of Texas faunas. The MB fauna includes many taxa commonly found in Texas Pleistocene localities: Equidae, Camelidae, Folivora, *Holmesina*, *Castor canadensis*, *Odocoileus virginianus*, and *Mammot americanum*. Elements of those taxa include osteoderms (*Holmesina*), dentary fragments (*Castor* & *Odocoileus*), teeth (*Castor*, *Mammot*, & *Odocoileus*), and antler fragments (*Odocoileus*). Uncommon taxa include Tapiridae, *Tremarctos*, *Eremotherium*, *Lampropeltis*, *Trichechus manatus bakerorum*, *Smilodon*, and *Homotherium*. Elements of Tapiridae, *Tremarctos*, and *Eremotherium* consist of teeth. The other elements include a right maxillary fragment of *Homotherium*, a right dentary fragment of *Smilodon*, articulated vertebrae (~30) of *Lampropeltis*, and a mandibular symphysis of *Trichechus manatus bakerorum*. Comparisons of MB with two other nearby Texas sites of similar age, Moore Pit and Ingleside, find that the more coastal locations (MB and Ingleside) share more taxa with each other than either does with the more inland locality of Moore Pit. Some taxa, such as *Eremotherium* and *Trichechus*, are only recorded at MB, but are common in Florida, suggesting a separate Gulf Coast fauna. Comparisons of taxonomic abundances did not reveal any significant differences between the sites.

8:15 021.002 N A re-estimate of the total length of the holotype of the Pliocene bowhead whale *Baleana ricei*. Lamar University, Beaumont, Texas. **James Westgate**

The oldest known modern-size, bowhead whale in North America, was found in the middle Pliocene Mogarts Beach Member of the Yorktown Formation, at Rice's Pit in Hampton, Virginia, in 1960. A team from the National Museum of Natural History excavated the specimen and placed it in their collections in Washington, D. C. Two years later, a U.S. Geological Survey report estimated that the in-life size of the animal was 15.2 meters (50 ft.). In 2002, Frank Whitmore and I named the specimen *Baleana ricei*, after the owner of Rice's Pit. Recently, I discovered a system designed for historical archeologists to estimate the size of bowhead whales which had been butchered and disarticulated by Alaskan indigenous whalers. This method requires only complete scapulae. As *B. ricei* has a complete scapula which is 69 cm. high, its in-life length may be estimated by this archaeological tool, which suggests that its length was only 11 meters (36 ft.). The lack of fused vertebral epiphyses in the three preserved dorsal vertebrae indicates that the Rice's Pit specimen was an adolescent when it died. Although it might have reached a length of 15 meters as an adult, the maximum length of *B. ricei* adults remains unknown.

8:30 021.003 N Distribution and Significance of Ripple Marks on the Beach Face in Sea Rim State Park, Texas. Stephen F. Austin State University, Nacogdoches, Texas. **Russell LaReil Nielson**

Well-developed ripple marks are present on the beach at Sea Rim State Park. The locations and types of ripple marks at Sea Rim State Park can be related to their depositional environment. Ripple marks are divided into two types, symmetrical and asymmetrical and can have six different crest patterns that are: straight, sinuous, catenary, lunate, linguoid and rhomboid. Understanding where these different types of ripple marks and crest patterns are found on a modern beach can be used to determine the environment in which they are found in the geological record. Ripple marks at Sea Rim State Park are found associated with dunes, berm and bars, and in the runnels. Different ripple types are found at each location and reflect the environments in which they are produced. Ripple marks associated with dunes are asymmetrical with catenary crests and are produced by onshore winds. Berm and bar ripple marks are symmetrical, with straight to sinuous crests that have a longer wave length and are produced by the breaking of waves. Ripple marks formed in runnels are asymmetrical with sinuous, catenary and rhomboid crests that run perpendicular to the beach face and are produced by water flowing down the runnels.

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8:45 021.004 U **Thermodynamic and Kinetic Promoters/Inhibitors for Nucleation of Gas Clathrates: Halogenation in the Presence of Salts Combined with Carbon Dioxide Injection.** Stephen F. Austin State University, Nacogdoches, Texas. **Kason Malone**, Julie Bloxson, and Russell Nielson

Utilization of carbon dioxide as a promoter in the methane hydrate extraction process combined with thermal stimulation and depressurization is an economical choice for storage during production. Inclusion of various guest species increases lattice stability at higher temperatures and lower pressures. Catalysts provide free energy as thermal stimulants for dissociation. Thermodynamic promoters increase stabilization, and inhibitors cause dissociation. At higher sea temperatures stability decreases, and methane leakage into the environment escalates. One solution is to use salts for production and halogenate the methane to stabilize injected carbon dioxide as it renucleates. Chlorine radicals react in ultraviolet light with methane dissociating the hydrate structure, which allows the byproduct hydrochloric acid to potentially fracture pore space. Salts can act as hydrophobic-hydrophilic inhibitors due to their ionic interactions with hydrogen bonding. Multiple halogenated hydrocarbons were evaluated for stability and salts were compared for inhibition effects. Incremental phase diagrams for each were evaluated at varied concentrations using numerical simulations, including Gibbs free energy minimizer and survival probabilities. Results of simulations indicate that halogenated hydrocarbons act as a promoter for CH₄ and CO₂. Greater concentrations of the halogenated hydrocarbon with simultaneous decreasing methane amount maximizes thermodynamic stability for CO₂. Effects of highly concentrated alkali cations tend to inhibit nucleation, but for lesser concentrations the alkali ions inhibit at lower pressures only, acting weakly as a kinetic promoter. Halogenated systems allow for stability shifts, while salts could be further used to engineer desolventizing flow rates for a reservoir of methane hydrates within sediment. Insight into mechanisms of hydrates in the presence of ions is valuable for understanding potential reservoir storage and production.

9:00 021.005 G **Shape Factor Parameterizations of the Edge Effect Correction Using the Debye Series for Super-spheroids to Represent Convex Particles.** Texas A&M University, College Station, Texas. **Nancy Okeudo**, Jiachen Ding, Ping Yang, Ramalingam Saravanan
A recent study has shown that it is possible to model the single scattering properties of all sizes of non-spherical atmospheric particles by combining the numerically exact invariant imbedded T-matrix (II-TM) method and the approximate physical geometric optics method (PGOM). However, II-TM cannot be applied to very large size particles due to the huge computational burden, and PGOM cannot be applied to very small size particles due to limitations of the geometric optics approximation. In addition, PGOM does not include the edge effect contributions to extinction and absorption efficiencies. Until recently, the edge effect contribution to extinction and absorption efficiency was only known for spheres, spheroids, and ellipsoids. In addition, a study has also shown that super-spheroids have the potential to provide good estimates of the optical properties of natural non-spherical particles. Super-spheroids are a more general version of a spheroid. Recently, we developed an edge effect formula for the extinction and absorption efficiency for a special case of super-spheroids with rotational symmetry called the superegg. However, we still do not have an edge effect formula for extinction and absorption efficiency for arbitrarily shaped convex particles. In this study, we will use the edge effect formula for supereggs as a tool to parameterize the shape factor in the case of convex particles, either with n-fold rotational symmetry or without any symmetry. The shape factor relates the edge effect contribution to extinction and absorption efficiency of a convex particle to a superegg with similar shape properties. Then, we apply the edge effect correction formula for super-spheroids and shape properties to calculate the edge efficiency for arbitrary non-spherical particles. We will add the edge effect correction formula to PGOM in the hopes of improving the accuracy of the extinction and absorption efficiency in PGOM for moderate size parameters.

9:15 021.006 N **A microphysics-based snow optical parameterization scheme for the Community Radiative Transfer Model.** Texas A&M University, College Station, TX. **Tong Ren**, Jiachen Ding, James Coy, Ping Yang
The Community Radiative Transfer Model (CRTM) is widely used by the data assimilation community to simulate satellite signals and associated matrix calculations used in radiative transfer calculations. However, no document can be found describing how the snow bulk optical properties are derived in the current CRTM. Recent studies suggest that microphysics-scheme-consistent non-spherical snowflakes should be assumed in the CRTM snow optical parameterization development for data assimilation applications. Because vapor deposition and aggregation are the two main mechanisms responsible for snow growth, in this study, scattering computations are performed for two types of ice particles: A hexagonal column and an aggregate of dendrites. Snowflakes are simulated by mixing the two types of particles with mixing ratios determined such that the mass-dimension relation matches the microphysics scheme. The mixed snow model that satisfies the mass-dimension relation in the Thompson microphysics scheme is implemented into CRTM for a test. The Global Precipitation Measurement (GPM) Microwave Imager (GMI) has 166 and 183 GHz channels whose measurements are sensitive to the solid hydrometers in the atmosphere. Hence, GMI measurements are suitable for the test of the new snow parameterization scheme. A CloudSat-GPM collocation dataset is adopted for the test, where CRTM is run with the CloudSat snow and liquid precipitation water content retrievals as the input. The simulated GMI signals are compared with the collocated GMI measurements.

9:30 021.007 U **Geologic and Geomorphological Interpretation of the Mare Orientale Impact Basin Region of Earth's Moon.** Department of Geology, Stephen F. Austin State University, Nacogdoches, Texas. **Kyla S. Gray**, Melinda S. Faulkner
The Mare Orientale impact basin is located in the southern equatorial region of Earth's Moon and is composed of mafic igneous rocks and ash displaced by primary and secondary impact events. The lunar rocks of the area range in age from 4.5 to 1 Ga making the geology and geomorphology of the area broadly defined. The study area is 1.24 million square kilometers of the Eastern Mare Orientale impact basin. In order to interpret the geology of the area, various lithologic, topographic, and chronologic datasets were compiled in ArcMap. The topography of the region was constructed by using a high-resolution lunar digital elevation model from the NASA Goddard Space Flight Center using the Lunar Orbiter Laser Altimeter and SELENE Terrain Camera. Analyses of the Unified Geologic Map of the Moon from the USGS Astrogeology Science Center provided the data needed to determine lithology and ages of the geologic formations of the study area. From these data, a comprehensive history of the geologic and geomorphologic events was used to create a series of figures showing the stratigraphic and structural relationships of the geologic units. The incorporation of the current lunar geologic time scale enabled the construction of a generalized timeline of major events providing a more detailed geologic history of the study area.

9:45 **Geosciences Section Meeting**

022. STEM Education Oral Section 1

8:00 am to 10:15 am, Room 1313

8:00 022.001 N **Career paths of STEM biomedical minority students in an undergraduate research program at a large HIS.** University of Texas at El Paso, El Paso, Texas. **Angelica Monarrez**, Aleida Ramirez, Danielle Morales, Lourdes Echegoyen, and Amy Wagler
There is a need for more diversity in biomedical research. Undergraduate research experiences (UREs) have become an important practice to develop, recruit and retain students in STEM fields, as well as encouraging them to pursue further research training. In this session, we will share results from a URE program focused on preparing students from a large Hispanic Serving Institution (HSI) to pursue biomedical graduate programs and research careers. The core questions we will address are: (1) how students perceive their participation in an URE and (2) whether it influenced their decision to continue towards graduate school in pursuit of a biomedical research career. Students participating in this URE are provided with financial support

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(tuition and stipend) and multiple professional development opportunities, including course-based undergraduate research experiences (as freshmen), apprentice style research experiences on campus and at partner institutions each summer, peer mentoring training, and a series of workshops (e.g., GRE preparation, applying to graduate school). This study utilized a longitudinal mixed methods design. Quantitative survey data was collected while students were still completing their undergraduate degrees. Qualitative data was collected from interviews with 17 students who had graduated. Nine of those students were pursuing graduate school in a biomedical field while eight were working in industry. Criterion pattern analysis provides evidence that those in graduate school showed higher academic self-concept and habits of mind, whereas those working in industry had higher leadership skills. Qualitative data demonstrates that those in graduate school talked about research and spoke more often about how the URE program prepared them for the process of applying as well as thriving while pursuing graduate degrees, while those who were not in graduate school talked about the economic benefit of being in industry and the need for more resources.

8:15 022.002 N **How a Hispanic Serving Institution is building scholars to increase diversity in the biomedical research workforce.** University of Texas at El Paso, El Paso, Texas. **Angelica Monarrez**, Clarissa Valles, Lourdes Echegoyen, Danielle Morales, and Amy Wagler

Increasing diversity in the biomedical research workforce is a major goal of the BUILDing SCHOLARS program at The University of Texas at El Paso (UTEP). As a (large Hispanic enrollment) Hispanic Serving Institution, UTEP has been recognized as a top producer of Hispanic students who go on to pursue advanced degrees in STEM disciplines. In this presentation, we will address the primary factors influencing timely degree completion and plans to pursue a graduate biomedical degree for students in the program. Participants receive an array of opportunities, including (but not limited to) financial support at multiple levels, course-based undergraduate research experiences, and apprentice style research experiences on campus and at partner institutions during the summer. We will describe the program's asset-bundles approach to student training and draw from quantitative and qualitative data sources to highlight results. Quantitative results demonstrate student development of core outcomes such as research self-efficacy and science identity. We will also show empirical evidence comparing time to degree and entrance into graduate programs for students in this program with students with the same GPA and in the same majors but not in the program. Qualitative data gathered from exit senior surveys and semi-structured interviews with former students in their first years of graduate school highlight student voices about how their experiences in the program informed their decision to pursue graduate school and future research career in the biomedical sciences. Results indicate that the materials resources provided by the program were critical and allowed other components of the training to assist students in developing the core skills and scientific networks essential for them to finish their degrees and enter graduate school.

8:30 022.003 N **Texas Academy of Science and the new Texas Science and Engineering Practices.** Texas State University, San Marcos, TX. **Sandra West Moody**

In 1991 the Texas Science Academy of Science Board of Directors created a position statement identifying three types of scientific investigations: Descriptive, Comparative, and Experimental which was adopted by the Texas State Board of Education into the 1998 Texas Essential Knowledge and Skills (TEKS) Introductions. In 2021, the Texas Science Academy of Science Board of Directors created a new position statement identifying four types of scientific investigations: Descriptive, Correlative, Comparative, and Experimental which was also adopted by the Texas State Board of Education into the K-8 Introductions. A scientific investigations flowchart ([Nature of Science in Science Instruction: Rationales and Strategies, 2020](#). Edited by Wm. F. McComas. Springer. Beyond Experiments: Considering the Range of Investigative and Data-Collection Methods in Science. Co-authors: S. Schwinning & *A.D. Denn) enables the user to more clearly understand the different types as well as how to use them in their classroom and field investigations. However, our Texas TEKS lack clarity and are not consistent with the Framework. Moreover, because the high school science courses were adopted before the middle school TEKS, there is a lack of alignment between the high school and the middle school TEKS.

8:45 022.004 N **Revision of the Texas Science Standards: A Perspective of a Texas State Board of Education Member.** Texas State University, San Marcos, TX. **Matt Robinson**, Sandra West

The Texas State Board of Education has the responsibility for K-12 education including adopting state science standards. The Board has 15 members, one of whom is Dr. Matt Robinson, a retired urologist and a former Friendswood ISD Board of Trustees from 2008 to 2018. He was elected to the Texas State Board of Education (SBOE) in November 2018 to represent Southeast Texas. He was one of 15 Board members who oversaw the arduous and sometimes contentious revision of the Texas science education standards, Texas Essential Knowledge and Skills (TEKS) from January 2019 – September 2021. The high school science courses were approved November 2020. Grades K-8 TEKS were approved November 2021. Insights from a SBOE perspective reveal the difficulties of such an enormous challenge in a state that leads the nation in purchasing instructional materials (physical and digital) for teachers and students to use to teach/learn science content and processes.

9:00 022.005 N **The Revision of the K-12 Science TEKS: Texas Science Education Leadership Association.** Texas State University, San Marcos, TX. **Joey Belgard**, Sandra West

Take a deep dive into the new Texas Essential Knowledge and Skills (TEKS) and SEPs (Science and Engineering Practices) adopted by the Texas State Board of Education. A quick review of how the *Framework for K-12 Science Education* influenced the new TEKS. There are TEKS that are new, TEKS that have been removed, and TEKS that have been moved. Compare the Kindergarten TSELA recommendation to the proposed TEKS. Proposed TEKS: K.5 Matter and its properties. The student knows that objects have physical properties that determine how they are described and classified. TSELA: KS 5 Matter and its properties. The student knows that whole objects are systems made of different kinds of matter and have observable properties that determine how they are described. Rationale: The proposed revisions align better to the SEs and move student understanding from known to unknown and concrete to more abstract. 3rd grade begins preparing students for engineering by seeing a whole made of up of parts that work together to do a job. It sets the stage for systems thinking: A system is an organized collection of parts (or subsystems) that are highly integrated to accomplish an overall goal. Systems thinking is needed in K-12 to replicate authentic science and engineering practices. Students can easily understand a system such as pencil sharpener as a system (a whole made up of parts that work together to do a job) and understand the human body is a system or the energy flow in a grassland ecosystem The system has various inputs, which go through certain processes to produce certain outputs, which together, accomplish the overall desired goal for the system.

9:15 022.006 N **Academic community supports undergraduate success, especially during the isolation of a pandemic.** University of the Incarnate Word, San Antonio, TX. **Julian Davis** and Rachell Booth (co-PIs)

Undergraduates, particularly those who are financially disadvantaged and / or under supported outside school face many challenges as they progress through school. Strong academic support, in the form of mentoring by peers and faculty, study sessions, and professional development activities, has been shown to enhance student performance in courses and increase retention. These activities also have a positive impact on student morale, particularly those without encouragement and assistance outside their school environments. The covid-19 pandemic has presented an additional layer of challenges to college students in general and has further widened the disparities in students' resources. Our Cardinal Chemistry Scholars (C₂S) Program, funded by an NSF S-STEM grant, has been providing financial, academic, professional, and mentoring support to financially disadvantaged undergraduates since the fall of 2018. The positive impact this type of program and the supportive academic community it fosters on undergraduates has been well-documented. Our studies suggest it is even more important during the covid-19 pandemic. For one, it helps boost the sense of

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community among participating students. It also serves to narrow the “resource gap” experienced by financially disadvantaged students &/or those who do not have a good support network outside school (who might be, for example, first-generation college students).

9:30 022.007 N **University Retention, Graduation and Success. Intervention in years 1 and 2 Crucial.** The University of Texas at El Paso, El Paso, Texas. **Keith H. Pannell** and Denise Carrejo

It has been well-established that the so-called pipeline for the creation of a STEM-educated and/or STEM-savvy society has many bottlenecks. Impediments such as a perception of sexist attitudes within the scientific community, racial stereotypes about who can excel in scientific disciplines and aspects of the impostor syndrome, clutter this pipeline and syphon off from initial pool feeding this pipeline at many stages. Under the auspices of a grant from the National Science Foundation we performed a 5 year experiment covering entering STEM-oriented students for the first 2 years of their university experience. The program, and requirements, were simple and minimal. The incoming UG students were awarded a \$10,000 scholarship for each of the first two years with only 2 formal mandatory requirements: they had to live on campus in the University dormitories and they had a mandatory seminar-type class with the Program Director each semester. There was no formal expectation for research activity, no requirement for aiming for graduate school, and no promise or expectation provided for continued support. The results can be summarized: All but one the students graduated in less than 14 semesters; with a cumulative GPA >3.5, and all students are working, or studying, in a STEM related field. Full details of the program activities and the lessons to be learned will be presented.

9:45 022.008 N **STEM Majors Experiencing K-8 Lesson Plan Development & Implementation.** Lamar University, Beaumont, TX. **Mamta Singh**

The purpose of the study was to explore STEM majors' interest in K-12 science teaching. The study was conducted in summer 2020 and 2021. The participants in the study were students majoring in biology, physics, engineering, and mathematics. The students participated in a six weeklong intensive pedagogy internship program where they developed science tricks, 5E lesson plan with embedded formative and summative assessments and conducted a teaching demonstration. The results suggested that student participants not only increased their interest in K-12 teaching but also gained in-depth knowledge on pedagogy and pedagogical content knowledge at the end of the program.

023. Systematics and Evolutionary Biology Oral Section 1

8:00 am to 9:30 am, Room 1215

8:00 023.001 G **Comparative eye development during late-stage embryogenesis in divergent *Eurycea* species.** The University of Texas at Austin, Austin, TX. **Ruben U. Tovar**, and David M. Hillis

The paedomorphic *Eurycea* salamander clade of Central Texas exemplifies a continuum of morphological characteristics associated with aquatic-subterranean living. Past research has identified the surface-dwelling Barton spring salamander (*E. sosorum*) and San Marcos salamander (*E. nana*) exhibit typical optic anatomy and acuity. Comparatively, the subterranean population of Cascade Caverns salamander from Honey Creek Cave (*E. latitans*) maintains reduced eyes, and the obligate subterranean Texas blind salamander (*E. rathbuni*) has an incomplete developed optic system. Together this clade represents a transformation series of karst phenotypes and a potentially exemplar system for using comparative developmental approaches to understanding vertebrate ocular evolution in the face of relaxed selective pressures. We hypothesize that eye development will be similar between phenotypes (surface vs. subterranean) during early development, then diverge at some point during later stages of development. We collected late stage embryos (stage 45; just before hatching, three buds on forelimb) from four species (*E. rathbuni*, *E. latitans*, *E. sosorum*, and *E. nana*) to identify when ocular development is paralleled between the two phenotypes (surface and subterranean). Specimens were fixed with PAXgene Fixative, washed with PAXgene Stabilizing solution, contrast-enhanced with 1% PAXgene Stabilizing-iodine (I2E) solution, micro-CT scanned, and digital reconstructed using 3D rendering software (Dragonfly ORS) for comparison. Herein, we identify paralleled soft tissue development including a lens, optic cup, and retinal differentiation in all four species, suggesting similar developmental progression between the two divergent phenotypes.

8:15 023.002 G **Investigating signal color polymorphism in the desert lizard, *Urosaurus ornatus*.** The University of Texas at Austin, Department of Integrative Biology, Austin, Texas. **Britt White** and David Hillis

Understanding how species form is a central goal of evolutionary biology. Selective pressures and genetic drift tend to limit variation to an optimal phenotype, but multiple and cooccurring color polymorphisms are not uncommon in nature. Species with signal color polymorphisms offer powerful opportunities to study the process of speciation, yet most research on the evolution of signal color polymorphisms focus on morph behavioral differences and genetics within single populations. Here we examine spatial variation of signal color polymorphism across the entire distribution of the desert tree lizard, *Urosaurus ornatus*, to investigate patterns of phenotypic and genotypic structure with respect to natural and sexual selection, biogeographic history, and relatedness amongst populations.

8:30 023.003 G **Two New Species of *Pyrgulopsis* Springsnails Found in the Rio Grande Watershed.** The University of Texas Rio Grande Valley, Edinburg, Texas. **Houston Glover**, Manuel Spor Leal, Benjamin Hutchins, Benjamin Schwartz, Rebecca Chastain, Kathryn Perez *Pyrgulopsis* Call & Pilsbry, 1886 is a genus of small (<5 mm) spring snails, usually endemic to single freshwater springs. Two new populations of *Pyrgulopsis* found in very small, isolated springs and spring runs in the mainstem Rio Grande watershed of western Texas are distinguished from congeners. Mitochondrial and nuclear sequences, morphometrics, and morphological characteristics support *Pyrgulopsis rubra* sp. nov. and *Pyrgulopsis harymilleri* sp. nov. as distinct from other known *Pyrgulopsis* species, including the geographically proximate *P. metcalfi*

8:45 023.004 N **Sorting out the “tall” aquifer and cave snails from Central Texas.** University of Texas Rio Grande Valley, Edinburg, Texas. **Kathryn E. Perez**, Pete Diaz, Randy Gibson

The Edwards-Trinity Aquifer System of Central Texas hosts 15 known species of stygobitic freshwater snail. The shells of these snails come in 3 broad categories of shape, trumpet shaped (*Phreatoceras*), globose or wide (*Phreatodrobia* and *Balconorbis*), and elongate or tall (*Stygopyrgus*, *Texapyrgus/Tryonia diabolii*). The tall and highly sculptured species, *Stygopyrgus bartonensis* was described from Barton Springs (Travis County) and *Texapyrgus longleyi* / *T. diabolii* from the Devil's River (Val Verde County). In recent surveys we have encountered several additional populations of “tall” phreatic snails that, while tall, are not otherwise very similar to known taxa. To determine placement of these unknowns, we incorporate mtCOI and nLSU sequences from the unknown populations into a phylogeny with the known species of phreatic snails from Central Texas and wider sampling of the gastropod family Cochliopidae. This work provides greater understanding of the diverse groundwater fauna of Central Texas.

9:00 023.005 G **A preliminary review of the distribution of the freshwater algal species *Sheathia involuta* (Rhodophyta: Batrachospermales) from the southwestern U.S. and northern Mexico.** Angelo State University, San Angelo, TX. **Bethany Skye Guajardo**, Ned Strenth

While the type locality of *Sheathia involuta* (Vis & Sheath) is in central Texas and the distribution of this species is widespread in eastern North America, there are few documented collections from the southwestern U.S and northern Mexico. This study examined the lotic environments of the major tributaries of west Texas, New Mexico, Coahuila, and Chihuahua for the presence of the filamentous red algal genus *Sheathia*. Recent collection trips to

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these areas resulted in a total of ten different sample sites from seven different river systems. While preliminary morphological comparisons support the existence of a single species, the final phase of this study will involve sequencing material from all collection localities. Species identification within this group is often difficult using morphological characteristics alone due to phenotypic plasticity and cryptic diversity. Three genes (COI, rDNA ITS region, and *rbcL*) will be amplified, sequenced, and compared to existing GenBank sequences to confirm preliminary morphological identifications. This study will provide a definitive resolution as to the identity and distribution of the numerous collections of filamentous red algal specimens which are currently known to exist in the freshwater ecosystems of west Texas, southeastern New Mexico, and northern Coahuila and Chihuahua. Voucher specimens will be deposited with Botanical Research Institute of Texas here in Texas and UNAM in Mexico City.

9:15 023.006 U **Comparative Genomic Analysis of Cryptophyte Algae Plastid Genomes.** The University of Texas at Tyler, Tyler, Texas. **Prabhat Kattel**, Matthew J. Greenwald
Cryptophyte algae have four genomes derived through secondary endosymbiosis. The nuclear and mitochondrial genomes are inherited from an unknown eukaryote host and a second nuclear genome (nucleomorph) and plastid genome are from a red algal symbiont. Through secondary endosymbiosis and subsequent evolution, they have acquired a unique photosynthetic system. Cryptophytes have undergone differential retention and loss of photosynthetic genes partly due to some species being photosynthetic while others are non-photosynthetic (heterotrophic). In collaboration with the Department of Energy (DOE) Joint Genome Institute (JGI), we sequenced the plastid genomes of 28 cryptophyte species and assembled them using NOVOPlasty. The assembled genomes were comprised of 1 - 7 contigs, with 3 being the most common number. We used NCBI BLAST to align the contigs to reference genomes. For most of the species, two contigs were found to align to the whole genome, and the rest of the contigs were hypothesized to be inverted repeats. Fifteen species were found to have a complete genome, and hence they were chosen for downstream comparative genomic analyses. The sequencing depth was determined using Bowtie 2, and the results were visualized using Tablet. Average coverage depth ranged from 515 to 11,891; hence all fifteen genomes had excellent coverage depth. GeSeq was used for gene annotation. The GenBank files outputted by GeSeq were uploaded to GeneCo to visualize synteny, gene rearrangement, and the presence/absence of genes among eight published cryptophyte plastid genomes and fifteen novel genome sequences presented here.

025-030. Oral Paper Session 3

10:30 am – 12:45 am, all rooms listed below are in Bayou Building

025. Chemistry and Biochemistry Oral Section 3 and Section Meeting

10:30 am to 11:45 am, Room 1218

10:30 025.001 G **Catalytic Studies of the Oxidation of Organic Substrates Using Iron-Tetradentate Amine Complexes.** Stephen F. Austin State University, Nacogdoches, Texas. **Grace Milem**, and John Brannon Gary
Typical synthetic catalyst systems for hydrocarbon oxidation are most commonly based upon noble metals such as platinum, palladium, rhodium, and iridium. While these manifolds have been highly successful in aromatic sp^2 C-H bond functionalization, expansion towards alkane sp^3 C-H bonds has been much rarer. In contrast, nature employs cheap and earth abundant metals such as iron, copper, and manganese to perform impressive chemical transformations with exquisite selectivity. Using nature as an inspiration, this presentation will highlight investigations into new iron-oxo complexes for organic oxidations. Using tetradentate amine ligands, *in situ* catalyst preparation is used to generate a simple catalytic system with iron capable of oxidizing C-H bonds and olefinic substrates. This talk will highlight the effect of small ligand perturbations and catalytic condition changes to cause dramatic modifications in oxidative efficiency.

10:45 025.002 G **Progress toward the design, synthesis, and analysis of paired coiled-coil peptidic molecular building blocks exhibiting controlled self-assembly.** The University of Texas at Tyler, Tyler, Texas. **Jason DiStefano**, Dustin Patterson, Sean C. Butler
Molecular building blocks are fundamental to biological synthesis and processes and have been utilized in advanced materials, drugs and drug delivery systems, and biotechnology. Proteins have been used as molecular building blocks for the construction of complex, well-ordered structures. Coiled-coil protein domains are essential subunits used for the oligomerization of protein complexes, gene expression, and structural elements of biological materials. The synthesis and assembly of proteins utilizing coiled coil motifs are of great scientific interest due to their potential applications in disease treatment, biomechanical motors, nanoscale delivery systems, etc. However, assembling protein complexes with specific morphology is still challenging because the controllability of the protein association is complicated by multiple interactions between a diverse array of amino acids. Here we show the progress toward the design, synthesis, and characterization of paired coiled-coil peptidic molecular building blocks (pMBB) that can self-assemble with a high degree of controllability. Presented are four unique 32-residue peptides each with one modified residue to covalently crosslink two peptides via a 1,3-dipolar cycloaddition click reaction. Each peptide is expected to fold into α -helical coiled-coil heterodimer peptide pairs upon association with its complementary pair. Furthermore, each crosslinked pMBB was designed to exhibit controlled self-assembly with its specific complementary pMBB. This design strategy allows the peptide's intermolecular interactions to control self-assembly of multiple pMBBs via association through the sidechains of the heptadic sequences. Size exclusion chromatography (SEC) and HPLC analysis show successful synthesis and purification of individual peptides. Additional chromatography data show successful association of dimeric coiled coils, synthesis of crosslinked pMBBs, and self-assembly of the crosslinked pMBBs.

11:00 025.003 G **Exploration of perfluoro surface modifying agents for super-hydrophobic applications.** The University of Texas at Arlington, Arlington, Texas. **Oluchukwu Virginia Igboenyisi**, Frederick MacDonnell.
Superhydrophobic surfaces with high water repulsion have diverse applications in textile, automotive, medical, marine, and aerospace industries. The peculiar ability of these surfaces to exclude and highly repel water have increased their use in protective and self-cleaning coatings, automobiles, corrosion resistant coatings, biosensors, and protection of electronic devices in wet or humid environment. This study involves modification of alumina and silica surfaces with perfluoro carbons which can alter the hydrophilicity of the surface and potentially work to exclude water from the modified surfaces, even at high water partial pressures. We explored the best method of modification, hydrophobic properties, thermal stability of three different perfluoro surface modifying agents (Perfluorooctane sulfonic acid, perfluorobutane sulfonic acid and perfluorooctyltriethoxysilane) and the effect of the superhydrophobic modification on the stability and textural properties of the modified alumina and silica monoliths. The minimum amount of loading of the perfluorocarbons was established to be 10% weight by mass of the monolith. Perfluorobutane sulfonic acid was the least hydrophobic with a contact angle of 143° and a sliding angle of 11° while the other two perfluorocarbons show superhydrophobicity with contact angle above 150° and sliding angle of 5° for perfluorooctanesulfonic acid and 0° for perfluorooctyltriethoxysilane. The thermal stability of the perfluorocarbons depends on the monoliths. Perfluorooctyltriethoxysilane maintains thermal stability and hydrophobicity up to 400°C on silica and 300°C on alumina. The high thermal stability on silica could be attributed to the silane head group on the perfluorocarbon forming a stronger bond with the silica monolith which requires higher

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temperature and thermal stress to dissociate. Perfluorooctanesulfonic acid maintained thermal stability and hydrophobicity up to 320°C on alumina surface and 200°C for silica surface.

11:15 025.004 N **Lanthanide coordination polymers with interstitial solvent molecules.** Angelo State University, San Angelo, Texas. **Ralph Zehnder**

Application of hydrothermal experimental conditions at 170°C as well as slow diffusion methods at room temperature enabled us to create an extended library of lanthanide coordination polymers. This includes various trivalent lanthanide cations that associated with a number of terephthalate derivatives but also mixed ligand compounds that incorporate the glutarate (Glut) and terephthalate derivatives (TPX). For instance, we have obtained a collection of $\text{Ln}_2(\text{Glut})_2(\text{TPX})(\text{H}_2\text{O})_4 \cdot 16\text{H}_2\text{O}$ frameworks with X = Br, NO₂, NH₂, and OH, and Ln = La, Ce, Pr, and Nd. We further created extended series of lanthanide 2-nitroterephthalates, $[\text{Ln}_2(\text{TPNO}_2)_3(\text{H}_2\text{O})_2] \cdot 2\text{H}_2\text{O}$, and lanthanide 2-sulfonatoterephthalates, $[\text{Ln}(\text{TPSO}_3)(\text{H}_2\text{O})_2]_n$. Recently we have obtained a few derivatives of the $\text{Ln}_2(\text{Glut})_2(\text{TPX})(\text{H}_2\text{O})_4 \cdot 16\text{H}_2\text{O}$ frameworks (X = Br, NH₂) that contain THF or ethanol as interstitial solvent molecules.

11:30 **Chemistry and Biochemistry Section Meeting**

026. Conservation Ecology Oral Section 2 and Section Meeting

10:30 am to 12:45 pm, Room 1326

10:30 026.001 U **Monitoring the Increase in Biodiversity of Urban Forests by Observing Aves and Vegetation: Oak Point Nature Preserve Plano, TX.** Collin College, Plano, TX. **Katelyn Danielle Perkins**, Tamara Basham

Urban forests are crucial tools for preserving biodiversity. With 42% of Dallas already urbanized and a rapidly growing human population, it is vital to conserve and expand green areas in these cities and neighborhoods. Forest regrowth in areas adjacent to preexisting forested regions can restore lost habitat and improve the overall quality of habitats in urban preserves. By comparing bird biodiversity between old-growth and regrowth forests within an urban forest preserve, I sought to assess the effectiveness of forest regrowth for addressing habitat fragmentation and biodiversity decline. I hypothesized that bird biodiversity would increase as forest regrowth occurred, and I will observe how wildlife (birds) take advantage of new-growth forest resources. To test this idea, I analyzed bird biodiversity as a function of forest regrowth stage (old growth, regrowth since 2018 or grassland areas) using Community Scientist data sourced from iNaturalist and eBird observations recorded in Oak Point Nature Preserve in Plano, Texas. I found that bird species composition was more similar between regrowth and old-growth forest areas than grassland areas. Still, bird biodiversity in regrowth areas was lower in old-growth areas. These preliminary results indicate that these regrowth areas do not provide the resources and habitat conditions that many of the bird species found in the old-growth regions require. Further investigations of bird biodiversity and vegetation regrowth are ongoing. As regrowth continues, we will continue to use Community Scientist data (iNaturalist and eBird) with expert bird and vegetation field sampling.

10:45 026.002 U **Nestling begging behaviors and body condition of the Carolina wren in a rural and an urban environment.** Sam Houston State University, Huntsville, Texas. **Sara Moore**, Dr. Diane Neudorf

With the increase of urbanization, it is becoming increasingly important to understand how this increase affects native wildlife and how animals are able to adapt around human activity and disturbance. We monitored nestlings of the Carolina wren (*Thryothorus ludovicianus*) in rural and urban environments to determine their survival and fledging success rate. We measured the nestling growth periodically in the development of the nestlings between hatching and fledging and we monitored sound levels inside and outside the nest to determine the overall amount of begging behaviors exhibited by the nestlings. We predicted that nestlings in the urban environment would have poorer body condition due to a reduced amount of food and greater disturbances. We also predicted urban nestlings would spend more time begging due to greater noise pollution in the urban environment. We found no differences in nestling condition between the two habitats. We will discuss differences in nestling begging behavior between the two habitats and relate it to fledging success.

11:00 026.003 U **Chemical Analysis of Volatile Organic Compounds in Urine of Multiple Canid Species.** Hardin-Simmons University, Abilene, TX. **Adrianna Simpson** and Wendi Wolfram

Semiochemical signals play a vital role in both the intraspecific and interspecific communications between animals. These semiochemical signals are composed of a mixture of volatile organic compounds that communicate messages from reproductive status to territoriality, among other important olfactory cues. These olfactory cues can influence both immediate behaviors as well as reproductive behaviors in many species, including canids. In wolves, 22% of the volatile organic compounds found in urine are the same across species and subspecies, while 88% are uniquely specific. One wolf species, the red wolf (*Canis rufus*), has been known to cross breed with coyotes (*Canis latrans*). The reason behind this alternate mate choice that results in hybrid species is yet unknown. We believe that comparing the volatile organic compounds in urine of multiple canids, including wolves (*Canis lupus*), red wolves, domestic dogs (*Canis lupus familiaris*), and coyotes, may shed some light on what volatile organic compounds might be the same or different. This result could aid in determining if there is a chemosensory element driving red wolf females to prefer coyote males. In our study, we compared the chemical constituents of coyotes to those of the red wolves and found that less than 10% of the volatile organics isolated from urine samples were the same as those of coyotes while approximately 90% were uniquely specific.

11:15 026.004 U **The Effect of Chinaberry (*Melia azedarach*) Leaves and Bark on Texas Native Crayfish.** Schreiner University, Kerrville, TX. **Halli Lovell**, Noah Hawkins, Giovanna Barragan, and Rachel Rompel, and Chris Distel

Chinaberry trees (*Melia azedarach*) are a globally invasive ornamental plant. Their tissues are toxic to some animals. Because shed berries, leaves, and bark commonly fall into aquatic systems, they may pose a threat to native aquatic species. Environmental chemistry analyses have indicated that most of the toxins in chinaberry plants are present in the fruits and seeds. Preliminary work has shown that direct exposure of native aquatic arthropods (dragonflies, Order *Odonata*, & crayfish, *Procambarus clarkii* and *Faxonius occidentalis* species) to chinaberry fruits produces high mortality at very low exposure doses. However, the toxicity of chinaberry leaves and bark to the crayfish species is unknown. Here we show that chinaberry leaves and bark also significantly reduced survival for two different native crayfish species. This direct exposure was at comparable mass to low-dose berry exposures and suggests that shed chinaberry leaves and bark may be equally toxic to aquatic arthropods. This suggests that toxin concentrations in leaves and bark are functionally equivalent to berries at certain times of year. The results reaffirm and expand our knowledge on toxicity of chinaberry to aquatic species, emphasizing a little-studied threat to native Texas biodiversity.

11:30 026.005 G **Modeling the potential impact of climate change on range expansion in *Eleutherodactylus cystignathoides* and *E. planirostris* (Anura).** The University of Texas Rio Grande Valley, Edinburg, Texas. **Rebecca T. Chastain**, Gisel Garza, Drew R. Davis, & Teresa Patricia Feria Arroyo

Climate change is inducing changes in the distributions of many species, causing declines, range shifts, and habitat loss, as well as facilitating invasions. It has been a broad contributor to global amphibian decline, already causing mass extinctions and extirpations of amphibian populations, which, unfortunately, is expected to continue. The understudied direct-developing *Eleutherodactylus cystignathoides* (Rio Grande chirping frog) is a notable outlier, having rapidly expanded its distribution in recent years. Originally found in the lower Rio Grande Valley and parts of northern Mexico, *E.*

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cystignathoides has now established populations in north and east Texas, as well as in southern Louisiana and Alabama. This expansion has largely been dismissed as ecologically neutral due to a lack of evidence of negative impact; however, no investigation has occurred into the potential impacts of this species in its non-native range, meaning its impact is essentially unknown. The dearth of information about this species' dispersal and ecology, coupled with the documented negative impacts of other successful eleutherodactylid invaders, warrants investigation that preempts waiting for any potential consequences of this invasion to make themselves known. To conduct such an investigation into the potential range limits of this species as they are defined by climatic variables, both now and in the future, we used spatially rarefied presence data and selected future climate models to develop Maxent projections of potentially suitable habitat of *E. cystignathoides* in the United States. This modeling was repeated with the better studied congener *E. planirostris*, an invasive species from Cuba with an introduced range from Florida to Texas. Our preliminary models suggest the existence of currently non-invaded potentially suitable habitat across the southeastern United States under both current and future models for *E. cystignathoides* and range contractions for *E. planirostris*.

11:45 026.006 U **Snake Fungal Disease Caused by the Fungal Pathogen *Ophidiomyces Ophidiocola* in East Texas.** The University of Texas at Tyler, Tyler, TX. **Lesley Hart**, Michele Nolen, Joseph Glavy, and Alan Lizarraga
Snake fungal disease (SFD) has recently been identified in Texas and has been linked to an invasive fungus, *Ophidiomyces ophidiocola*. Between May 2021 and November 2021, 126 snakes were encountered utilizing shade traps, minnow traps, walking encounters, and road cruising. Of the 126 snakes, 22 were clinically expressive of infection. Snakes were sampled in the field, followed by lab analysis through qPCR and histological testing to determine the presence of *Ophidiomyces ophidiocola*. Using clinical expression, qPCR, and histology for verification, confirmed the presence of snake fungal disease outside its most western known natural spread of the disease. With this knowledge, further modeling is underway to improve the evaluation of the extent of the spread of the disease. Using these data points we can make correlations between infected snakes and their environment. This data evaluation may lead to an improved understanding of this disease and lead to insights into other fungal pathogens such as chytrid fungus in amphibians and yellow fungus in lizards.

12:00 026.007 G **Dietary analysis of the imperiled Rio Grande cooter (*Pseudemys gorzugi*) from west Texas, with an examination of its isotopic niche relative to the syntopic red-eared slider (*Trachemys scripta elegans*).** Texas State University, San Marcos, Texas. **Lawrence Bassett**, Weston Nowlin, Daniel Foley, Ivana Mali, and Michael Forstner.
The Rio Grande Cooter (*Pseudemys gorzugi*) is an imperiled freshwater emydid turtle currently in review for listing under the USA Endangered Species Act. Little information has been published regarding the natural history of this taxon, including its dietary habits. The objective of this study was to elucidate the diet of *P. gorzugi* from San Felipe Creek, Texas and evaluate its dietary niche in relation to the syntopic red-eared slider (*Trachemys scripta elegans*). Turtles were captured by hand for collection of feces and claw tissue. Fecal matter contents were sorted to the lowest taxonomic level possible and measured volumetrically. Claw tissue and tissue from putative food items were analyzed for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values. Trophic position and niche overlap were measured for *T. s. elegans* and *P. gorzugi*. We identified 13 novel food items in the fecal samples of *P. gorzugi* and confirm that *P. gorzugi* is a primarily algivorous and herbivorous turtle. Higher levels of algivory are noted in this population relative to a previously examined population in New Mexico. Niche overlap between the two chelonian taxa was small ($\leq 25.42\%$) with sliders occupying a higher trophic position than cooters. Data provided from the current study improves our understanding of how *P. gorzugi* satisfies its bioenergetic demands and may be useful for informing species and habitat management strategies.

12:15 026.008 N **Nose to the Ground: Using Detector Dogs to Sniff Out the Cryptic Western Chicken Turtle (*Dierochelys reticularia miaria*).** ¹Environmental Institute of Houston, University of Houston-Clear Lake, Houston, Texas, ²SP8 Ecoservices, Jefferson, Texas. **Mandi Gordon**¹, Laura Speight², and Ashley Collins²
Field surveys aimed at documenting rare or cryptic species face varied issues limiting detectability, especially when these species exhibit life history parameters such as smaller population sizes, wide distribution, discrete seasonal behavioral patterns, or shorter lifespans. Detector dogs have been used to successfully locate terrestrial turtles and tortoises but have rarely been applied to studies focusing on aquatic species. The western chicken turtle (WCT; *Dierochelys reticularia miaria*) is a small, aquatic, ephemeral wetland dwelling species that is currently a candidate for inclusion on the Endangered Species Act due to a lack of documented populations throughout its range. We tested the applicability of detector dogs in a wetland setting by sampling multiple habitats where WCT populations are known to exist. Detector dog surveys were conducted concurrently with environmental DNA surveys for confirmation of species presence. Single detector dog surveys were conducted in May and June of 2020 (n = 2) and from April through July 2021 (n = 8) at three wetland sites in east Texas. Average survey duration was 117.8 minutes and turtles were captured at 16 of 25 detections (64%), with two detections (8%) resulting in WCT captures. Presence of WCT eDNA was confirmed on 6 of the 10 canid survey dates, though WCT eDNA was not detected on the same day as a WCT capture via detector dog (26 May 2021). Surveys will continue in 2022 at the same locations with modifications to protocols based on lessons learned from 2020 and 2021 surveys, including addition of more detector dogs per survey. This study represents one of the first known uses of detector dogs for an aquatic turtle species. Preliminary analyses suggest that this method may prove useful as a detection technique for future studies focusing on cryptic, wetland dwelling organisms.

12:30 **Conservation Ecology Section Meeting**

027. Neuroscience Oral Section and Section Meeting

10:30 am to 11:15 am, Room 1135

10:30 027.001 G **Global Proteomic Analysis Reveals a Novel Pathway Regulated by PERK, an ER Stress Sensor.** UT Health San Antonio, San Antonio, Texas. **Rathipriya Viswanathan**, Brian Stoveken, Sammy Pardo, Dana Molleur, Hema Gudlavalleti, Susan Weintraub, James Lechleiter

Misfolded proteins are a common phenotype of many neurodegenerative diseases including Alzheimer's, frontotemporal dementia, and progressive supranuclear palsy. When misfolded proteins accumulate in the endoplasmic reticulum (ER), the unfolded protein response (UPR) is activated to restore cellular homeostasis. Interestingly, the UPR stress-sensor, PERK, is activated in the brains of patients with neurodegenerative tauopathies. However, the specific mechanisms by which PERK signalling contributes to neurodegenerative diseases need to be more clearly defined. We performed global proteomics to identify pathways that were differentially regulated by PERK knockout (PERK-KO) in mouse embryonic fibroblasts (MEFs) using data-independent acquisition mass spectrometry (DIA-MS). Protein identification and relative quantification were accomplished with Scaffold DIA (Proteome Software). The results for comparisons among experimental groups were submitted to Reactome for pathway analysis. DIA-MS analysis of wild-type and PERK-KO MEFs identified > 5900 proteins. Cholesterol biosynthesis was the top over-represented pathway for proteins with $\geq 1.5\text{x}$ down relative abundance. Of note were lanosterol 14- α demethylase (> 4x down) and 24-dehydrocholesterol reductase (DHCR-24) (> 2x down). Cholesterol plays an important role in various metabolic pathways. Its dysregulation has been linked to a variety of diseases, including neurodegenerative disorders. An elevation of the level of cholesterol has been shown to correlate with ER stress and activation of the stress response pathway. However, the relationship between PERK and cholesterol biosynthesis has been under-investigated. Our preliminary data suggest PERK regulates key enzymes in the cholesterol

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biosynthesis pathway. This study uncovers an important role for PERK in regulating cholesterol biosynthesis, potentially revealing a mechanistic link to various neurodegenerative diseases.

10:45 027.002 G **Correlation between Cerebrospinal Fluid Biomarkers and Cognitive Decline in Alzheimer's Patients and Classification of Stages with Artificial Neural Network.** University of Texas at Tyler. **Vivek Kumar Tiwari**, Premananda Indic and Shawana Tabassum

Early detection of Alzheimer disease is still lacking because recent works do not reflect a person's functional state, and are subject to education, language, and cultural influences. Molecular biomarkers which are found in cerebrospinal fluid (CSF): Abeta 1-42, T-tau, and P-tau, showed promise in the diagnosis of Alzheimer's disease. We analyzed an electronic health record of 890 patients from the National Alzheimer's Coordinating Centre database, including 585 patients with normal cognition, 143 with mild dementia, 145 with moderate dementia, and 17 with severe dementia. Using Pearson correlation coefficients, we first investigated the relationship between the subjects' CSF biomarkers and their Mini-Mental State Examination (MMSE) scores. Our findings show the following: 1) In subjects with moderate dementia, MMSE scores have a weak correlation with the three CSF biomarkers and 2) In subjects with severe dementia; MMSE has a moderately strong correlation with the biomarkers. Furthermore, we used a dense layer-based artificial neural network to classify Alzheimer's disease into three stages: normal cognition, mild, and severe dementia. The model's test accuracy was 73%. Our findings will have a substantial impact since the correlation and prediction models will assist clinicians in early diagnosis of Alzheimer's disease, monitoring its course, and implementing appropriate measures.

11:00 **Neuroscience Section Meeting**

028. Physics and Engineering Oral Section 2 and Section Meeting

10:30 am to 12:15 pm, Room 1217

10:30 028.001 G **Nano-Electrocatalysts for the *In-Situ* H₂O₂ Production for Space Applications.** The University of Texas El Paso, El Paso, Texas. **Armando Peña-Duarte** and Carlos R Cabrera

The growing world of space missions requires auto-sustainable close-living environments, antimicrobial sanitizing solutions, and the inevitable decline in dependence on land resources. We have proposed the synthesis of nano-catalysts---by using cheap materials with terrestrial and space abundance, combined with low toxicity and high stability---for the *in-situ* production of hydrogen peroxide as a sterilization solution for space applications. The catalysts were synthesized by the Rotating Disk Slurry Electrodeposition (RoDSE) technique and thermal treatments. Our findings through the rotating ring-disk electrode (RRDE) and the *in-situ* peroxide generation unit (PGU)---under the compatibility conditions of the drinking water resources available in the International Space Station (ISS)---revealed a high activity for the oxygen reduction reaction (ORR) via two-electron pathway. Transmission electron microscopy (TEM) analysis reveals the well-dispersed 4 nm quantum dots. The chemical-physical characterization---through induced coupled plasma-optical emission spectroscopy (ICP-OES), transmission scanning electron microscopy (STEM), X-ray diffraction (XRD), Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), and X-ray absorption spectroscopy (XAS)---reveals that our quantum dots system is a combination of hematite and magnetite. The obtention of H₂O₂ under the compatibility conditions of the drinking water in the ISS enhances the applicability of the catalyst synthesized here for *in-situ* H₂O₂ production in future space scenarios. These results establish our catalyst at a competitive level for space and terrestrial new materials carriers, specifically for the *in-situ* H₂O₂ production.

10:45 028.002 N **Silicon Building Silicon: Dynamic Modeling of Dust Crystal Formations in a Complex Plasma using NVIDIA GPUs.** Tarleton State University, Stephenville, Texas. **Bryant Wyatt**

A complex plasma is a plasma (electrons, ions, and neutral particles) that contains nanometer to micron-sized solid particles (dust). Dust grains collect more electrons than ions on their surface and become negatively charged. The action of this charged dust has important ramifications in a wide array of systems, such as self-assembly of nanostructures, removal of dust in semiconductor fabrication and fusion reactors, and in astrophysics, learning how space dust coalesces to ultimately form the stars and planets in our universe. Experimentalists study dust actions in complex plasma by confining and levitating the charged dust in an electric field, illuminating the dust with lasers, and recording their action with high-speed cameras. These experimental setups cost hundreds of thousands of dollars. The experiments are also extremely hard to control and can take months to years to get significant results. Because of the expense and time needed to perform physical runs, experimentalists rely on computer modelers to lead their work and confirm their findings. Here we present our work on dynamically modeling dust crystal formation in a complex plasma accelerated on NVIDIA GPUs. We hope this work will help create new nanostructures, manufacture higher quality semiconductors, produce fusion energy, and shed light on the origins of our universe.

11:00 028.003 G **Magnetic structures of sawtooth olivines Mn₂Si_X4 (X = S, Se) determined through neutron powder diffraction.**

University of Texas at El Paso, El Paso, Texas, Idaho National Laboratory, Idaho Falls, ID, Department of Chemistry and Biochemistry, University of Oklahoma, Norman, Oklahoma, Neutron Scattering Division, Oak Ridge National Laboratory, Oak Ridge, TN. **Melaku Sisay Tafere**, K. Gofryk, B. Saparov, Q. Zhang, H. Nair

Chalcogenide olivines A₂BX₄ (A = Mn, B = Si, X = S, Se) crystallize in the orthorhombic Pnma space group where the A atoms form a sawtooth and consist of two crystallographically distinct sites leading to geometric frustration. They are predicted to be thermoelectrics owing to the "flat" features in the band structure. Our previous work has shown frustrated magnetism of A = Mn in the olivine Mn₂Si_X4 (X = S, Se), using magnetization, specific heat, and thermal conductivity properties, as well as density functional theory calculations. Mn₂Si₄ and Mn₂Si_{Se}4 order in a collinear antiferromagnetic configuration below their Néel temperatures, TN = 83 K and 66 K respectively. The Curie-Weiss temperatures of -226 K and -336 K indicate a rather small frustration index of 2.7 in Mn₂Si₄ and a moderately frustrated value of 5.1 in Mn₂Si_{Se}4. Additionally, the entropy release at TN for both compounds is significantly smaller than expected for Mn²⁺ S=5/2 spins, particularly for Mn₂Si_{Se}4, pointing to strong spin fluctuations and short-range correlations that further support the picture of geometrical frustration. Crucial missing information about the sawtooth olivines includes experimental studies of the short-range spin correlations and the local atomic structure. In this poster we will present results from magnetic structure refinements using neutron powder diffraction studies confirming the phase transitions at TN = 83 K for Mn₂Si₄ and 66 K for Mn₂Si_{Se}4. The low temperature magnetic structure will be presented. Though the crystal structure remains the same, the magnetic space groups for Mn₂Si₄ and Mn₂Si_{Se}4 are found to be different. To understand the local structure, we used X ray PDF measurements. The details of magnetic structure, local atomic structure and bond parameters that influence magnetic exchanges will be presented.

11:15 028.004 G **Boron-doped alumina for smart lubricants: Density functional theory study.** ¹University of Texas at El Paso, El Paso, TX, ²University of Nevada – Reno, Reno, NV. **Nicholas Wilson** ¹, Ashish Kasar ², Pradeep Menezes ², Eunja Kim ¹

Density functional theory (DFT) is a quantum mechanical method that can be used to model atomic structures from first principles. Using this method, we have carried out atomistic modeling of ceramic alumina (Al₂O₃) doped with boron oxide (B₂O₃). Alumina exhibits excellent material properties, including a high melting point, hardness, and corrosion resistance. Alumina can also exhibit lubricating properties that can be enhanced with the addition of solid lubricants such as boron. In this study we investigated structural changes of alumina with respect to boron weight percentages (wt%) between

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5% and 20% in order to understand the role of boron, introducing tribological properties to a mechanically favorable structure. Increasing amounts of boron oxide doping were added by substitution to an alumina unit cell and optimized using DFT. The most energetically favorable structures at each boron wt% were identified and directly compared to experimental x-ray diffraction (XRD) patterns, finding agreement between theoretical and experimental patterns for stable aluminum borate phase (9Al₂O₃ 2B₂O₃). Further investigation into theoretically produced structures can then be carried out to determine properties favorable to lubrication. This mechanically and tribologically favorable material can be used for extreme space applications, namely treading for planetary rovers.

11:30 028.005 U **Mechanical Wire Separator using bladed rollers at desynchronized phases.** University of Houston – Clear Lake, Houston TX. Richard Mann, Ross Orsino, Tony Cao, Jessica Cruz, Oscar Ochoa Perez, **Jose Ortiz**. Mentored by Ariful Bhuiyan. The wire separator is a product designed recover scrap copper from wires for recycling. Due to the abundance of raw wire material available, this product was designed to be relatively portable. With environmental and economic considerations in mind, the separator was developed to employ strictly mechanical means of insulation removal, to avoid the need for inputs such as water or lubricant, and with minimal demand for power. The purpose of this design was to develop an affordable, efficient design, within a limited budget. Economically, the wire separator is a capital initial investment that must have sufficient longevity to produce enough income, in the form of scrap copper, to exceed the investment and provide a net return. There is additional value as an educational tool, both in demonstrating the functionality of elements like chains and gears (much of the enclosure is clear acrylic, permitting users to see what happens inside) and in spreading awareness of the approachable and profitable nature of salvaging scrap metal. The separator works by mincing wires into a fine mulch with a set bladed rollers with descending blade thicknesses, such that most sizes of wire will have been cut axially and the insulant will have been severed. The last pair of rollers are knurled shafts, one of which rotates significantly faster than the other. This causes a moment, curling and deforming any pieces of insulant that still encompass any amount of copper. The biggest constraint on the budget was the cost of the motor. To minimize the power required, each pair of rollers was synchronized such that they operate out of phase with one another. Consequently, a maximum of two pairs of rollers will be engaged in cutting copper at any given time, and there will almost always be at least one pair of rollers that is engaged. This allowed us to more than halve the power requirement, which meant decreased cost on the motor and decreased operational expense from power consumption.

11:45 28.006 U **A Journey from Present into Past of Future.** Kumaun University, Rudrapur, Uttarakhand, India. **Yash Taneja** As the modern study of time and space indicates that fabric of time slows down near heavier objects and its pace increases as we move away from them. this nature of time may be used to travel into past of future. Suppose a man is set to go into space with his spaceship and land on a planet lighter than earth, the spaceship is quite advanced that it doesn't take much earth time to reach there. As a result of being lighter than earth, time will pass fast then it does on earth. For example, we can say like few years on that planet are equal to only few months on earth, as the supply of that man is about to end after 30 years, he decides to go back on his mother planet and so he evacuates the planet on which he was living from last 30 years. On reaching the earth, to his surprise it's been only 5 years on earth since he left, he is shocked because he is now older than his own dad because when he left his was 20 and his father was 40 and today his father's age is only 45 but he is a 50 year old man. As being a student of physics, he understands that he has done a journey into the past of future.

12:00 **Physics and Engineering Section Meeting**

029. STEM Education Oral Section 2 and Section Meeting

10:30 am to 12:30 pm, Room 1313

10:30 029.001 U **Virtual Learning Environments and Their Impact on Education.** University of Houston – Clear Lake, Houston, Texas. **Eric Washington**, Maxfield Smith, Prashanth Gatreddi, Datta Soma Social distancing introduced challenges to every field of study and areas requiring students to perform laboratory experiments. Laboratory experiments are essential to the understanding of microbiology. Since microbiology majors perform many laboratory experiments, shutdowns due to Covid-19 proved extremely devastating to their curriculum. To offset the knowledge lost from the lack of physical labs, the computer science department and the microbiology department came together to create a virtual biology lab to allow students to gain lab protocol skills while at home. Creating this virtual microbiology lab is an interdisciplinary endeavor; we hope we will provide microbiology students with a basic understanding of laboratory procedures. This project will also provide software engineering/computer science students with Unity's real-life game development skills. Students participating in the development of the lab will treat the microbiology department as a customer and deliver a finished product that meets their specifications. In developing this simulation, we hope to transfer the knowledge needed to successfully perform an experiment to extract DNA from bacteria in a virtual environment. After playing the simulation, microbiology students will have the skills to attempt the investigation in a physical setting with little help from the professor. We hypothesize that the transfer of knowledge from the simulation to the student would be sufficient for the students to perform the steps of one of the MALDI-TOF (matrix-assisted laser desorption/ionization-time of flight) processes and utilize laboratory equipment to complete the lab.

10:45 029.002 N **Teaching During Pandemic: A Potential Package for Organic Chemistry Remote Teaching.** University of the Incarnate Word, San Antonio, Texas. **Ashok Khanal** The pandemic has brought both challenges and opportunities to all universities across the globe. Every challenge will open the door for new opportunities. As the world was fighting against the global pandemic, all universities were transitioned online over a short period without any prior preparation. Over time as an instructor, I shape myself for combating the situation. Utilizing Zoom, whiteboard, molecular model, videos, ChemDraw, Respondus, LockDown Browser, blackboard, mandated attendance, interactive class, and office hour, this instructor was able to facilitate the learning process compatible with the face-to-face model. Laboratory was the blend of lab manuals, lab videos, and simulation experiments. Prelab, quiz, and report were prepared based on the lab manual and lab video. Similarly, simulation experiments were conducted for each lab via Beyond Labz which helped to connect the lecture with the techniques of the laboratory. In fall 2020, a survey was conducted on sixty students representing different organic chemistry lectures (CHEM 2311) and laboratories (CHEM 2111) at the University of the Incarnate Word, San Antonio, Texas. The outcome of the survey revealed that live synchronous with mandated attendance and office hour fulfills the expectations of the students as well as the standards of the course. This instructor's perspective also aligned with the outcome of the students' thoughts. The preferred response for live synchronous is almost half of the total so it is equally beneficial, provides full expectation, and almost as effective as face to face.

11:00 029.003 N **Teaching aquatic science without any water: challenges and opportunities for integrating intermittent and ephemeral streams into environmental science curricula.** The University of Texas at San Antonio, San Antonio, Texas. **Brian Laub** Providing experiential learning opportunities in aquatic science is an important educational objective in environmental science programs at the university level. Experiential learning may include hands-on demonstrations of field sampling techniques and assessment of river and stream health using established rapid survey protocols. Providing such learning opportunities is critical for students pursuing careers in aquatic science. However, providing experiential learning in aquatic science can be challenging in arid and semi-arid regions where easily accessible streams are intermittent or ephemeral. In this talk, I will review elements of a typical aquatic science lab course and identify specific subject areas where lack of flowing-water streams may

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impact the ability to convey important concepts to students. Examples include measurement of discharge and the concept of pool-riffle sequences. I will also highlight when lack of flowing water can be advantageous, such as the ability to easily examine and measure properties of streambed sediments. Strategies for delivering aquatic experiential learning opportunities in intermittent and ephemeral streams will be discussed, drawing from experience with an aquatic science lab course at the University of Texas at San Antonio campus, where easily accessible stream channels are mostly dry with only isolated pools of water present most of the year. Intermittent and ephemeral streams naturally occur in arid and semi-arid regions, and more streams may become intermittent where climate change reduces precipitation amounts. Thus, it will be important to integrate intermittent streams into aquatic science curricula, so that students do not learn to perceive such streams as inherently unhealthy compared to perennial systems.

11:15 029.004 N **Using Human Rights Issues to Engage Students in STEM Courses.** Lone Star College – Kingwood. **Brian Robert Shmaefsky**

As STEM instructors we often choose to teach STEM with few explorations of social context. We tend to assume that students can make these connections on their own. By teaching how STEM relates to human rights issues, STEM instructors can model social responsibility for STEM majors including health professions students. In addition, it demonstrates a relevant need for biological literacy for nonmajors. Human rights issues can be incorporated into the content with having to find space to bring in social issues, and without the concern that course content may be omitted in the process. In addition, this presentation addresses the concerns that human rights issues are topics of conflict, resistance, and indifference that should not be approached in traditional college STEM courses. Studies on science education reform promote this pedagogical approach because it prepares students to rationally approach the interdisciplinary nature of twenty-first century problems. This integrative learning is consistent with the science pedagogy recommendation of the American Association of Colleges and Universities, CCSS, National Academy of Sciences, National Research Council, NGSS, and Vision & Change. The pedagogy demonstrated in this presentation adds equity and inclusion to the curriculum and improves engagement of underserved students. Participants will be guided through the processes behind adding a human rights issue to the commonly taught STEM concept. Ample resources about teaching with human rights will be provided.

11:30 029.005 N **Indirect Evidence – Imaging a Body, A New Take on an Old Lab.** Stephen F. Austin State University, Nacogdoches, Texas. **Joseph Alan Musser**

The STEM Center at Stephen F. Austin State University hosts a STEM Academy program for two local high schools. I developed an interdisciplinary physics laboratory experience for the program. To engage students and reach across multiple disciplines the experience focused on medical physics. I present the results of a new take on the old indirect evidence lab. Cancer has touched directly or indirectly most if not all of our students. In the lab students use low level radioactive sources along with a detector to scan a “body” in order to find a “cancer” and a loss of tissue. Our sample bodies were constructed of aluminum foil and placed inside envelopes. Eleventh grade students proceeded to scan a grid marked on the outside of the envelope. They mapped the data into a color-coded two-dimensional grid forming an image of their “body”. Their first body was a geometric shape. The second body was a stylized bone or kidney with a “growth” in one spot and tissue loss elsewhere. Nearly every group successfully identified the location of the cancer and the location of the tissue loss. Students strongly engaged in the learning experience. Through questioning and self assessment students demonstrated an introductory understanding of: radiation, detection of radiation and pixilation resolution versus scan times. Hopefully this activity stimulates the creative nature of others teachers to develop activities which incorporate meaningful topics in exciting new ways for students.

11:45 029.006 N **Construction of an engaging non-majors microbiology course.** University of Mary Hardin-Baylor, Belton, Texas. **Joni Ylostalo**

During the COVID-19 pandemic, much public interest has risen regarding microbes, diseases, and treatments. In most cases, understanding of the microbial world by the general public is limited leading into misunderstandings regarding the basic characteristics of microbes, their spread, and the ability to cause diseases. Hence the need for developing a non-majors microbiology course with a lab is even more crucial, giving students with non-science majors an opportunity to become more informed about microbes regarding the current pandemic and possible future pandemics. In order to engage students with non-science majors, relevant and attainable learning objectives regarding microbiology were developed. Following these course-wide learning objectives, more detailed learning objectives for each class period were developed and used as the basis for the various assessments and activities. The developed assessments included multiple choice and short answer type exams and quizzes, but in addition, also interactive and relevant problems were developed, that students could work on in pairs or in small groups. Furthermore, the course employed teaching case studies to engage the students into the learned topics without losing the real-life application. The laboratory portion of the course introduces the students into the basic laboratory techniques of microbiology including microscopy, staining, generation of pure cultures, enumeration methods, study of growth conditions, and testing of various antimicrobial agents, in an inquiry-based modality. The course will be taught in the Spring of 2022 and various feedback from students will be collected throughout the semester to aid in further development of the engaging non-majors microbiology course.

12:00 029.007 U **pH Analysis and Comparison of Cola Products.** Stephen F. Austin State University, Nacogdoches, Texas. **Heather Smith, Alyx Frantzen**

In the high school laboratory settings, it is challenging to conduct experiments that keep students engaged and still cover the required educational knowledge. An experiment using popular cola drinks was developed to introduce the concepts of pH, titration, and equivalence points to students. Samples of drinks were titrated to completion using drop counters and pH meters to monitor the progress of the neutralization. As a side demonstration, litmus paper was used to quickly indicate the pH level of the drinks as the titration progressed. For the titration, students are measuring the pH levels of six different sodas and one energy drink: Coke, Coke Zero, Diet Coke, Mexican Coke, Pepsi, Dr. Pepper, and Monster. Sodas were used in this experiment as a way to peak the students' interest in learning about the acidity of beverages that they consume daily. The majority of the drinks have an initial pH of roughly 3-4 at the beginning of the titration. In the school setting, this lab can be conducted over the time span of a week, as each student group will be required to titrate 3-4 of the sodas. The majority of the drinks used contain phosphoric acid and the students will be able to observe at least two equivalence points, maybe all three. The analysis of the data requires the students to be able to accurately define acid-base concepts, such as pH, equivalence points, and neutralization and be able to do calculations involving molarity, stoichiometry, and percent by mass.

12:15 **STEM Education Section Meeting**

030. Systematics and Evolutionary Biology Oral Section 2 and Section Meeting

10:30 am to 12:00 pm, Room 1215

10:30 030.001 U **Life history evolution in a clade of freshwater mussels revises taxonomy and reveals synchronous diversification with host fish.** The University of Texas at Austin, Texas. **Sakina Neemuchwala, Chase Smith**

Life history characteristics are at the utmost importance in biology as they demonstrate evolutionary adaptations associated with ecological niches. Freshwater mussels are aquatic bivalves that possess a parasitic life cycle requiring larval attachment to freshwater vertebrates to complete metamorphosis. The North American freshwater mussel tribe Quadrulini consists of 25 species and its taxonomy has been unstable due to systematics relying on external shell morphology. Life history characters involved with parasitism have been proven useful in resolving the evolutionary history of

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freshwater mussels but have not been tested within a phylogenetic framework in *Quadrulini*. Here, we use a holistic approach incorporating biogeographical, ecological, molecular, and morphological datasets to resolve the evolution of *Quadrulini*. Comparative phylogeography revealed synchronous diversification between quadrulines and their hosts, with major diversification events occurring in the Mississippi River basin. Phylogenomic inference could not resolve the monophyly of *Cyclonaias* or *Tritogonia* – each of which were diagnosed based on shell morphology. We make multiple taxonomic changes to accurately reflect the evolutionary history of *Quadrulini*, each of which is based on synapomorphies associated with life history characteristics. We resurrect the genus *Amphinaias* based on distinctive host use, larval size, and brooding morphology. Further, we synonymize *Tritogonia* into *Quadrula* based on multiple shared life history characteristics, including miniature larvae and parasitic growth. Our findings add to a growing body of literature that external shell characters are unreliable in this group, whereas host use and associated life history traits are phylogenetically conserved.

10:45 030.002 U **Evolution of body size in four species of lizards (Family Phrynosomatidae) across an east-west gradient in the American Southwest.** The University of Texas, Austin, Texas. **Sora Michelle Sunby**, Travis James LaDuc

Habitat differences for the tree lizard, *Urosaurus ornatus*, are correlated to observed changes in body shapes between different populations. Correlations between body size and latitude have been seen in lizards, though the correlations are often the inverse of that found in endotherms that follow Bergmann's Rule (larger body size in colder climates/higher latitudes). However, whether differences in precipitation along an east-west gradient are correlated with variations in body shape of lizards has not been tested. This project aims to understand the effects of an east-west precipitation gradient across the American Southwest on body shape in lizards and whether similar patterns are seen across four species in the family Phrynosomatidae: *Cophosaurus texanus* (Greater Earless Lizard), *Phrynosoma cornutum* (Texas Horned Lizard), *Sceloporus olivaceus* (Texas Spiny Lizard), and *Urosaurus ornatus* (Ornate Tree Lizard). Based on previous studies examining the relationships of both latitude and elevation to lizard body size, we predict that limb lengths and body sizes will increase as precipitation decreases from east to west across the gradient. Using available museum specimens, up to 20 adults (10 male and 10 female) of each species were examined for each species from 10 different geographic regions, each measuring 1.5 degrees longitude across an east-west transect from central and west Texas, through southern New Mexico to southern Arizona. A total of 540 specimens were included in this study. Twelve external measurements were recorded from each specimen, including snout-vent length, body width, and limb and toe lengths. Results from this study may suggest future shifts in lizard morphology as precipitation patterns are predicted to change with a warming planet.

11:00 030.003 G **Soft tissue preservation of lizards in amber allows for inference of ancestral scale traits across squamate reptiles.** Sam Houston State University, Huntsville, TX. **Daniel Doucet**, Juan Diego Daza

Lizards in amber sometimes retain their skin and keratinized scales. Because of this, they provide a novel method of studying scale morphology in an evolutionary context. Fossil groups give reptile morphologists the rare opportunity to observe and include extinct taxa in cladistic analysis. However, morphological diversity in squamates creates a problem for phylogenetic inference when using only osteological characters. Over the past few years, accepted squamate phylogenies combine molecular and phenotypic data. Despite the vast amount of morphological and molecular data available, detailed anatomy of scale characters from the integument are rare in these analyses, and this information is very rare in fossil taxa. In an ongoing project, the thorough analysis of morphological variation in squamate scales fulfills this lack of information on cladistic analyses. Here we include lizards in amber as viable fossil taxa with characters from the integument. In this analysis the nearly complete amber specimen *Retinosaurus hkamtiensis* is included in this data set, testing the viability of this data to support taxonomic allocation based on scale morphology. 180 characters from the integument were scored from 122 extant representatives belonging to 53 squamate families. Characters were examined against the phylogeny through the R package *phytools*. CT scans of the specimen were scored for the same characters, and comparative analysis supports the hypothesized placement of this fossil as a proto-xantusiid. Further application of this method on other lizards in amber may improve inferences on their taxonomic allocation. These specimens may allow a better understanding of scale evolution across all lizards and snakes. With detailed information on when scale traits could have been altered based on this preserved soft tissue, accurate fossil reconstructions can now include precise scale morphology.

11:15 030.004 G **Cranial Characteristics in the Genus *Zygaspis*.** Sam Houston State University, Huntsville, TX, University of Texas at Austin, Austin, TX. **Antonio Meza**, Christopher J Bell, and Patrick J Lewis

Amphisbaenians are a group of limbless, fossorial reptiles that are recognized today as a highly specialized group of lizards. In this project, the inter- and intraspecific cranial variation of seven of the eight currently recognized species of the amphisbaenian genus *Zygaspis* was assessed and unique characteristics among them were identified. I hypothesize that variation does exist between the skulls of the specimens of *Zygaspis*. A total of 15 specimens from the seven species were micro-CT scanned (*Z. quadrifrons* (5), *Z. vandami* (2), *Z. niger* (2), *Z. violacea* (2), *Z. dolichomenta* (1), *Z. ferox* (1) and *Z. kafuensis* (2)). The software program Avizo 9.7.0 was used to digitally isolate the individual cranial bones of each specimen. The cranial anatomy of *Z. quadrifrons* has been previously described, providing a baseline for comparison to other *Z. quadrifrons* specimens and the remaining species of the genus. Our results demonstrate that cranial variation does exist, even in specimens of the same species. Most of the bones were similar in general form, with minimal differences. Some had no consistent pattern and displayed their own variation of characteristics: parietal, septomaxilla, and tabulosphenoid. Asymmetry among the paired bones of the same specimen was observed in the ectopterygoid of *Z. dolichomenta*, the nasal & quadrate of *Z. kafuensis*, and the prefrontal of *Z. violacea*. Characteristics of certain cranial bones that help distinguish a species includes the shape of the nasal process of the premaxilla in *Z. quadrifrons*, the anterior ball shape of the extracolumella in *Z. niger*, the pronounced notch on the pterygoid of *Z. kafuensis*, and the pattern of the frontal processes of the parietal in *Z. ferox* & *Z. vandami*. These descriptions of the species of *Zygaspis* suggests that inter- and intraspecific variation should be accounted for in functional and phylogenetic studies. This study provides further comparable material for other qualitative amphisbaenian studies.

11:30 030.005 G **Context and evolution of Abrocomidae (Rodentia: Octodontoidea) and unexpected genetic distances in the endangered *Abrocoma boliviensis*.** Texas Tech University, Lubbock, Texas. **Daniela Arenas Viveros**, Jorge Salazar Bravo

The family Abrocomidae represents a lineage of South American rodents well adapted to inhabit rocky environments along the central Andes and which form part of a radiation that has been present on the continent since the Eocene (i.e., Caviomorphs). Members of this family include no less than seven extinct and two extant genera: *Abrocoma* and *Cuscomys*. Here, we aimed to reconstruct the phylogenetic relationships of the family Abrocomidae, with a special emphasis on *Abrocoma boliviensis*. *A. boliviensis* is a species endemic to Bolivia and is considered as critically endangered by the IUCN. Results from the analysis of mitochondrial and nuclear markers support a close phylogenetic relationship of *A. boliviensis* with *A. cinerea* rather than *A. bennetti*. In addition, mitochondrial data from 11 individuals of *A. boliviensis* revealed high levels of genetic distance when compared with other closely related taxa. Possible explanations for these results include: 1) *A. boliviensis* is a species complex and further taxonomic revision is required, 2) sex-biased dispersal is promoting divergence within the mitochondrial genome, or 3) *A. boliviensis* might require further partitions into subspecies. Preliminary results seem to point to hypothesis number 2 as the most likely scenario. Because *A. boliviensis* is both endemic and endangered, understanding how its genetic diversity is apportioned will better inform any potential conservation efforts.

11:45 **Systematics and Evolutionary Biology Section Meeting**

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013. Poster Session 1

5:00 pm – 6:30 pm, Recreation and Wellness Center, second floor track area

Anthropology Posters:

- 013.001 U **An *in-silico* method for modeling the nasal cycle in 3D: Implications for assessing human nasal form and function.** University of Texas at Arlington, Arlington, Texas. **Baonhu Tran**, Lyndee Ward, Elizabeth Thai, and Scott Maddux
Anthropologists have long posited that geographic-mediated links between human nasal morphology and climate evince climatic adaptation. Such arguments focus on the nose's prominent role in respiratory air-conditioning, as intranasal heat and moisture exchange in different climates is largely governed by the amount of nasal mucosa surface area relative to the volume of air passing through each nasal passage. Notably, nasal morphology is affected by the nasal cycle – a physiological process where the left and right nasal passages reciprocally alternate in their mucosal congestion levels. Yet, the inability to morphometrically account for the nasal cycle has limited investigation into the adaptive influence of nasal soft tissues. We thus developed an *in-silico* methodology to control mucosal congestion via digital expansion/contraction of nasal mucosa during the nasal cycle. Three-dimensional (3D) models of the nasal airways with three different mucosal congestion levels were then generated using a computed tomography (CT) scan of one human male head: decongested (left/right = 0/0%), asymmetrical (left/right = 90/10%), and mid-cycle (left/right = 50/50%). Overall nasal mucosal surface area to airway volume ratio (SA/V) was lowest for the decongested model (0.57) compared to the mid-cycle (0.72) and asymmetrical (0.74) models. Unilateral analyses also showed the highly congested left passage of the asymmetrical model exhibited a higher SA/V (1.06) compared to the same left passage in the mid-cycle (0.84) and decongested (0.60) models. Our results conform to theoretical and anatomical expectations, suggesting that the developed 3D digital methods permit reliable *in silico* modeling of nasal soft tissues. This will allow future studies to control for mucosal congestion while investigating the role of nasal morphology on respiratory airflow (e.g., using computational fluid dynamics analysis).
- 013.002 U **Supracondylar process percent incidence in a modern forensic collection.** ¹Department of Anthropology, Baylor University, Waco, Texas, ²Department of Biological Sciences, Sam Houston State University, Huntsville, Texas, ³Department of Anthropology, Texas State University, San Marcos, Texas, **Kylie Adyson Mongan**¹, Stephanie Anne Baker^{2,3}, Timothy Lee Campbell¹
The supracondylar (supracondyloid) process is a rare bony projection found on the anteromedial aspect of the distal humerus and serves as an attachment for Struther's ligament when present. Extending from the supracondylar process and attaching to the medial epicondyle, this ligament has been clinically associated with the compression of the median and brachial artery in some patients. Previous studies which examined large samples derived from late nineteenth and early twentieth century populations found that the supracondylar process is almost exclusively found in people of European ancestry. In order to assess the prevalence of this anomalous process in modern populations, a visual survey was conducted on digital photographs of distal humeri from the Texas State University Donated Skeletal Collection (TXSTDSC) housed in the Forensic Anthropology Center at Texas State (FACTS). Right and left humeri were visually scored for 355 individuals consisting of 151 females and 204 males with a mean age of 65 years and a range of 18-103. Racial identifications reported on the donor questionnaire include one Asian Indian, two American Indian or Alaska Native, 11 Black or African American, 15 Hispanic, and 326 White individuals. Results from our survey found that eight White individuals including two females and six males, possessed supracondylar processes for a 2.3% incidence. Two individuals exhibited this trait unilaterally on the left humerus, three unilaterally on the right humerus, and in three individuals the process was bilaterally expressed. Although the sample utilized here is heavily biased towards individuals classified as White, these results support previous studies which found this trait is predominantly found in people of European origin.
- 013.003 U **The Prevalence of Afro-Cuban Religions and their Scope of Influence on the United States.** Texas A&M University, College Station, Texas. **Lilian Ferran**
The realm of Afro-Cuban religions is not strictly tethered to Cuba but has extended its influence far from the country's borders. The island's colonial period was a time when indigenous religions were influenced by the Spanish Catholicism of its conquerors, resulting in syncretic and complex belief systems. The most notable of these groups are Regla de Ocha, Palo Monte, and Regla Arara, which originally hail from African Yoruba. The African slave trade, in conjunction with the Cuban Revolution of 1959, propagated the migration of large numbers of Cubans into the United States. The focus of my literature review concerns the contributions that these diasporic cultural practices had on the United States, explicitly covering regions that were directly involved in the slave trade or become immigrant destinations. Following a study of the presence of Santeria in New York City, researchers discovered that practitioners, and recent proselytes alike, demonstrated an unwavering commitment to the religion despite the stigmas associated with it. The reconstruction of these practices in such a prominent American city is a testament to the religion's resilience despite entering an environment that rejected these religious trends. Similarly, a second study outlined the manner in which Santeria flourished in Florida, constituting a vital mental health care system for the residents of Dade County who are drawn to the religion for emotional support. These studies outlined how Afro-Cuban religions have been incorporated into major U.S. cities and contributed towards the betterment of the community. I anticipate that the two aforementioned articles, with the inclusion of others outlining the presence of these practices across the United States, will help me demonstrate the prevalence of Afro-Cuban religions across America and their assimilation into our society.
- 013.004 U **Taphonomic analysis of micromammal skeletal part proportions and breakage patterns found within barn owl (*Tyto alba*) pellets from Bolts Farm, South Africa.** Baylor University, Waco, Texas. **Noah Dawson Wingate**, Garrett Cooper Croley, Timothy Lee Campbell
In this study, we analyzed skeletal part proportions, and breakage patterns of micromammal (<500g) remains found within African barn owl (*Tyto alba*) pellets. Micromammal remains are often used in paleoenvironmental reconstructions and can be found in abundance in fossil bearing localities such as caves. Environmental reconstructions based on paleocommunity compositions, however, must account for biases introduced by the accumulating agent. In order to test for predator-specific taphonomic patterns, we analyzed skeletal remains from 38 barn owl pellets recovered from Bolts Farm, South Africa. The minimum number of individuals (MNI) recovered include 60 rodents and eight shrews. Long bone, cranial, and girdle elements were scored using a breakage schema modified from the literature. Skeletal element representations were calculated as proportions of expected number of elements based on MNIs, and correlations with sites reported in the literature were calculated. Previous studies have classified long bone remains as complete even in the absence of epiphyses. Utilizing our modified breakage categories, we found that relatively few long bone elements (20.0% - Humeri) retain their epiphyses in this assemblage. This suggests that micromammal long bones retaining their epiphyses should not be expected in the fossil record. Correlations coefficients for skeletal element representation compared to site data derived from the literature ranged from positive ($r = 0.79$) to negative ($r = -0.58$). Based on these comparisons, caution is warranted in assuming a singular pattern for skeletal element representation between owl roosts. As the assemblages compared here were recovered from both Europe and Africa, it is possible that differences in prey community compositions and taxonomic makeup may account for the differences in element representations observed. As such, more research into region-specific assemblages and cross-site correlations is needed.
- 013.005 G **Quantitative analysis of coronal suture separation due to cranial trauma.** ¹Department of Biology, Sam Houston State University, Huntsville, Texas, ²Department of Anthropology, Baylor University, Waco, Texas, ³Department of Anthropology, Texas State University, San Marcos, Texas. **Stephanie Anne Baker**^{1,3}, Timothy Lee Campbell², Juan Diego Daza¹, Patrick John Lewis¹

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Morphometric analysis of cranial sutures can provide evidence of microfractures, diastasis, and early sutural closure. Recently, mCT has allowed for analyses on much smaller scales and has been used to differentiate normal cranial sutures from early sutural synostosis suggesting that more data may be available at microscopic levels. Here, we investigate for asymmetrical separation in coronal sutures to determine if differences exist between sides that received trauma and the contralateral regions. Two human cranial trauma cases and one control specimen from the Southeast Texas Applied Forensic Science (STAFS) facility were analyzed. All specimens were European adult males >56 years of age. Trauma types include an intraoral gunshot wound and blunt force trauma. To standardize data collection, Type-1 landmarks were used with mCT imaging of the coronal sutures beginning at their origin (sphenion) and terminating at bregma. Due to the tortuous nature of the coronal suture, a comb-based approach was used to standardize sampling sites. Utilizing Avizo segmenting software, a chord line between bregma and sphenion was first defined allowing for the placement of twenty equidistant sampling sites along the suture at orthogonal angles from the chord. ImageJ was then used to calculate the total area of separation for individual scan slices at each sampling site and asymmetry was determined by comparing the mean differences in coronal suture separation between sides delineated by bregma. While preliminary results suggest asymmetry with less separation on the side that received the trauma compared to the contralateral (BFT=0.164 mm², GSW=0.046 mm²), the largest mean difference was observed on the control (0.487 mm²). Data collection on additional specimens is needed for statistical comparisons and is currently ongoing. Ultimately this study could provide forensic scientists another method to assess injury and lead to a more thorough understanding of sutural diastasis.

013.006 N **Comparison of two packing methodologies for microfaunal mCT scanning.** ¹Baylor University, Waco, Texas; ²Sam Houston State University, Huntsville, Texas; ³Forensic Anthropology Center, Texas State University, San Marcos, Texas. **Timothy Lee Campbell**¹, Stephanie Anne Baker^{2,3}, Deborah Lenz Cunningham³, Juan Diego Daza²

The use of digital imaging technologies for analyses of vertebrate remains provides numerous advantages as they are nondestructive and allow data to be shared virtually. Alternately, these methods incur various costs in terms of time and money, thus limiting their use in studies of large samples. As microfaunal (< 500 g) fossils can be found in dense accumulations, the development of methodologies that reduce costs will facilitate analyses of large collections. In this study we compare measures of efficiency for a variation of a packing methodology recently published (Method 1) to one we developed (Method 2). Briefly, Method 1 involves stabilizing specimens in a packing material, inside gelcaps, inside straws, inside a 50 ml centrifuge tube. While using this innovative protocol on fossil microfauna from Swartkrans, South Africa, we found that the gelcap dimensions prevented the packing of many specimens (e.g., squamate frontals), and that specimens frequently came into contact. Due to these issues, we developed an alternate packing protocol that relaxes specimen dimension restrictions using 2" stackable bead storage jars with specimens layered and stabilized with cotton. Holding scan duration and parameters constant, fossil avifaunal humeri were used to compare four measures of efficiency: total specimen volume (Vol-mm³), percent of potential volume utilized (Vol%), percent of total specimens in contact (Con%), and average segmentation time (SgTMin). Results are as follows: Method 1 – 2878 Vol-mm³, 5.2 Vol%, 48.2 Con%, 266 SgTMin; Method 2 – 4798 Vol-mm³, 4.0 Vol%, 14.9 Con%, 98 SgTMin. While both methods utilize less than 6% of available volume, Method 2 contained 67% more specimen volume and had fewer specimen contacts resulting in a 63% reduction in segmentation time. While not quantified, packing time was also significantly reduced. This protocol thus provides an alternate viable packing option for scanning microfaunal remains with varying dimensions.

Biomedical Sciences Posters:

013.007 U **Correlating CD30 Expression with Anti-CD30 BITE Induced Lysis.** ¹Texas Christian University, Fort Worth, Texas, Departments of ²Pediatrics and ³Biochemistry, Medical College of Wisconsin, WI, USA. **Alexandra Dunker**¹, Charles Hay², Mary Faber², and Jeffrey Medin^{2,3}
Immunotherapy is an emerging field that utilizes the body's immune system to treat cancer. One specific type of immunotherapy involves the incorporation of engineered antibodies and antibody fragments. Our lab has developed multiple monoclonal antibodies against CD30, which bind different epitopes. CD30 is a surface protein involved in immune regulation. CD30 is predominantly expressed on the surface of many different cancers, with lower levels of expression observed on B and T cells. Since CD30 is largely limited to cancerous cells, the off-target effects of CD30 immunotherapy should be minimal. One of these anti-CD30 antibodies have been incorporated into a bispecific antibody therapy. Bispecific antibodies are made of two different IgG antibodies, in this case one recognizing CD30 and one recognizing CD3, found on T cells. One way of delivering anti-CD30 bispecific antibody immunotherapy is to arm CD3⁺ T cells with the anti-CD30/CD3 bispecific antibodies ex vivo to form bispecific antibody armed-activated T cells (BATs). Overall, the aim of this project was to determine the level of CD30 expression necessary for efficient CD30⁺ cell cytotoxicity. In order to determine the level of CD30 required to induce cytotoxicity when using anti-CD30 BATs, a Quantibrite Kit was used to measure the relative level of CD30 expression on varying cell lines (with and without expression of CD30). Then, Cr⁵¹ release assays were performed to determine the levels of cytotoxicity that resulted after incubating the above cell lines with the anti-CD30/CD3 BATs and the results were correlated with the Quantibrite Kit data. As expected, CD30⁺ cell lines, were found to have significantly higher levels of lysis when compared to their CD30⁻ counterparts. Overall, the association between CD30 levels and quantified cytotoxicity could allow for future predictions on how cytotoxic armed T cells will behave when they encounter new cell lines or even in vivo models.

013.008 U **Nutritional Influence on Movement in Drosophila Melanogaster.** University of Mary Hardin-Baylor, Belton, TX. **Amanda Franks**, Seena S. Mathew

Western diet staples include diets high in saturated fats, sugar, and salt content. This can lead to obesity as well as other health risks and diseases such as hypertension and type II diabetes. In this study, the Locomotor Activity Monitor (LAM) and the TriKinetics DAM system were used to study movement of several different mutations of *Drosophila melanogaster* on different diets. These diets consisted of a 0.5% sodium chloride solution, yeast, and 0.5% fructose solution. Mutations of *Drosophila melanogaster* studied were ebony and lobed, ebony and white, sepia and yellow, and wild type. The amount of movement, length, and weight of the species were taken, and analysis shows some mutations thrive on certain diets more than others. With the yeast diet, ebony and lobed mutations had the most increase in movement. On the fructose diet, the most active mutation was sepia and yellow flies. When given a diet of sodium chloride, wild-type *Drosophila melanogaster* had the largest increase in movement. In the yeast and salt diets, the effects were more pronounced in males while females had more movement in the fructose diet. With this data, we have strong evidence that diet can impact *Drosophila melanogaster* movement and each mutation reacts differently to selected diets. Further analysis will improve the understanding of nutrition's effect on *Drosophila*'s physiology.

013.009 U **Detection and characterization of the cytotoxicity of novel compound NC2559 on cancer cell lines.** University of Texas at El Paso, El Paso, Texas. **Cristina Guerena**, Edgar Borrego and Dr. Renato J. Aguilera

Multiple anti-cancer compounds were tested to determine their cytotoxic activity against both cancer and non-cancerous cells. Based on the Selectivity Cytotoxicity Index, one compound, NC2559 was selected for further research. Different assays were performed to determine which cell death mechanism was caused by compound NC2559. Both the Annexin V and Caspase 3 assays indicated that the compound induced apoptosis. In addition, NC2559 induces Reactive Oxygen species and mitochondrial membrane depolarization. Two genes, HMOX and PMAIP1 (NOXA) were found to be highly induced by RT-qPCR that are related to oxidative stress. These data demonstrate that NC2559 induces apoptosis in acute promyelocytic leukemia cells via the intrinsic pathway.

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013.010 U **Progressive Deterioration of Muscles in a Cachexia Tumor Model System with Focus on Myosin Heavy Chain.** Sam Houston State University, Huntsville, Texas. **Ellen Thompson**, Grace Stegemoller, Logan McDowell, Mardelle Atkins
Cachexia is a common wasting disorder, in late-stage cancer patients, with symptoms of fat loss, weight loss, and muscle deterioration/weakness. To examine the effects of cachexia on skeletal muscles, our lab uses a *Drosophila melanogaster* tumor model that displays the major symptoms of the disorder. The tumor larva fail to pupate and have observable symptoms of wasting with loss of muscle fibers and sarcomere structure over days 8-12 in their development. In my project, I am identifying how the sarcomere structures of the larval muscles are changing due to cachexia wasting. Observing a degenerative skeletal muscle strength over the span of days 8-12 indicates a progressive loss of muscle integrity. At subcellular focus, the loss of the sarcomere structure is increasingly consistent throughout the progression of the syndrome. Utilizing immunohistochemistry, I have observed defects in the larval skeletal muscle proteins, actin, alpha-actinin, and myosin heavy chain. Mislocalization of these proteins is progressively common in day 12 larva with fewer disturbances on days 8 and 10. With day 12 tumor larva having multiple broken muscle fibers and extensive sarcomere changes in comparison to the younger tumors (Day 8 and 10). I observed of these three structures, myosin heavy chain displays the earliest and most prevalent changes within the sarcomere. From this, it is predicted to be the structural change that is directly related to the progressive breakdown of the larval skeletal muscles and loss of muscle integrity. Our upcoming experiments will investigate if this change in sarcomere structure is due to reduced protein production or elevated turnover.

013.011 U **The link between periodontal health and anti-inflammatory diet: an ongoing study.** Temple College, Temple, TX. **Glenda Panzieri & Phillip Greco**
Eating healthy is currently a worldwide advocacy for preventing health-related disease. Evidence indicates that a diet rich in a wide variety of nutrients such as fiber, omega-3, protein, antioxidants such as vitamins A, C, and E, and foods with anti-inflammatory compounds, improve many conditions of chronic and systemic diseases such as cardiovascular diseases, diabetes, cancer, and several inflammatory diseases. However, there is insufficient evidence to correlate periodontal health and anti-inflammatory habits. Therefore, more studies are needed to show that proper nutrition can slow down and overturn an inflammation disease process. This study aimed to explore whether or not a patient's anti-inflammatory dietary habits are correlated with periodontal health score. The result of this study will enhance the understanding of dietary habits and overall health. A dietary assessment tool called the Anti-inflammatory Diet Food Frequency Questionnaire was administered to patients during their routine oral exam visit. Following the dental exam, patients' oral health score was recorded. Unfortunately, the current number of participants is too low to identify if a correlation does or does not exist between anti-inflammatory diet habits and oral health scores. More data will be required to draw a conclusion.

013.012 G **Bacterial Community Profiling of *Ixodes scapularis* ticks from Western New York, USA.** Sam Houston State University, Huntsville, TX. **Rachel Porter**, Javier Gomez, Megan Burch, Luis M. Lopez Salazar, Alyssa Russell, Sebastian Juarez-Casillas, Grant Means, Aaron Lynne, Jeremy Bechelli
The microbial community composition of disease vectors, including ticks, is an area of growing interest due to its ability to transmit a diverse array of human pathogens resulting in Lyme disease, anaplasmosis, and ehrlichiosis. We examined the diversity of bacteria associated with the blacklegged tick (*Ixodes scapularis*) by sequencing the hypervariable region three (V3) and four (V4) of the bacterial 16S rRNA gene originating from ticks collected from Cattaraugus County, New York across life stages (larvae, nymphs, and adult males and adult females). Sequencing generated 598 ESVs (exact sequence variants) that were assigned to 195 taxa. The microbiome across all life stages was dominated by gram-negative proteobacteria, specifically *Rickettsia* species closely matching *Ixodes* Rickettsial endosymbionts. Rickettsial abundance decreased as ticks matured, and adult females had significantly more *Rickettsia* than adult males (81.3% and 32.8% respectively). We detected *Anaplasma* species in adults (16.67%) and nymphs (75%) by 16s sequencing and confirmed *A. phagocytophilum* in 62% of nymphs and 14.58% of adults using primers for msp2. The findings of our study confirm previous data about the *I. scapularis* microbiome conducted in other geographical regions and provide insight into the microbial diversity and pathogen burden of *I. scapularis* in Western New York that is applicable for a One-health approach for monitoring and prevention of tick-borne disease transmission.

013.013 U **SARS-CoV-2 Spike Protein Sequence Variation Among Nonsymptomatic Test Subjects.** Abilene Christian University, Abilene, Texas. **Sierra Brock**, Daniella Martinez, Gracie Granados, and Joshua Brokaw
In the spring of 2020, nonsymptomatic students and employees at Abilene Christian University were offered free PCR-based testing for SARS-CoV-2. Subsequently, viral RNA from positive test samples was converted into cDNA for PCR and Sanger sequencing to identify specific variants of SARS-CoV-2. Based on viral genomes from the GenBank sequence database, primers were designed and tested to amplify the most informative segments of the spike protein gene, corresponding to codons 1–220 and 400–700 respectively. Using standard PCR protocols with optimized annealing temperatures, amplicons were purified and sent to GENEWIZ Laboratories for Sanger sequencing. Earliest collected samples corresponded to the ancestral B.1 lineage with the D to G substitution of amino acid position 614 and no other spike protein changes. Later in 2020, sequences consistent with the B.1.1.7 lineage (a.k.a. the UK variant) became most common. Nucleotide sequencing also revealed multiple silent mutations among the earliest samples and fewer mutations resulting in amino acid substitutions, suggesting that purifying selection played an important role in removing deleterious mutations from SARS-CoV-2 populations.

013.014 U **Core/Shell Superparamagnetic Nanoparticles and their Potential for Magnetic Hyperthermia Cancer Therapy.** University of Texas at El Paso, El Paso, Texas. **Siria Jansen**, Marcos Garcia, Yohannes Getahun, Ahmed A. El-Gendy
Synthesis of superparamagnetic nanoparticles for use of hyperthermia treatment has been a focus of cancer research scientists for decades. To date, iron-oxide nanoparticles have proven to be successful in hyperthermia applications thus far. However, due to its low magnetization, iron-oxide nanoparticles pose a challenge in their ability to reach the ideal Specific Absorption Rate (SAR) under hyperthermia treatment. In this work, we prepare several recipes for iron nanoparticle (FeNP's) synthesis to be coated with gold (Fe@Au), silver (Fe@Ag) or plant material in order to use for future hyperthermia applications. The magnetization, morphology and structure of these nanoparticles were then analyzed for possible use in hyperthermia applications using XRD, SEM, and VSM devices. The data produced indicates that pure iron nanoparticles are present and produce higher levels of magnetization than iron-oxide. However, the XRD measurements also indicate presence of minor phase of iron-oxide with the gold core shells. The specific absorption rate (SAR) of the gold coated iron nanoparticles (Au@FeNP's) indicated favorable outcomes in future hyperthermia applications with magnetism being measured at 69-87 emu/g for Fe@Ag and 50-75 emu/g for Fe@Au nanoparticles. The specific absorption rate (SAR) of the silver coated iron nanoparticles however did not indicate favorable outcomes due to the low dispersion time of the particles in water. The measured magnetism reached 71.78 emu/g.

Cell and Molecular Biology Posters:

013.015 U **Exploration of the Hallmarks of Cancer in Mus musculus cell lines A9 and Mutated PA28γ Deficient Cancer Clones.** Austin College, Sherman, Texas. **Brigid Fox**, Henry Neal, Lance Barton
Cancers are a family of diseases resulting from aberrations in normal cell physiology. These aberrations are resultant of an accumulation of mutations that affect biological hallmarks of cancer like cell migration, proliferation, and resistance to cell death. To examine how these biological capabilities have changed the overall function of cancer in the absence of PA28γ, *Mus musculus* immortalized, tumorigenic A9 fibroblasts and mutated PA28γ deficient

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cancer clones were experimentally examined for increased migration, resistance to cell death, and aneuploidy. This was done via karyotyping, cell migration assays, and treatment with known anti-cancer therapeutics. Here we show that mutated PA28 γ deficient cancer clones (KOCCs) exhibit fewer tumorigenic phenotypes as compared to A9 cells. Scratch assay data suggested possible migration ability in the A9 and KOCC cell lines but not in the negative control KOMEF cells. Migration assays revealed similar results to the scratch assay with migratory cells in KOCC and A9 cell lines. Treatment with anti-cancer therapeutics Cladribine and Taxol also caused cell death in KOCCs. These data suggest that KOCC have some tumorigenic phenotypes but are not cancerous. As cancer is one of the leading cause of death worldwide, understanding these hallmarks could lead to new treatments and prevention mechanisms

013.016 G **Application of Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS) for Tracking Fecal Contamination by Pinnipeds.** University of Houston – Clear Lake, Houston, Texas. **Caroline Kmiciec**, Akshita Mirani, Michael G. LaMontagne

Since the passage of the Marine Mammal Protection Act in 1973, pinniped populations in coastal waters of the United States have increased exponentially. These high populations of large mammals could contribute to fecal contamination of recreational waters. *Enterococci* species counts are used to assess the degree of fecal contamination and elevated counts of this fecal indicator bacteria (FIB) force managers to close beaches; however, contribution of pinnipeds to high *Enterococci* counts is not known. This may reflect the high cost of methods of tracking the source of microbial contamination. Matrix assisted laser desorption ionization – time of flight Mass Spectrometry (MALDI-TOF MS) is a time- and cost-effective way to identify bacteria through protein spectra analysis. MALDI-TOF can distinguish strains of bacteria of the same species but has not been evaluated as a tool for tracking the *Enterococci* from pinnipeds. In this study, *Enterococci* isolates were cultured from samples taken from fresh seal scat taken from a pen housing Harbor seals. *Enterococci* were isolated by serially diluted in Enterococcus mixed media and positive wells were restreaked on Rapid Enterococci ChromoSelect agar to generate a library of isolates from captive seals. A library of isolates was also generated from a composite sample of human waste pumped from several septic tanks along with wastewater treatment plants. These isolates were identified with a MALDI-TOF system and cluster analysis was performed of mass spectra to determine if MALDI-TOF could differentiate sources of Enterococci responsible for positive wells. Of the total library of 45 isolates, 27 were confirmed to be *Enterococci*. Isolates from seals clustered separately from isolates from septic tanks. This suggests that MALDI-TOF MS can differentiate pinniped and human sources of fecal contamination and points to a microbial source tracking tool.

013.017 U **Testing Pine Oil as a Bio-friendly Substitute for Xylene in Histological Staining Techniques.** University of Houston – Downtown, Houston, TX. **Christina Nguyen**; Naghme Azoo Foroghi; Taylor Han Nguyen; Adriana Patricia Visbal

Xylene is an aromatic hydrocarbon used as a histoprocessing agent for tissues and histological stains such as Hematoxylin and Eosin (H&E) and Masson's Trichrome. Xylene is used to dewax and clear tissues in the deparaffinization and dehydration steps. Xylene is a biohazard that can irritate the skin, eyes, nose, and throat and can cause loss of muscle coordination and death at high exposures. It is also an environmental pollutant and difficult to dispose of. Finding bio-friendly alternatives to xylene in histological techniques can make tissue processing and staining safer. Our study focuses on potential use of pine oil as an alternative to the deparaffinization and dehydration steps in both H&E and Masson's Trichrome staining. We used xylene in both deparaffinization and dehydration steps as the control, while in the experimental groups we substituted xylene with pine oil in deparaffinization steps, dehydration steps, or both. In our preliminary studies for H&E and Masson's Trichrome staining of murine mammary gland tissue, the xylene control showed good color balance and clarity for both deparaffinization and dehydration steps. Pine oil treatment was effective at deparaffinization but had color balance issues. Our preliminary results indicate that pine oil is a suitable replacement for deparaffinization steps and an adequate replacement for dehydration and clearing steps of histological staining methods. Our next steps include optimizing both H&E and Masson's trichrome staining protocols with pine oil and testing other tissue types such as kidney and lung. Additionally, we will also test other downstream histological applications like immunohistochemistry following pine oil treatment.

013.018 U **Characterization of PA28 γ -deficient MEF Mutagenesis in Comparison with the 4T1 Breast Cancer Model.** Austin College, Sherman, Texas. **Electra Coffman**, Ray Vazquez, Lance Barton

Cancer is a leading cause of death worldwide with breast cancer causing almost 700,000 deaths in 2020 alone. Cancer displays several hallmarks such as genomic instability and mutation, invasion, and apoptotic resistance. The nuclear 20S proteasome activator, PA28 γ , has been shown to play an important role in several such hallmarks including apoptotic resistance and genomic instability. Thus, PA28 γ expression is associated with tumorigenesis in many cancers such as skin and breast. However, its impact on the many other hallmarks of cancer requires further investigation. To simulate oncogenesis in this context, we mutagenized murine embryonic fibroblast (MEF) cells that are either PA28 γ -deficient (KOMEF) or PA28 γ -sufficient (WTMEF) and assessed several cancer hallmarks while using the 4T1 mouse breast cancer cell line as a positive control. Cell aneuploidy, invasion, migration, chemotherapeutic impacts, and protein-specific effects were analyzed. We demonstrate that while 4T1 cells show significant increases in aneuploidy, invasion, and response to chemotherapeutic treatment, PA28 γ -sufficient cancer clones (WTCC) and PA28 γ -deficient cancer clones (KOCC) only show select oncogenic phenotypes. The cancer clones require further investigation to understand the influence of PA28 γ on mutagenesis. Furthermore, our investigations into the well characterized 4T1 cell line may offer insight for clinical application in breast cancer.

013.019 U **A role for the neoblast in annelid regeneration.** University of the Incarnate Word, San Antonio, TX. **Fatima Ali** and Veronica Martinez Acosta

Lumbriculus variegatus is an annelid model system capable of regenerating an entirely new body from a segment that is only 1/50th of the original animal. During the regeneration process, not only are body structures reformed but also full recovery is regained along any portion of the anterior-posterior axis post-injury, suggesting that individual segments are poised for regeneration. Regenerating annelids possess a population of stem cells called neoblasts, which have been described to migrate along the ventral nerve cord to a wound site for tissue repair (Zattara and Bely, 2016). In this study, we characterize the stem cells responsible for this recovery of structure and function. Using EdU and bromodeoxyuridine (BrdU) staining techniques, we identify and label stem cells in fixed tissues starting from 15-min post-amputation to 1-hr. Via immunohistochemistry, the regenerating worm fragments are labeled by the antibody 1D9-411, generated against Planarian blastemal tissues, which has been used as a marker for neoblasts. The stem cell subpopulation was originally described in Lumbricid tails by Harriet Randolph (1891). 1D9-411 labels two protein bands measuring 214 kDa and 137 kDa, which are present in both anterior and posterior regenerating and non-regenerating fragments with differential expression. Hybridization chain reaction (HCR) will also be used for the first time in Lumbriculus to demonstrate the expression of different stem cell related genes such as *piwi*, a regulatory gene known for stem and germ cell differentiation. Overall, this work revisits the role of neoblasts in annelid regeneration.

013.020 U **Mitochondrial defects can be rescued by Inhibiting Hippo signaling.** Sam Houston State University, Huntsville, TX. **Harris Obioma**, Peyton Brent, Felix Oppong, and Ellen Thompson, Mardelle Atkins

The Hippo signaling pathway is considered a vital modulating role for organ size in *Drosophila Melanogaster* fruit fly and humans. We identified that the Hippo pathway works jointly with mitochondrial ATP synthase, Complex V, to regulate organ size. Within fly eyes, a weakening of Complex V subunits is shown to have minimal effects on eye growth. However, when Hippo signaling and ATP synthase is simultaneously lost, it shows a severe growth defect within the eye. This relation alludes Complex V being a possible modulator for organ growth. We decided to see if this phenomenon can be observed within another tissue in the fruit fly. In using the RNAi system, a stronger phenotype within the wing tissue appears to be an influence of the interaction. Also noted, a severe appearance is noted when knocking down the hippo pathway. It is hypothesized now the extreme phenotype within the wings and

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the eye can be rescued with increasing yorkie activity. I will present my work to test if increasing Yorkie activity using genetic approaches can further rescue the growth and survival of Complex V depleted tissues. Further research into the interactions of the Hippo pathway and Complex V may provide a possible solution for Mitochondrial diseases/defects which are among the most common human genetic diseases.

013.021 U **Application of matrix assisted laser desorption- time of flight to identification of rhizobacteria with beneficial traits.**

University of Houston – Clear Lake, Houston, Texas. **Jerry Dale Purdon**, Michael Geary LaMontagne

Plant growth promoting rhizobacteria (PGPR) – based biofertilizers allow growers to use less synthetic fertilizers without sacrificing yield. These PGPR often share traits that can be assessed with biochemical tests *in vitro*. PGPR with multiple beneficial traits are likely to be good prospects for development of biofertilizers; however, identification of isolates and cataloging these traits is time consuming. In this project, we applied matrix-assisted laser desorption - time of flight (MALDI-TOF) mass spectrometry, to identify rhizobacteria isolated from the roots of maize. Isolates were identified with a MALDI-TOF system and clustered by the similarity of their mass spectra. Isolates were also tested, with *in vitro* assays, for traits associated with PGPR. Of 45 bacteria, 12 were reliably identified with the MALDI-TOF system, seven tested positive for phosphate solubilization, 10 showed siderophore production and 6 showed ACC deaminase activity. Only, five rhizobacteria showed multiple traits and only strains of *Spingobacterium thalophilum* showed multiple beneficial traits. These bacterial phenotypes corresponded to groups of bacteria that were similar to each other in terms of mass spectra generated by MALDI-TOF. These results suggest MALDI-TOF can accelerate bioprospecting for PGPR. The good correspondence between the MALDI-TOF results and phenotypes assessed with *in vitro* assays suggests MALDI-TOF can help identify bacteria that are closely related to each other that share traits associated with PGPR.

013.022 U **Comparative study of the effect of weak magnetic field on size of bacteria.** University of Houston – Clear Lake, Houston, TX.

Kathryn Rutherford, Dillon Cline, Samina Masood

Biosynthesis is an electromagnetic process that occurs as nutrients are broken down and converted to energy which distributes throughout a cell. The way energy moves within a cell may be manipulated to affect the cell growth rate with weak magnetic fields. Bacterial cell growth and behavior is analyzed in the presence of magnetic fields with differing consistency, frequency, and strength. Strains of commonly found bacteria in the human body are grown to see how weak magnetic fields of a few Gauss affect the physical appearance of bacteria, such as length and thickness. Previously, the effects of magnetic fields on growth rate and optical density has been studied. This experiment focuses on how various magnetic fields effect the physical structure and chemical composition of bacterium. Sample selection concentrates on rod and disk shaped species, such as *Escherichia coli*, *Pseudomonas*, and *Staphylococcus*. Results have already shown a reduction in bacterial growth rate. Comparisons are made between bacteria types on the effect of cell shape, gram staining properties, and composition to deter magnetic field influence. Applications of this experiment mainly pertain to the sanitation effects of magnetic fields. Food service, healthcare, and water purification processes may utilize magnetic fields to slow or eliminate bacterial growth.

013.023 U **Effects of thermal exposure and feeding status on metabolic and cardiovascular processes in pulmonate land snails.**

Texas Lutheran University, Seguin, Texas. **Linden Claire Williamson**, Joceline Arleth Lopez, Kevin Bryan Tate

Acute and chronic thermal stressors in pulmonate land snails impact metabolic and cardiovascular function. Oxygen consumption (VO_2) and heart rate (HR) are physiological processes coupled with the cellular activity of all aerobic organisms and are directly affected by temperature. As poikilothermic ectotherms, pulmonate land snails are susceptible to changes in temperature. Climate change has impacted temperatures around the world, affecting these processes. The physiological impact of increasing environmental temperatures on pulmonate land snails has not been studied in depth. We addressed metabolic and cardiovascular responses to chronic and acute changes in ambient temperature in the milk snail (*Otala lactea*). We hypothesized an increase in heart rate and metabolic rate during in response to acute and chronic exposure to elevated temperatures. *O. lactea* were acclimated to 22°C or 30°C for 14 days, then acutely exposed to 22°C, 30°C, and 34°C. VO_2 and HR were measured using closed chamber respirometry and impedance cardiography, respectively. Data were collected in fasting and fed conditions to determine the impact of feeding on the thermal stress response. Analysis revealed that acclimation environment significantly affected VO_2 responses in fasted animals but not HR, whereas in fed snails VO_2 was unaffected and HR was significantly affected. Acute temperature was a significant factor in both fed and fasted VO_2 , whereas acute temperature only affected HR in fasting snails. In all cases, the interaction between acclimation temperature and acute temperature was significant. The VO_2 and HR acclimated responses to warmer environmental conditions appeared to be dependent on feeding status. The data suggests that *O. lactea* may experience physiological effects of seasonal temperature change that depend on food availability.

013.024 U **Spatial and temporal expression patterns of biliverdin reductase isoforms suggest potential developmental roles for these genes in zebrafish blood cell development.**

Abilene Christian University, Abilene, Texas. **Macee Valtr**, Ashley Price, and Dr. Andrew Holowiecki
Unbound heme is highly toxic and is degraded via the heme degradation pathway. We have previously shown that genes involved in this pathway (*hmox1*, *bvra*, and *bvrb*) are expressed in circulating red blood cells (RBCs) in zebrafish at 48 hours past fertilization (hpf). Interestingly, expression was also noted at time points prior to the onset of active circulation (24 hpf) in tissues associated with blood cell specification, suggesting potential developmental roles for these genes separate from their known roles in heme degradation. The purpose of this study is to evaluate the expression patterns of *bvra* and *bvrb* prior to 24 hpf. Here we show that both isoforms displayed overlapping expression patterns within the intermediate cell mass, the posterior lateral mesoderm, and the rostral blood islands between the 6-13 somite stages of development. These expression patterns suggest potential developmental roles for these genes in both the hematopoietic and myeloid blood cell lineages. To further evaluate the developmental necessity of these genes we used CRISPR-Cas technology to create *bvra* and *bvrb* mutants. Currently, F0 “CRISPANTS” are growing, and efforts are underway to determine the nature of these mutations (loss of function) and their suitability for further experiments.

013.025 U **Modelling, Cloning, and Expression of the J domain of C. elegans Rme-8 Protein.** Stephen F. Austin State University,

Nacogdoches, Texas. **My Tran**, Bingbing Xiao, Madison Thornhill, Oduyayo Odunuga

Rme-8 is a J domain-containing plasma membrane protein that is required for endocytosis in various cells. The J domain is a characteristic structural motif found mainly in heat shock protein 40 (Hsp40 or DnaJ) and other proteins such as Rme-8. Within the J domain is a tripeptide, the HPD motif, that is required by the J-domain protein to interact with and stimulate the ATPase activity of Hsp70, a major cellular chaperone. Rme-8 protein in *C. elegans*, CeRme-8, has not been identified with a particular Hsp70 partner. CeHsp70-1 is the only cytosolic Hsp70 in *C. elegans*, therefore, we hypothesize that it is the binding partner for the J domain of CeRme-8. To test this hypothesis, we first need to express and purify the J domain of CeRme-8. We report herein the successful cloning, expression, and attempted purification of the J domain of CeRme-8. Computer modelling revealed that the amino acid sequence of the J domain of CeRme-8 folds into the canonical J domain conformation, containing the HPD tripeptide. Complementary DNA of the J domain of CeRme-8 was cloned into the pGEX-Tev-KG plasmid, in-frame with the gene for glutathione-S-transferase (GST), to yield a GST-CeRme-8 fusion protein. IPTG-induced expression of the expected 37-kilodalton fusion protein was confirmed by both SDS-PAGE and western blotting using antibody against GST. Work is ongoing to develop a protocol for purification of both GST-tagged and untagged J domains of CeRme-8. Future work will involve testing the effect of the J domain protein on the ATPase activity of CeHsp70-1.

013.026 U **A Genetic Toolbox to Investigate Regeneration in Lumbriculus variegatus.** University of the Incarnate Word, San Antonio, TX.

Roman Barrera and Veronica Martinez Acosta

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While genetic model systems like the fruit fly, the nematode worm, or the mouse, have driven other biological discoveries, they have not completely allowed for studying the biological process of whole organism regeneration. *Lumbriculus variegatus*, also commonly known as the California blackworm, provides a unique opportunity to identify pathways following wound formation in a system that is committed to successful regeneration and recovery of function. *Lumbriculus* can regenerate an entirely new body from a fragment 1/50th of the original animal. *Lumbriculus* possesses the ability to recover structure and function along any portion of the anterior-posterior body axis, providing a simplified template for studying future biological application to organisms with more complexity. While there is much to learn from this unique model organism, currently studies are limited due to a lack of available tools for gene expression analysis. This work represents the primary works towards development of a genetic toolbox for *Lumbriculus* to ultimately create a model system for understanding wound healing and regeneration. The process of Hybridization Chain Reaction (HCR) allows for the visualization of specific nucleotides in cells, tissues, and whole mount samples. With respect to *Lumbriculus*, we can use HCR to visualize the nucleotides involved in the regenerating tissues to provide a basis for understanding the mechanisms in whole organism regeneration. The application of these mechanisms may eventually provide advancement for the field of regenerative medicine.

013.027 U **Characterization of a Chaperonin Mutant.** University of Texas at El Paso, El Paso, TX. **Samantha Garcia**, Daniel von Salzen, and Ricardo Bernal

In the cell, protein folding, and refolding is an essential mechanism that allows for vital biological interactions to occur. To aid proteins in conforming to their native structure, cells evolved a specialized protein complex termed a chaperonin. Chaperonins are multi-subunit enzymes that self-assemble to create a hollow cylinder where unfolded protein substrates are folded in the internal chamber by the means of an ATP-dependent pathway. A specialized chaperonin termed ϕ EL is the first of two enzymes to be encoded by a bacteriophage and has been identified as an ortholog of Gro EL. ϕ EL refolds a substrate through a mechanism that involves the separation of the ϕ EL cylinder into two rings. This study proposes that ring separation is an important intermediate in refolding substrate within the ϕ EL complex. In this investigation, we demonstrate that a point mutation (T91A) leads to the inhibition of ring separation in the ϕ EL chaperonin. The chaperonin has been expressed in *E. coli* and purified to homogeneity using column chromatography. The effects of the mutation will be characterized with a kinetics assay to investigate if all protein folding activity has been abolished. Furthermore, electron micrographs reveal that the chaperonin mutant is unable to form single-ring intermediates and all complexes observed are intact double rings. We anticipate that no single-ring intermediates will be produced, and the mutant will not be able to refold substrate proteins. This unique protein folding dynamic could contribute to the classification of a new group of chaperonins.

013.028 U **Glycoalkaloid solasonine as a target for SHH signaling to block MED12 mutant breast cancer oncogenesis.** University of the Incarnate Word, San Antonio, Texas. **Shivani Akula**, Marieke Burleson

Radiation and chemotherapy are the frontline choice for breast cancer treatment; however, personalized treatment is rapidly on the rise as a superior treatment method. Through prior studies, it has been found that 67% of breast cancer tumors carry a mutation in the Mediator subunit MED12 thus indicating that MED12 likely has a critical tumor suppressive role in the breast. Previous results from our lab, and others, have indicated that MED12 plays a role in restricting GLI3-dependent SHH signaling. Hyper-activated SHH signaling is known to play a role in promoting breast cancer oncogenesis, therefore, we hypothesize that MED12 mutations cause breast cancer oncogenesis through hyperactivated SHH signaling, and drug that target the SHH signaling pathway could prove to be beneficial for MED12 mutant breast cancer. Through proliferation assays and quantitative PCR analysis, we were able to conclude that MED12 mutations enhance breast cancer cell growth and promote GLI3-dependent SHH signaling. Through a MTT screening strategy, we found that the natural compound Solasonine can target MED12 knockdown breast cancer cells. Solasonine is a known glycoalkaloid that has previously been shown to potentially target anti-inflammatory signaling pathways. To study the effect of Solasonine, quantitative PCR was used to measure the levels of GLI3 target genes in cells treated with either vehicle or Solasonine. This treatment significantly decreased the GLI3 target genes GLI1 and CREB 5 thus suggesting that Solasonine could target the GLI3-dependent SHH signaling pathway to block breast cancer oncogenesis. These findings were furthered by colony formation assays which showed that Solasonine treatment leads to a significant reduction in the formation of colonies in vitro. Overall, our findings suggest that Solasonine targets the SHH signaling pathway to block breast cancer oncogenesis.

013.029 U **Inhibition of the MRTF/SRF pathway negatively impacts skeletal muscle, cardiac muscle, and blood vessel development in zebrafish.** Austin College, Sherman, Texas. **Yasmine Bukhari**, Emily Davis, Sarah Joseph, Keegan Nichols, Eva Perez, Tawfeeq Shaik, Madison Taylor, and Kelli Carroll

Myocardin-related transcription factors (MRTFs) interact with serum response factor (SRF) to regulate various developmental functions, such as formation and regulation of blood vessels, cardiac tissue, and skeletal muscle. Dysregulation of this pathway can result in severe phenotypes such as heart failure due to fibrosis and hyperplasia of the skeletal muscle. The drug CCG-203971 inhibits MRTF/SRF, specifically MRTF-A, expression and is used in this experiment to assess how the expression of tissue-specific genes (*cmhc2*, *flk1*, *mhc*) is influenced by MRTF/SRF dysregulation in zebrafish. We hypothesized that inhibition of this pathway will alter the expression of the genes responsible for cardiac, blood vessel, and muscle development in zebrafish, and the severity will be dependent on the concentration of CCG-203971. Our results suggest that high concentrations of CCG-203971 severely disrupt expression of these three genes. In skeletal muscle, *mhc* is normally restricted to the somites. As CCG-203971 concentration increased, darker *mhc* expression was observed in the somites of the embryos while behavioral assays showed an increase in muscle paralysis in embryos exposed to higher concentrations. Cardiac tissue was significantly underdeveloped in the presence of CCG-203971, and expression of *cmhc2* was decreased as concentration increased. Heartbeats per minute (BPM) was measured and a significant decrease was found between the control embryos and the embryos treated with 5 μ M CCG-203971. *Flk1*, the gene expressed in blood vessels, was also found to be inversely related to the concentration of CCG-203971. These results provide insight into how the MRTF/SRF pathway functions during development, such as organogenesis, and a starting point for discovering potential treatments for diseases that are caused by mutation or dysregulation of this pathway in humans.

Chemistry and Biochemistry Posters:

013.030 G **In-situ multi-residue derivatization and extraction of Per- and polyfluoroalkyl substances (PFASs) using stir bar sorptive extraction prior GC-MS analysis.** The University of Texas at El Paso, El Paso, Texas. **Ahsan Habib**, Wen-Yee Lee
Per- and polyfluoroalkyl substances (PFASs) are a class of manmade persistent organic chemicals manufactured for their heat, water, and stain-resistant properties. PFASs can be found ubiquitously, especially in water, because they are widely used in everyday consumer products. Among these PFASs chemicals, large parts are perfluoroalkyl carboxylic acids (PFCAs), in which carbon chain atoms are entirely fluorinated. PFASs are often referred to as 'Forever Chemicals' because they are highly persistent and bioaccumulative in the ecosystem. Toxicological data showed that PFASs could cause potential adverse health effects and are carcinogenic in nature. Hence, it is crucial to have a reliable detection technique that can quantify the trace amount of PFAS in water. Here we show that the in-situ derivatization and extraction of PFCAs by stir bar sorptive extraction (SBSE) coupled with thermal desorption in line with gas chromatography-mass spectrometry (GC-MS) can identify and quantify the ten PFASs mixture from water. The developed method offers a linear range from 100 to 10,000 ng/mL for PFASs. We aimed to develop a sample preparation technique that presents several advantages: simplicity, lower sample volume, low cost, no clean-up, and good sensitivity compared to the conventional LC-MS/MS method. We optimized several derivatization and extraction parameters such as the amount of derivatizing agent, derivatization temperature, derivatization/extraction time, and sample pH. The results of the limit of detection (LOD) were validated in water. The optimized parameters of solventless in-situ simultaneous derivatization and extraction of PFCAs exhibited this method as rapid and eco-friendly for PFASs determination in wastewater samples.

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- 013.031 U **An extended collection of lanthanide coordination polymers with functionalized terephthalate linkers.** Angelo State University, San Angelo, Texas. **Aidan Henry**, Mia Estelle Van Rheede van Oudtshoorn, Emma Rust, Matthias Zeller, and Ralph A. Zehnder
Slow diffusion reaction of trivalent lanthanide ions, Ln^{3+} ($\text{Ln} = \text{La}, \text{Ce}, \text{Pr}, \text{Nd}, \text{Sm}$), with the terephthalate (TP) ligand and glutarate (Glut) entities at room temperature (RT) in THF/EtOH/ H_2O solvent mixtures results in the formation of three-dimensional Ln-coordination polymers of formula $\text{Ln}_2(\text{Glut})_2(\text{TP})(\text{H}_2\text{O})_4 \cdot 16\text{H}_2\text{O}$ that exhibit spacious channels along the *b*-direction. We were able to extend this collection of $\text{Ln}_2(\text{Glut})_2(\text{TP})(\text{H}_2\text{O})_4 \cdot 16\text{H}_2\text{O}$ frameworks to include the terephthalate derivatives (TPX) that bear the bromo ($\text{X}=\text{Br}$), nitro ($\text{X}=\text{NO}_2$), amino ($\text{X}=\text{NH}_2$), and the hydroxy group ($\text{X}=\text{OH}$). This did not change the structural properties whatsoever, and simply introduced the respective functional groups into these networks. In some instances ethanol or THF molecules occupy the interstitial channels replacing some of the interstitial water molecules.
- 013.032 U **Implications of RecA binding in tuberculosis drug resistance.** Wayland Baptist University, Plainview, Texas. **Allison Alvarez-Garcia**, Kyle Rickman, Ellen Hamzy, Paxton Patterson, Dr. Robert Moore
According to the World Health Organization, in 2018, 480,000 people were affected by Multi-Drug Resistant Tuberculosis (MDR-TB) globally. MDR-TB is commonly caused by single nucleotide polymorphisms. *Mycobacterium tuberculosis* has no known canonical mismatch repair protein to fix single nucleotide polymorphisms. However, the protein RecA is utilized by the microbe as a DNA repairing mechanism when its DNA is damaged. Damage can occur, for example, during treatment for tuberculosis. Weak binding of RecA during repair is associated with unfaithful and mutagenic repair. To investigate the possibility of RecA introducing single nucleotide polymorphisms when repairing DNA, we began testing RecA's affinity for binding in different locations of the genome where single nucleotide polymorphisms occur. 83 nucleotide sequences on the *katG*, *rpo β* , *pncA*, and *rpsL* genes were segmented into thirds, of which the middle segment was centered where the single nucleotide polymorphism known to lead to drug resistance would occur. Relative to the other segments on the corresponding gene, RecA was found to have very poor binding to the middle segment of the *katG* and *rpo β* sequences and moderate binding to the middle segment of *pncA*, but very strong binding to the middle segment of the *rpsL* sequence. RecA's selective affinity for certain segments on the genome lends more evidence to the possibility that RecA could be a direct cause of drug resistance.
- 013.033 N **Interference in Amyloid-Beta Peptide Aggregation by polyphenols.** Stephen F. Austin State University, Nacogdoches, TX. **Bidisha Sengupta** and Robert Friedfeld
The amyloid plaques in Alzheimer's disease are the deposition of β -sheet-rich, insoluble amyloid β -peptide ($\text{A}\beta$) aggregates. Aggregation takes place after the peptides undergo a conformational change toward a high content of β -structure. Hence, the overarching goal of this study is to identify agents which can interfere with the conformational shift. In the search for small molecules which can prevent or slow down the $\text{A}\beta$ aggregation process, we initiated our study with two types of polyphenolic phytochemicals-flavonoid and curcuminoid using optical spectroscopic (fluorescence and circular dichroism (CD)) and atomic force microscopic (AFM) techniques. According to literature, flavonoids like fisetin and kaempferol and curcuminoid curcumin can cross the blood brain barrier. Hence (1-42) $\text{A}\beta$ peptide was incubated with these three compounds at 37°C and measurements were carried out in time intervals for 120 days. Both CD and AFM indicated that the conformation change in the control peptide for oligomerization and fibrillation included different stages of β -sheet. However, in the presence of fisetin, although oligomers form initially through β -sheet, prolonged incubation created a nonstandard secondary structure, termed as " α -sheet" in literature and fibrillation was not found. The extent of α - and β -sheets in the other treated $\text{A}\beta$ solution varied significantly. Among all the phytochemicals, fisetin seems to slow down the fibrillation process to a significant extent compared to kaempferol and curcumin. The $\text{A}\beta$ aggregation is the result of a network between peptides through strong hydrogen bonds, electrostatic salt-bridges, and hydrophobic interactions which can be interrupted by these small phytochemicals.
- 013.034 G **Towards the rational design of redox properties of iridium photoredox catalysts.** The University of Texas at El Paso, El Paso, Texas. **Christian Sandoval-Pauker** and Balazs Pinter
Transition metal catalysis has revolutionized the modern industry by enabling new ways of activating molecules with remarkable reactivity and selectivity. Its success relies on the capability of transition metal complexes to exhibit unique and versatile electronic structures and reactivity as a function of their chemical environment. Some of these compounds also display extraordinary photophysical and photochemical properties which have been exploited in several areas including photoredox catalysis, in which the energy of photons is directly converted to chemical energy in a form of super exothermic outer sphere electron transfers. In such transition metal photoredox catalysts, e.g. $\text{Ir}(\text{ppy})_3$ ($\text{ppy} = 2\text{-phenylpyridine}$), redox-active ligands (ligands that function as redox equivalents in complexes) enable the key photoinduced metal-to-ligand-charge transfer process and determine the energetics of subsequent excited- and ground state ligand-centered oxidations. In this work, we employed a large-scale systematic computational approach to understand, dissect, and quantify the key electronic and structural effects that determine the thermodynamics of ligand-centered electron transfers in octahedral iridium photoredox catalysts in the ground and excited state. Using our accurate solution-state DFT computational protocol, we calculated the ground and excited state reduction potentials of fifteen iridium photoredox catalysts featuring different ligand scaffolds and substitution patterns. The trends established allowed us to confirm that the properties of photoredox catalysts can be rationally tuned by altering the properties of the corresponding redox-active ligand. This understanding will help to propose rational design rules to develop newer generations of photoredox catalysts with improved properties. We introduce novel isodesmic and homodesmic reactions to quantify the effect of chemical triggers in all four states of the photoredox cycle.
- 013.035 U **New insight into the structural features and antitumor activity of Cu(II) complexes containing 4,4'-dimethoxy-2,2'-dipyridyl.** University of the Incarnate Word, San Antonio, Texas. **Daniel Lovasz**, Betsy Leverett, Hadi Arman and Rafael Adrian.
Platinum-based drugs, like cisplatin and carboplatin, are effective therapeutic agents in treating testicular and ovarian cancers. Still, their use is becoming limited due to the prevalence of severe side effects associated with the effective doses of these drugs. Efforts to circumvent these issues with metal-based agents have primarily focused on developing non-platinum antitumor agents, including gold and copper complexes. 4,4'-Dimethoxy-2,2'-bipyridine is a suitable ligand for the development of new antitumor drugs due to their excellent affinity for DNA binding and promising antitumor activity against human cancer cells. Here we discuss the structural features and antitumor activity of a series of copper(II) complexes containing 4,4'-dimethoxy-2,2'-bi-pyridine as ancillary ligand, plus an additional nitrogen-based ligand. The nitrogen-based ligands chosen for this experiment include acetamide, isonicotinamide, 4-cyanopyridine, imidazole, and theophylline, all known to disrupt the cell's normal metabolism. The structure of all these new complexes shows 4,4'-dimethoxy-2,2'-bipyridine acting as a bidentate ligand to the copper(II) metal ion. The inner coordination sphere is completed by a combination of the antimetabolite ligand, acetonitrile, and triflate ions leading to a distorted octahedral geometry. Infrared spectroscopy and elemental analysis confirmed the structure obtained by single-crystal x-ray diffraction. Cytotoxicity studies carried out in MCF-7 breast cancer cell lines show promising antitumor activity when compared with cisplatin. This work provides valuable insight related to the synthesis of copper(II) complexes containing 4,4'-dimethoxy-2,2'-bipyridine; knowledge that could lead, in the future, to the synthesis of more affordable and less toxic metal-based antitumor agents.
- 013.036 U **A Study of the Effects of an Ionic Liquid on the Synthesis of Biodiesel Fuels.** Stephen F. Austin State University, Nacogdoches, TX. **Elizabeth Gonzalez** and Russell J. Franks
Biodiesel fuels are an intriguing and environmentally-friendly alternative to conventional petroleum-based diesel fuels. Biodiesel fuels are commonly made by transesterification of a triacylglycerol and an alcohol, most commonly methanol. This reaction can be done under either acid-catalyzed or

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base-catalyzed conditions. One problem that does occur with base-catalyzed transesterification, however, is that of solubility. The most commonly-used bases (KOH, NaOH, and K_2CO_3) are relatively insoluble in the reaction environment used for most transesterification reactions. One potential means of overcoming this solubility issue is the addition of an ionic liquid to the reaction mixture. Ionic liquids are charged organic molecules that have appreciable solubility in low-polarity media as well as in high-polarity media. The ionic liquid used in this study was 1-butyl-3-methylimidazolium tetrafluoroborate (BMIM). Transesterification was performed using bitternut hickory kernel oil, methanol, and K_2CO_3 in all cases. Duplicate reactions were performed simultaneously, one reaction having BMIM (5 mol% with respect to K_2CO_3) added and the other reaction not having any BMIM added. Reactions were carried out for 30, 60, 90, 120, 150, and 180 min periods. After isolation and purification, the resulting fatty acid methyl ester product mixture was analyzed using 1H -NMR spectroscopy. The percentage conversion values for each reaction were then determined using the integration data from the NMR spectrum. The presence of the BMIM did seem to give slightly higher percentage conversion values, however, the overall effect of the BMIM does not seem to be significant. Percentage conversions were consistently similar for the reactions conducted without BMIM over all the time intervals studied.

013.037 G **Computational quest for effective smart molecular probes for ex-vivo early diagnosis of Alzheimer's disease.** University of Texas at El Paso, El Paso, Texas. **Gabriela Molina-Aguirre** and Balazs Pinter

Posttranslational modifications of tau protein (Tau) such as hyperphosphorylation and glycosylation promote the formation of insoluble intraneuronal inclusions known as neurofibrillary tangles (NFTs). The presence of (NFTs) and deposits of amyloid β ($A\beta$) has been found characteristic for Alzheimer's disease (AD). The damage caused in the brain is irreversible and there is still no effective treatment due to the late symptomatology. The quantity of deposition of hyperphosphorylated tau protein is related to the degree of neuronal degeneration and the first deposits occur years before the first symptoms. $A\beta$ and Tau proteins appear in the blood serum functioning as potential biomarkers for identifying AD at early stages before irreversible brain damage has occurred. Diagnosis from blood samples would greatly help in tracking disease progression, applying treatment at early stages and in avoiding expensive, relatively invasive, and not specific techniques used today to detect AD. There is an intense ongoing research to develop highly selective, sensitive, and versatile fluorescent probe molecules with extraordinary Stokes shift for the detection of the pTau proteins using fluorescence-based techniques. Using a large-scale in silico protocol, this computational and theoretical work aims at proposing rational design principles for promising molecular probe scaffolds that were shown to have photophysical properties sensitive to Tau-binding. Using ground and excited state DFT simulations we established a computational protocol for the prediction of the photophysical properties of seven different families of potential molecular probes for the detection of AD. Amongst other insights, our simulations revealed a twisted intramolecular charge transfer (TICT) state to be responsible for the highly environment-sensitive emission of these species. The trends obtained allow us to put forward design principles which can be used in the molecular engineering of these probe molecules.

013.038 U **Spectroscopic (FT-IR, UV-Vis, and Fluorescence) and HPLC-PDA Studies of Carbamazepine, Diclofenac and Ketoprofen.**

Stephen F. Austin State University, Nacogdoches, Texas. **Gary Lopez**, Anthony Broom, and Kefa Onchoke

Pharmaceutical compounds are introduced into the environment and may pose adverse environmental and human health effects. The sources of pharmaceuticals include sewage, animal waste, and/or improper disposal from homes and hospitals. In this study, the spectroscopic, and chromatographic properties of carbamazepine (CBZ), diclofenac (DF), and ketoprofen (KT) were analyzed by using UV-Vis, infrared red, fluorescence and HPLC. Via UV-VIS spectroscopy, CBZ, DF, and KT exhibited absorption peaks at 285 nm, 284 nm, and 255.6 nm, respectively. The infrared peaks CBZ and DF were observed at (ν_{NH_2} (3467 cm^{-1}), and ν_{C-H} (3281, 3197, 3166, 3021 cm^{-1}), respectively. Whereas $\nu(C=O)$ absorption peak for KT was observed at 1708 cm^{-1} bands at 3467 - 3000 cm^{-1} for CBZ and DF were similar for carbamazepine and diclofenac. The determined fluorescence quantum yield (F_f) for CBZ, DF, and KT were $F_f = 0.226, 0.287,$ and 0.327 , respectively. Thus, KT and DF show nearly similar fluorescence quantum yields vis-a-vis CBZ. HPLC-PDA method was used to separate the compounds on a C-18 column using an isocratic mobile phase (70% MeOH and 30% water, v/v) at a flow rate of 1 mL/min and $\lambda = 285$ nm. Retention times was observed at 4.39, 7.02, 2.98 (min). This study is useful for the quantitation of these pharmaceuticals in wastewater treatment plants.

013.039 U **Microalgae-based Amendments: Extracts from Freshwater Microalgae Enhance Seed Germination and Abiotic Stress Response in Tomato.**

University of the Incarnate Word, San Antonio, Texas. **Genevieve Tourelles**, Lauren Bomer, Kayla Brown, B.D. Leverett

While the use of microalgae in agriculture has a long history, a recent focus on developing economically viable approaches to microalgal biofuels production has intensified the study of some algal species as biostimulators and biofertilizers of vegetable crops. Algal biomass and biofuels processing byproducts have been increasingly applied to the improvement of crop yields, remediation of soils, and the development of sustainable disease and stress resistance in crop plants. This study represents a preliminary modeling of the effects of industrial processing byproducts from selected freshwater and soil microalgae on seed germination and early seedling growth metrics in tomato. A series of algal derivatives (ADs), including biomass (BM), spent growth media (SM), total lipid extract (TLX), aqueous extract (AQX), aqueous-extracted biomass (AEB) and lipid-extracted biomass (LEB), has been obtained from each of *Eustigmatos vischeri*, *Mesostigma viride*, and *Pleurochloris mierenensis* through a lab-scale biofuels extraction process. The ADs have been tested at 1% (v/v) and 10% (v/v) concentrations for hydropriming of tomato seeds and as amendments to tomato seedling culture media at a 1% (v/v) application rate. Preliminary results indicate mild effects of some ADs on seed germination and early seedling growth with a more pronounced positive impact on seedling growth in saline conditions produced by extracts of *P. mierenensis*.

013.040 U **Synthesis and Characterization of Biodiesel Fuels from Shellbark Hickory and Bitternut Hickory.** Stephen F. Austin State University, Nacogdoches, TX. **Gillian M. Bustos** and Russell J. Franks

In an effort to find new potential sources of triacylglycerols to be used in the synthesis of biodiesel fuels, the nuts of the hickory tree (*Carya spp.*) have great potential. Hickory nuts are comprised on average of approximately 60% fat by weight. This is significantly higher than many other nuts like acorns, which are only approximately 30% fat). Moreover, while many species of hickory nuts can be consumed safely by humans, they are not an important food source for humans. Thus, harvesting hickory nuts for their oil is not expected to have a significant impact on human food supplies. It is, however, a challenge to extract the fat from hickory nuts. Hickory nuts do not give up their oil cheaply as their shells are quite hard, and it is difficult to remove the endosperm material from the shell. As part of an ongoing study investigating the properties of biodiesel fuels made from various species of hickory nuts, two particular species of hickory were used in this study: shellbark hickory (*Carya laciniosa*) and bitternut hickory (*Carya cordiformis*). Hickory kernel oil was subjected to transesterification under acid-catalyzed and base-catalyzed conditions using both methanol and ethanol. The resulting ester mixture was then purified and dried. The isolated product mixture was then analyzed using 1H -NMR spectroscopy. Percentage conversion was calculated using integration data from the NMR spectrum. Transesterification of the hickory kernel oil from both the shellbark hickory and the bitternut hickory using methanol gave the fatty acid methyl ester product with good conversion. The acid-catalyzed transesterification gave better percent conversion than the base-catalyzed transesterification. When ethanol was used, results were much more modest, however.

013.041 G **Molecular Modeling of Covalent Bonding between Topiroxstat Analogs and Xanthine Oxidase.** Chemistry and Physics

Department, University of Texas of Permian Basin, Odessa, TX. **Hans Ott**, Giovanni Jimenez, Chao Dong

Uric acid (UA) is the metabolite of purine type substrate by Xanthine oxidoreductase through hydroxylation of heterocycle C=N bond. The imbalance of UA production and its excretion gives rise to asymptomatic hyperuricemia due to UA level > 7 mg/dL. Due to physiological environment change such as temperature, pH, diet, and other diseases, UA can deposit in soft tissues, joints, and cause gout with inflammatory, swelling, painful symptoms. The

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uricostatic drugs, the xanthine oxidase inhibitors, such as allopurinol and febuxostat, are recommended to reduce the UA production, and prevent gout to attack in adult patients. The emerging new generation of xanthine inhibitor, topiroxostat (FYX051), displays a high effectiveness compared with febuxostat therapy in chronic gout patients with a half-life 8hours. This is due to its hybrid structure with mechanism (inhibitor covalent bond with molybdenum in xanthine oxidase) and structure (inhibitor occupying substrate binding channel) type. Interestingly, the second and third hydroxylation has been observed after 72hours incubation. The FYX051 inhibitor must re-enter substrate-binding pocket with different orientations such as upside and upside down which has been argued in molybdenum enzyme field. Here, we designed modified inhibitors with 1, 2, 4-triazole ring being replaced by furan, thiophene, pyrrole, pyrazole with different potential hydrogen bond interactions with three key amino residues Glu1206, Glu802 and Arg880. Here the Molecular Forecast software is employed to obtain binding energy of these topiroxostat analogs with xanthine oxidase active site with covalent bonding simulations. The preliminary data gives us insight into how these analogs interact with key amino residues in the substrate-binding pocket.

013.042 U **Bacteriophage purification and propagation for *Pseudomonas Aeruginosa***, University of Texas at El Paso, El Paso, TX. **Jesus Garcia**, Ricardo A. Bernal, Zacariah Hildenbrand

A series of recent published studies has revealed that various microbial species grow abundantly in carbonaceous wastewaters produced in the energy sector where they can form biofilms and deteriorate infrastructure. These bacteria, such as *Pseudomonas aeruginosa*, can become resistant to UV, ozone, and other traditional forms of disinfection. The focus of this research is to identify bacteriophages that will eliminate the bacteria found in raw oilfield waste. A bacteriophage, or phage, is a virus that selectively eliminates bacteria by infecting it and reproducing inside it. Once it has finished replicating, the cell goes through a lytic or lysogenic cycle. After making several observations of multiple bacteria strains and corresponding phages, our study has identified SN bacteriophage of the Myoviridae family as a focus for our stud. Our preliminary findings suggest that the SN phage was able to infect and kill *Pseudomonas aeruginosa* as indicated by the presences of phage plaques in the plague assay within 12 hours. We were able to obtain a higher phage titer of 10^8 PFU/ml by isolating the phages from the plate containing plaques. Purification of the phage was performed by infecting *Pseudomonas aeruginosa* in liquid medium and isolating the SN phage using ultracentrifugation. Successful future trails may lead to a combination of phages mixed into a "cocktail" to eradicate all microbes found in raw oilfield wastewater. Ultimately these finding may potentially serve as a cost-effective method to eradicate problematic microbes from compromising energy infrastructure without the use of harmful chemical additives.

013.043 G **Investigating Substrate Inhibition of Enzymes Encapsulated within HK97 Virus-Like Particles**. University of Texas at Tyler, Tyler, Texas. **Joseph Lively**, Dustin Patterson

Substrate inhibition is a phenomenon observed in enzyme kinetics in which increased substrate concentrations result in reduced, often dramatically, enzyme-catalyzed reaction rates. Presently observed in an estimated 25% of studied enzymes, substrate inhibition has serious implications in the understanding of many crucial biological processes, the function of these proteins inside the cell, as well as the utilization of enzymatic reactions for industrial applications. Studies show substrate inhibition to be a real limitation *in vitro* and logical conclusions have been drawn to explain the relevance of substrate inhibition in the self-regulation of biological pathways. However, there is currently no consensus on how important a role, if any, substrate inhibition plays *in vivo* as it is not clear whether cellular substrate concentrations reach the levels required to initiate substrate inhibition or what effects the cellular environment and organization may have. Conditions within the cell are high in macromolecular concentration and are segregated and confined, properties that are not easily duplicated by *in vitro* assays and may have an influence on substrate inhibition effects. Here, HK97 virus-like particles (VLPs) were employed to encapsulate various enzymes known to undergo substrate inhibition in-order-to mimic cellular conditions and examine what effects close confinement and localization may have on enzyme kinetics. Our initial results suggest that encapsulation and confinement within VLPs does not reduce enzymatic activity. We anticipate these findings to be the starting point of a model of enzymatic function in a confined cellular environment.

013.044 U **Mixed copper(II) phenanthroline-terpyridine complexes as antitumor agents**. University of the Incarnate Word, San Antonio, Texas. **Joseph Sulaica**, Betsy Leverett, Hadi Arman and Rafael Adrian

Metal-based agents have been employed to treat some of the deadliest types of cancer, including cancers of the pancreas, brain, and reproductive organs. In recent years efforts to develop novel metal-based antitumor agents have primarily focused on developing non-platinum antitumor agents containing gold, ruthenium, and copper. A few metal complexes of copper(II) have been described as DNA cleaving agents and have been shown to initiate apoptosis by enhancing reactive oxygen species. Mixed copper(II) phenanthroline complexes containing imidazolidinethione as a ligand were shown to prompt cell death in many cancer cell lines exhibiting auspicious anti-proliferative effect in ovarian cancer cells by eliciting the unfolded protein response (UPR), resulting in rapid cell death. This work presents the synthesis and characterization of a couple of mixed ligand copper(II) phenanthroline complexes, including terpyridine and 4-chloro-terpyridine as ligands; terpyridines are suitable ligands to develop new antitumor drugs due to known potential as DNA intercalators. In these novel complexes, the copper(II) metal center is fivefold coordinated by three nitrogen atoms of the terpyridine and two nitrogen atoms of the phenanthroline ligand in a distorted trigonal bipyramidal geometry. Triflate ions complete the asymmetric unit in the x-ray crystal structure of both complexes. Infrared spectroscopy corroborates the presence of both ligands, while elemental analysis proves the homogeneity of the bulk sample. Both compounds showed potential as antitumor drugs when screened for their ability to kill MCF-7 breast cancer cells in culture. This work will add to the accumulated understanding of copper(II) cellular dynamics and provide insight into the chemotherapeutic potential of complexes based on copper.

013.045 U **A Method for the Determination of Pesticides in Wastewater Samples with High Performance Liquid Chromatography with Photodiode-Array (PDA) and Fluorescence Detectors**. Stephen F. Austin State University, Nacogdoches, Texas. **Joshua Spencer Hamilton**, Kefa Karimu Onchoke

The development of a rapid and simultaneous method for the determination of commonly used pesticides in wastewater samples was investigated. Standard solutions of carbaryl, chlorpyrifos, and paraquat were prepared and analyzed using a Jasco 4000 Series High Performance Liquid Chromatograph with Photodiode-Array (PDA) and Fluorescence detectors (HPLC-PDA-FD). A Waters Spherisorb ODS column (2.5 μ m, 250 mm x 4.6 mm) was used for separation by isocratic elution with an acetonitrile and water (70:30, v:v) mobile phase. PDA detection gave LOD and LOQ values of 0.65 ppm and 1.98 ppm, 0.39 ppm and 1.17 ppm, for carbaryl and chlorpyrifos, respectively. FD gave LOD and LOQ values of 0.98 ppm and 2.96 ppm, 1.57 ppm and 4.76 ppm, for carbaryl and chlorpyrifos, respectively. In addition, UV-Vis spectrophotometry was used to qualitatively determine the absorbance spectra for each target pesticide. Based on UV-Vis absorption and fluorescence emission peaks, λ_{ex} (270 nm) and λ_{em} (320 nm) were chosen for fluorescence detection. Carbaryl exhibited higher fluorescence intensity than chlorpyrifos and paraquat. Method validation was investigated with the use of solid phase extraction (SPE, C₁₈ cartridges) of pesticides from Nacogdoches Wastewater Treatment Plant samples.

013.046 U **Quantification of Kaempferol Conjugates in Watercress Juice and Extract using HPLC and Protein Binding Studies**.

Stephen F. Austin State University, Nacogdoches, TX. **Laken Simington** and Bidisha Sengupta

Flavonoids are a large group of biologically active polyphenolic compounds found in plants and have been researched extensively in recent years. Flavonoids have gained importance due to their medicinal and therapeutic properties of high potency and low systemic toxicity. Kaempferol (3,4',5,7-tetrahydroxyflavone) is a type of flavonoid that is found in an array of plants species, specifically plants of the *Brassica* family, which includes our subject vegetable, watercress. However, the quantification of kaempferol and its derivatives (in watercress) is still relatively unknown. Here we show a novel approach for quantifying kaempferol and its derivatives in watercress juice and methanol extract using HPLC and protein binding studies. Human serum

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albumin (HSA) is chosen as the model protein. The current study is carried out on one gm of coarsely crushed watercress leaves which were extracted in water and methanol and further filtered through a 0.22- μ m filter. Our HPLC results on methanol extract showed higher absorbance (compared to juice) at 350 nm indicating the presence of more kaempferol/derivatives, as most polyphenolic phytochemicals absorb mostly at ~350-370 nm. The exploratory study of kaempferol in HSA showed increased kaempferol fluorescence with increasing HSA concentration suggesting an increase in binding of kaempferol in the protein matrix. Usually, flavonoids with a 5-OH group show fluorescence emission only when they are bound in a rigid environment. Computational docking studies indicated the binding site of kaempferol to be in the vicinity of the fluorescent amino acid tryptophan 214 of HSA. Further studies are underway.

013.047 U **Agricultural Applications of Microalgae: Extracts from Marine Microalgae Enhance Seed Germination and Abiotic Stress Response in Tomato.** University of the Incarnate Word, San Antonio, Texas. **Lauren Bomer**, Genevieve Tourelles, Kayla Brown, B.D. Leverett
With the recent focus on developing viable secondary products from biofuels processing of microalgae has come an increased application of algal biomass and biofuels processing byproducts to agricultural challenges. Microalgae have been employed as biostimulators and biofertilizers, improving crop yields and soil quality, and providing more sustainable options for disease and stress resistance in crop plants. This study examines the effects of industrial processing byproducts from three species of marine microalgae *Picochlorum oklahomensis*, *Tetraselmis suecica*, and *Tetraselmis striata*, on seed germination and early seedling growth metrics in tomato. A series of algal derivatives (ADs) has been prepared from each species using a lab-scale biofuels extraction process, and includes biomass (BM), spent growth media (SM), total lipid extract (TLX), aqueous extract (AQX), aqueous-extracted biomass (AEB) and lipid-extracted biomass (LEB). The ADs have been tested at 1% (v/v) and 10% (v/v) concentrations in hydropriming of tomato seeds and as amendments to tomato seedling culture media at a 1% (v/v) application rate. Initial results indicate mild effects of some ADs on seed germination and early seedling growth as well as positive impacts on seedling growth in saline conditions.

013.048 U **Quantification of Hydrolyzable Tannins in Hickory Nuts.** Stephen F. Austin State University, Nacogdoches, TX. **Macayla E. Guerrero** and Russell J. Franks
Tannins are a large class of organic molecules found in many plant products including tea leaves, grape skins, and many types of nuts. Tannins are believed to be produced by plants as a defense mechanism to discourage potential predators. Tannins are well known for their ability to precipitate proteins. For this reason, humans have used tannins for tanning of animal hides. Tannins can be divided into two major categories: condensed tannins (which are polymeric species based on repeating flavanol monomer units) and hydrolyzable tannins (which are oligomeric structures consisting of a number of gallic acid and/or ellagic acid monomers bound to a carbohydrate core via ester linkages). Acorns from many species of oak trees are well known for having high tannin content. A number of experimental methods have been developed for analyzing tannins in different types of plant materials. Among these methods, the Prussian blue method is generally considered to be the best method for quantification of hydrolyzable tannins. Although the tannin content in acorns from various species of oak trees has been reported, similar efforts to quantify tannin content from hickory nuts have not. In this study, nuts from various species of hickory tree (*Carya spp.*) were analyzed for their hydrolyzable tannin content using the Prussian blue spectrophotometric method. Endosperm material from the nuts of *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya cordiformis* (bitternut hickory), *Carya laciniosa* (shellbark hickory), and *Carya illinoensis* (pecan) was subjected to this process. Absorbance values from the hickory nut samples were used to extrapolate the amount of hydrolyzable tannins in the sample. Results are reported in mg of gallic acid equivalent per g of hickory nut material.

013.049 U **Synthesis, characterization and antitumor activity of mixed palladium(II) phenanthroline-bipyridine complexes.** University of the Incarnate Word, San Antonio, Texas. **Mariana Araujo Rincon**, Betsy Leverett, Hadi Arman and Rafael Adrian
Platinum-based drugs, like cisplatin and carboplatin, are effective therapeutic agents for treating testicular and ovarian cancers, even when their use is commonly associated with the prevalence of severe side effects. Recently, considerable effort has been directed to the study and understanding of the chemistry of palladium complexes due to their potential application in antitumor therapy. Chemically speaking, palladium(II) complexes are similar to platinum(II) complexes in their structural features and ability to bind DNA covalently but provide faster reaction kinetics and lower toxicity and cost. With this in mind, this work presents the synthesis and characterization of a series of mixed palladium(II) complexes containing phenanthroline and a pair of interesting nitrogen-based ligands, including 4,4'-dimethyl-2,2'-bipyridine and 4,4'-dimethoxy-2,2'-bipyridine. Characterization of these complexes using infrared spectroscopy, proton NMR spectroscopy, and single-crystal x-ray diffraction show that in all complexes, the palladium(II) metal ion is fourfold coordinated, by two nitrogen atoms of the phenanthroline ligand and two nitrogen atoms of the bipyridine ligand, in a slightly distorted square planar geometry. Cytotoxicity studies performed using MCF-7 breast cancer cells exhibit the complexes' ability to stop the proliferation of cancer cells. The results obtained by this study reveal that palladium(II) complexes are suitable models to study the reactivity of group 10 metal complexes and their potential to develop new antitumor agents.

013.050 N **Combined effects of cationic porphine, dihydroxynaphthalene and Fe(III) in the presence of hydrogen peroxide as a potent anti-cancer agent against ovarian cancer.** ¹Department of Chemistry and Biochemistry, Stephen F. Austin State University, Nacogdoches, TX, USA; ²Department of Biological Sciences, Alcorn State University, Lorman, MS, USA. **Matibur Zamadar**, ¹Aqeeb Ali, ¹Jacob R Herschmann, ¹Michele Harris, ¹Laken Simington ¹Bidisha Sengupta, ²Debarshi Roy.
Ovarian cancer (OVCA) is the most common cause of gynecological cancer-related death. Symptoms can go undetected until the patient reached the advanced stages due to the drug-resistant nature of OVCA. Like most tumor tissue, OVCA manifests excessive oxidative stress which further creates an opportunity to therapeutically target the redox signaling and reactive oxidative stress (ROS) mediated cell death. Here, we report a multi component solution (referred as 'drug combo'), which is comprised of Fe(III) ions, cationic meso-tetra(N-methyl-4-pyridyl)porphine tetrachloride (TMPyP), and 1,5-dihydroxynaphthalene (DHN). The cationic porphyrin meso-tetra(4-N-methylpyridyl) porphine (TMPyP) is a well-known photosensitizer (PS) used in Photodynamic Therapy (PDT) for curing cancer due to its strong affinity for DNA and high yield of reactive oxygen species (ROS) upon light activation. Since the possibility of irradiating tumor cells alone in the physiological system is slim (due to the close proximity of healthy cells and tumors), we looked for a variation in the PDT using a mixture of TMPyP with DHN and Fe(III) ions at a mole ratio of 1:20:17 respectively in aqueous solution. The drug combo cleaves DNA in test tube by producing ¹O₂, $\dot{\text{O}}\text{H}$, and Juglone upon visible light irradiation. *In situ* the drug combo produces one or more reactive oxygen species (ROs) such as, singlet oxygen (¹O₂), hydroxyl radical ($\dot{\text{O}}\text{H}$), and a naphthoquinone derivative, 5-hydroxy-1,4-naphthalenedione (Juglone) in H₂O₂ rich conditions, which is prevalent in cancer cells. The drug combo acidifies the cancer cells and inhibits cell proliferation and induces oxidative stress in both drug-sensitive and resistant ovarian cancer cells. However, there was no observed cytotoxic effect of the drug combo on normal fibroblast cells.

013.051 U **pH Effects of Beta-2-microglobulin Misfolding.** Austin College, Sherman, Texas. **Miranda Galvan**, Hersh Patel, Georgia Burton, John Richardson
Beta-2-microglobulin(B2m) is a 99-residue protein that is filtered out by the kidneys. During kidney failure, B2m accumulation has a toxic gain of function leading to the disease Dialysis-Related Amyloidosis (DRA). DRA is the accumulation of amyloid fibrils and misfolded proteins that are deposited in joints and bones. The only treatment currently available is filtration which can reduce the amount of circulating B2m but does not remove the amyloid. To understand the mechanism of protein misfolding, we studied how changes in hydrophobicity affect the hydrophobic surface area of B2m. In this analysis

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using the Camsol software to compare solubility profiles of different mutants to wildtype at pH 2 and wildtype at pH 7 we observed that there was an apparent pH effect. Four regions of amino acids in the wildtype were identified, a comparison showed major solubility differences. In PyMol software, a 3D structure of B2m was used to look at the 4 regions' potential interactions with the rest of the molecule. Our 4 regions were also compared to regions studied by Ivanova et.al. for overlap in amino acid residues. This analysis led to several interesting positions that will be further analyzed to study if changes in electrostatics affect the hydrophobic surface area of B2m.

013.052 U **Phosphates for protection, not detection: Development of a non-radiolabeled strand exchange assay.** Wayland Baptist University, Plainview, TX. **Paxton Patterson**, Allison Alvarez-Garcia, Dr. Robert Moore
RecA strand exchange assays have historically been dependent on radiolabeling DNA with ³²P phosphate. This requires expensive modification and a phosphorimager. We created a strand exchange assay for RecA that is independent of radiolabeling. By protecting the 3'-terminus of selected oligonucleotide strands with non-radioactive phosphate prior to strand exchange, we can then utilize unprotected strands for biotinylation following strand exchange and subsequent chemiluminescent detection. Biotinylation was selective for non-phosphorylated DNA, and preferential for ssDNA. This technique gives immediate access to studying RecA-mediated strand exchange without the use of radiolabeling or the corresponding necessary equipment.

013.053 G **On the origin of potential inversion of folded bianthrone: a solution-state DFT computational and theoretical study.** University of Texas at El Paso, El Paso, Texas. **Peter Girnt**, Balazs Pinter
Bianthrone is a sterically hindered molecule that possesses two stable nonplanar isomers, a folded and a twisted one, with strikingly different electrochemical properties. Namely, electrochemical reduction of folded bianthrone at a platinum cathode in DMF proceeds in a two-electron process with potential inversion of about -1,17 V. In contrast, the two-electron reduction of the twisted isomer takes place in consecutive electron transfers at -0,195 and -0,505 V. Interestingly, folded bianthrone significantly distorts in the reduction process forming a dianion with structural parameters that closely resemble to the folded species. In brief, bianthrone undergoes rapid isomerization from a folded to twisted geometry during the overall redox process leading to potential inversion (the second electron transfer is more exothermic than the first one) and a two-electron reduction event. Our solution-state density functional theory (DFT) simulations support the rationale that a folded-to-twisted conversion in the monoreduced form, i.e. an overall ECE mechanism, leads to the observed potential inversion. Using state-of-the-art computational methods we separated and quantified the contribution of the structural relaxation an electron transfer sub-processed to the energetics of each redox steps, visualized the redox-active sites and analyzed the aromaticity and bond nature changes during reductions for both conformers. Our insights potentially can help with developing organic multi-electron electrolytes for redox-flow batteries.

013.054 G **Techno-economical study of Produced Water (PW) valorization in Hydraulic Fracturing.** The University of Texas at El Paso, El Paso, Texas. **Ramon Sanchez**, Zacariah Hildenbrand.
Hydraulic Fracturing is the process in which a fluid is used to create small fractures in petroliferous formations, to stimulate the production of oil and natural gas. The fluid used is comprised of water and organic additives. The main waste streams of this industrial process have been identified as flowback water and produced water (PW), which are typically disposed of by injection into the subsurface through saltwater disposal wells (SWDs). This practice has been associated with surface spills when transporting to disposal sites, increases in seismic events in nearby areas, and stress on fresh water sources. An alternative solution is the implementation of novel treatment modalities to process PW for direct reuse, and/or recycling the water into various activities, i.e., agricultural discharge, natural water sources replenishment and domestic usage. Additionally, these waters can be rich in a vast number of ions, including valuable metal ions such as nickel (Ni), cobalt (Co), and lithium (Li), that can be extracted from PW with the appropriate treatment scheme. In this research we have evaluated the technical requirements for produced water treatment and metal mining. Furthermore, we covered the financial requirements (CAPEX and OPEX) of produced water valorization, based on Li extraction.

013.055 U **Synthesis of Two Different Hydrogels for UTI treatment.** University of Texas Permian Basin, Odessa Texas. **Reagan Hudson**, Milka Montes, Ph.D.
Hydrogels have a variety of uses including medical, hygiene, and environmental applications. In this study, two hydrogels were synthesized using different synthesis methods to compare their effectiveness. For use in the treatment of urinary tract infections.

013.056 U **The Effect of Carbon Quantum Dots on the Structure of Intrinsically Disordered Proteins.** The University of Texas at El Paso, El Paso, Texas. **Salvador A. Valdez Jr.**, Gyan Narayan, Dr. Mahesh Narayan
6.2 million Americans 65 years old and older are found to be suffering from a neurodegenerative disorder, with 12.2 million Americans of the same age group expected by the year 2050. It is well-known that a major contribution to the onset of neurodegenerative disorders is the aggregation of Intrinsically Disordered Proteins (IDPs), leading to fibril formation and nerve cell degeneration. Although recent studies have identified CQD's (Carbon Quantum Dots) efficacy in mature fibril breakdown, this study aims to identify if CQD facilitation can confer a tertiary structure on IDPs thereby prohibiting aggregation. For context, Carbon Quantum Dots are carbon-based nanoparticles structured with oxygen-containing functional groups on their surface. CQD's are very cost-effective to synthesize and have different biodegradable starting materials. To test if CQDs can confer a tertiary structure on IDPs, samples of the protein α -lactalbumin are induced into their molten globule state through the removal of their calcium ions, and varying dosages of different CQDs are introduced. Results obtained through the usage of UV-Spectrophotometry and Fluorescence Spectrometry have hinted at the confirmation of protein refolding with CQD facilitation, however, further tests are needed to conclude.

013.057 U **Thermodynamic studies of dyes' adsorption of magnetite-carbon nano-onions composites for environmental remediation applications.** Sam Houston State University, Huntsville, Texas. **Sandra Simmons**, Ariel Van-Sertima, Adrian Villalta-Cerdas
In 2015, the U.S. Government Accountability Office reported that the Bureau of Land Management had identified at least 7013 contaminated and potentially contaminated federal sites. The sites may pose a risk to human health or the environment. The estimated total liability for environmental cleanup was over \$350 billion for the identified areas. Although many cleaning and remediation methodologies exist, nanotechnology using carbonaceous materials presents significant advantages concerning efficiency and performance. One of such nanomaterials is carbon nano-onions (CNOs). CNOs consist of a hollow spherical fullerene core surrounded by larger concentric fullerene layers forming quasi-spherical multilayers. In the project herein, CNOs were utilized in the removal of organic molecules from aqueous solutions. To this end, CNOs were synthesized by arc discharge underwater, and magnetite nanoparticles were incorporated into its surface, leading to a composite having magnetic properties. The study of the applicability of mag-CNOs for environmental remediation consisted of removing known compounds from a water sample. Dyes blue #1, yellow#4, and red #40 were used as the targets for removal. The adsorption isotherms were investigated for different magnetite-CNOs composites. In the experiment, magnetite-CNOs composites were mixed with solutions of the target molecules for 48 hours. After the adsorption time, the concentration of the target was determined via UV-visible spectroscopy. The study results showed differential absorption capacities for pristine and magnetized-CNOs materials, and the results were contrasted against commonly used carbon substrates. The experiment shows the potential for the CNOs' usage in the adsorption removal of organic molecules from water samples. Findings from the study contribute to the existing body of knowledge on environmental remediation of anthropogenic chemicals, particularly of chemicals with known bioaccumulation potential.

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- 013.058 U **The Impact of Carbon Nano Materials on Nascent Proteins.** The University of Texas at El Paso, El Paso, Texas. **Sofia A. Delgado**, Kaleigh J. Love, Olivia Fernandez-Delgado, Luis E. Echegoyen, Mahesh Narayan
Amyloid proteins such as α -synuclein, amyloid β , and mutant Huntingtin protein (mHTT) are prone to aggregation, forming toxic oligomers and protofibrils that create pores in cell membranes, disrupt Ca^{2+} homeostasis, facilitate leakage of neurotransmitters, and induce neuronal death. This results in the onset of neurodegenerative disorders such as Parkinson's (PD), Alzheimer's (AD), and Huntington's (HD) diseases. In previous work, we have demonstrated that Carbon Quantum Dots (CQDs) prevent the model amyloid protein Hen-Egg-White Lysozyme (HEWL) from losing solubility and becoming toxic. CQDs also dissolve preformed HEWL oligomers, protofibrils, and mature fibrils indicating both prophylactic and therapeutic potential. However, nothing is known about the effects that CQDs and other Carbon Nano Materials (CNMs) have on nascent proteins. In this project, we use the fully-reduced statistical coil of the model milk-protein β -Lactoglobulin to observe the effects, if any, that CNMs may exercise on nascent proteins. The study outcomes are an important first step in addressing the impact of CNMs on the proteome as they find increasing and widespread use in biomedicine.
- 013.059 U **Synthesis, Characterization, and electronic structure calculation on new synthesized Strandberg-Type POM (Polyoxometalate) Structure.** Sul Ross State University, Alpine, Texas. **Thomas Levrie** and Hong Young Chang
Considerable attention has been focused on the polyoxometalates (POMs) composed of covalently linked clusters by d^0 transition metal cations (V^{5+} , Nb^{5+} , Ta^{5+} , Mo^{6+} , or W^{6+}). Owing to their wide compositions and structural versatility, POMs have important applications in the field of catalysis, medicine, biology, and material science. In addition, the extended POM structures have been constructed by adding different linkers such as transition metal cations, organic groups, and metal-organic frameworks into the conventional POM structures. (*Keggin*, *Dawson*, *Anderson*, and *Strandberg*-type POMs). Especially, since POMs contain octahedrally coordinated d^0 transition metal cations susceptible to second-order Jahn-Teller (SOJT), it is expected that synthesized POMs show non-linear optics (NLO) attributed to second harmonic generation (SHG). Therefore, this research will report on synthesis, characterization, and physical properties for new *Strandberg*-type POM structure composed of Mo^{6+} , P^{5+} , and alkali metal cations with its electronic structure calculation by density functional theory (DFT) and the first principle quantum calculation.
- 013.060 G **Structural and Biochemical Studies on Neurodegenerative Disease Related Protein, Heat Shock Protein 27.** The University of Texas at El Paso, El Paso, Texas. **Zhaobo Li**, Bianca A Holguin, Ricardo A. Bernal
Small heat shock proteins are a class of chaperones that help maintain protein homeostasis in a cell, making small heat shock proteins essential to all kingdoms of life. Hsp27, a small human molecular chaperone, has been shown to have the ability for inhibiting protein amyloid formation. The misfolding or aggregation of microtubule associated protein tau, and alpha-synuclein are the pathological hallmarks for Alzheimer's and Parkinson disease. Published studies have suggested a significant role of Hsp27 in inhibiting the aggregation of both Tau and alpha-synuclein. The contact area between Hsp27 and its client proteins Tau and alpha-synuclein have been determined by HSQC NMR that enhance our understanding neurotherapeutics. However, high-resolution atomic structure of the monomeric full length Hsp27 still remains ambiguous because of struggles in obtaining a homogeneous purified product for reconstruction and due to the intrinsic disorder of the protein. This project aims to apply Cryo-EM 3D reconstruction techniques to elucidate the high-resolution structure of human Hsp27 in complex with its substrate.
- Conservation Ecology Posters:**
- 013.061 U **Constructing a plant species checklist for Castner Range, Texas and identifying important species through species distribution models.** The University of Texas at El Paso, El Paso, Texas. **Aparna Mangadu**, Mingna Zhuang, Michael Moody
Castner Range National Monument is an area of land in El Paso, Texas that stretches from the northeast section of the Franklin Mountains to the peak of North Franklin Mountain. The vegetation of the area includes a variety of desert scrub and endemic plant species. In spite of the weapons firing practice that took place in the area from 1926 to 1966, the original flora is still intact. Additionally, Castner Range receives the heaviest amount of rainfall for the Franklin Mountains, which possibly gives rise to unique vegetation patterns. Since the native vegetation is still present, some plant species may serve as bioindicators in analyzing the health of the ecosystem. A current checklist of the plant species present in the region has not been constructed due to difficulties in present day surveying. To address this, I georeferenced historical plant specimens of the UTEP Biodiversity Collections recorded for El Paso County, Texas and compiled these records with those from Seinet and GBIF in a checklist and map of Castner Range. Using this compilation of records, I identify historical collecting trends and gaps. In total, 120 families, 335 genera, and 558 species were identified from 1586 specimen records. Using this data, we also intend to use MaxEnt to construct species distribution models for important species, in order to assess the effects of climate change on this region.
- 013.062 G **Lack of response in Carolina Chickadee to Predator Scents.** Sam Houston State University, Huntsville, TX. **David Farris**, Hannah McNeese, Diane Neudorf
Odor recognition including predator detection is important for some avian species. Predator scent recognition can aid cavity-nesting species like Blue Tits (*Cyanistes caeruleus*) and Great Tits (*Parus major*) avoid cavities used by potential predators. We tested whether Carolina chickadees (*Poecile carolinensis*), a native cavity-nester in the family Paridae, respond to predator odors by measuring hesitation during nestling feeding. We used American mink (*Neovison vison*) urine for the predator scent, garlic for a positive control, and water for a negative control. Our results indicate that during the nestling feeding stage, response to predator scents did not significantly differ from the positive or negative control. This could indicate that Carolina chickadees may not have the same scent recognition found in some of the other members of Paridae but further testing is needed.
- 013.063 U **Plant Diversity in a Huisache-Dominated Area on the Weston Ranch, Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Jacob Sagstetter**, Mark Gustafson, and Alan Lievens
Huisache (*Vachellia farnesiana* [L.] Wight & Arn.; Fabaceae) has encroached into parts of the Blackland Prairie. The Weston Ranch is located in the Blackland Prairie Ecoregion of Texas near New Braunfels. As a part of an experimental prairie restoration project, we measured the plant diversity in two control plots and two plots where huisache was removed. This study focuses on diversity in a control plot in which huisache was not removed. We used a modified Whittaker method on a 20 meter by 50 meter plot in June 2020 and June 2021. We found 20 species in June 2020 and 18 in June 2021. Only 10 species were found in both years. In both years the plot had a species area relationship with R^2 greater than 0.8. This study shows the importance of using controls in restoration projects due to natural variation in plant diversity from year to year.
- 013.064 U **Biodiversity of Native Bees in Grayson Co., Texas.** Ausitn College, Sherman, Texas. **Keegan Nichols**, Ben Berggren, Frank Goodavish, Dr. Loriann Garcia
Native bee populations are declining worldwide, a trend would affect the plant landscape and agricultural output. Bees are an integral pollinator of the native flora of Grayson County. Native bees are more effective pollinators than the invasive honey bee as they have developed behaviors that specifically target pollen instead of nectar. Our study occurred in the Blackland prairie, a remnant of the original ecosystem of North Texas. For comparison to the native system, we surveyed Austin College, an urban college campus. We captured bees using active sweeping techniques so we could also take metadata of the plants the bees were found on. Additionally, we used tri-colored bee bowls in our survey finding 155 individuals of 30

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species from 5 families. Metadata from community projects, such as iNaturalist, were used to add to our data to for a better assessment of the bee diversity in the region.

013.065 U **Mycoremediation with *Pleurotus ostreatus* and *Pluteus cervinus*.** Howard Payne University, Brownwood, Texas. **Madison Marzullo**

Diesel fuel is a common contaminant in soil. It is harmful to the environment and humans because it disrupts the soil's microbiome, inhibits plant growth, and contains carcinogens. Mycoremediation is a form of bioremediation that uses mushrooms to remediate contaminated soil. Mushrooms are able to break down the hydrocarbon components of diesel fuel with the enzymes that they produce. *Pleurotus ostreatus*, also called the oyster mushroom, is a species that is commonly used for mycoremediation purposes. Since *P. ostreatus* is both saprophytic and lignophytic, the species is an excellent decomposer. It is unknown whether *Pluteus cervinus* is capable of remediating soil, and if so, how it compares to the performance of *P. ostreatus*. In order to determine the remediation capabilities of *P. cervinus*, soil was contaminated with diesel fuel in varying quantities. For each volume of diesel fuel, *P. ostreatus* and *P. cervinus* were grown in separate containers. Additionally, both mushroom species were grown in soil that had not been contaminated by diesel. A sample of each diesel concentration was left without mushrooms as well. Each week, a small amount of soil from each trial was analyzed for its diesel content. This was done via headspace analysis. The sample was heated so that the volatile components in the diesel became gaseous. The gas was then collected and analyzed using a gas chromatography mass spectrometer. This method revealed how much diesel was in the soil each week. The data from the performance of *P. ostreatus* and *P. cervinus* was then compared. Results are pending. Given that the two species share many similar qualities, it is predicted that *P. cervinus* will have mycoremediation potential comparable to that of *P. ostreatus*.

013.066 G **Examining the role of trap color on pollinator attraction: A test using yellow vane and colorless traps.** The University of Rio Grande Valley, Edinburg, Texas. **Satinderpal Kaur**, Adegboyega Fajemisin, Alejandro V Vasquez, Alexis Racelis, Rupesh Kariyat

Pollinator density and identity estimation is crucial for pollinator conservation and agroecosystem health diagnosis. Although there is a huge variety of traps routinely used for such purposes, whether trap color has a significant impact on pollinator attraction is less understood. Even more critically, it's unclear whether trap color attracts pollinators beyond the target area's ambient pollinator community. To test this, we did a field experiment with two types of traps: yellow vane traps and colorless vane traps. In three field sites in the Rio Grande Valley, we set up twelve traps each, six were colorless and six were yellow. The traps were placed equidistant from each other. The insects collected in the traps were identified to order, families and separated based on their feeding guilds. Then, we repeated this experiment one more time. Generalized regression analyses shows that yellow-colored traps attracted significantly more insects and pollinators, but these were also field dependent. Furthermore, we noticed that Hymenoptera followed by Coleoptera were the prevalent orders found in all the traps. The hymenopterans of families Megachilidae, Xylocopidae, Vespidae and Halictidae were more common than others, and the coleopterans of families Meloidae and Melyridae were also found. Our results suggest that trap color is important and should be factored into experiments that estimate pollinator density in field.

013.067 G **Terrestrial vertebrate community structure within a restored habitat and conservation easement for the federally threatened eastern massasauga rattlesnake.** Sam Houston State University, Huntsville, Texas. **Zander E. Perelman**, Howard K. Reinert, and William I. Lutterschmidt

Habitat restoration and management are important in maintaining critical habitat for threatened and endangered species. Through the support of the United States Department of Agriculture Natural Resource Conservation Service (USDA-NRCS), a conservation easement was created to preserve critical habitat for one of the few remaining populations of endangered eastern massasauga rattlesnake (*Sistrurus catenatus*) in Pennsylvania. We assessed the biodiversity of terrestrial vertebrates within this restored habitat and conservation easement in Venango County, Pennsylvania, from April through August 2021. We identified nine amphibian species, 10 reptile species, and 11 small mammal species with the American toad (*Anaxyrus americanus*), the short-headed gartersnake (*Thamnophis brachystoma*), and the white-footed mouse (*Peromyscus leucopus*) comprising the most abundant species within each taxonomic class, respectively. We report species occurrence and abundance with calculated biodiversity indices. Species occurrence is also compared to documented species accounts for Venango County, Pennsylvania. This survey ultimately provides baseline information for the biodiversity of terrestrial vertebrate species within a restored habitat and conservation easement. Such information may help assess how habitat restoration and management of critical habitat may support prey diversity and availability to improve the potential foraging success and conservation of the federally threatened and state endangered eastern massasauga rattlesnake.

014. Poster Session 2

6:30 pm – 8:00 pm, Recreation and Wellness Center, second floor track area

Freshwater Science Posters:

014.001 G **Spatiotemporal Distribution of Microplastics in an IRES System.** University of Texas at San Antonio, San Antonio, Texas. **Andre Felton**, Jeffrey Hutchinson

Microplastics have been reported in ecosystems across the globe and is a growing environmental concern. Rivers are recognized as primary vectors for transporting microplastics between terrestrial and marine systems, yet how they are distributed over space and through time is an area of scientific interest. Furthermore, freshwater microplastic studies have largely focused on lakes and perennial rivers with little attention to intermittent rivers and ephemeral streams. In this study, ephemeral pools (n = 14) within a major drainage basin of South-Central Texas were investigated for microplastic occurrence and monitored for 5 months to assess effects of time and hydroperiod on microplastic concentration and distribution. Microplastics were found in all pools throughout monitoring timeframe. Fibers were the most abundant (~72%) morphology followed by films (21%). The abundance of microplastics varied from 20 to 320 items/cm³. Potential MPs were marked and analyzed using Fourier Transform Infrared Spectroscopy (FTIR) and Raman Spectroscopy for confirmation and polymer identification. This study is the first to report microplastics in ephemeral streams and the first to monitor microplastic distribution along a river channel on a monthly temporal scale. As the global extent of IRES systems is projected to increase with continued climate change, evaluating the how fluvial regimes in such systems influence microplastic spatial distribution and exposure to environmental degradative forces constitutes valuable information in assessing microplastics pathways and their fate as a part of the global "Plastisphere" geochemical cycle in the Anthropocene.

014.002 G **Removal of Nonylphenol from water using Activated Carbon-Alginate (AlgC) beads.** University of Texas at El Paso, El Paso, Texas. **Angelica Araly Chacon** and Wen-Yee Lee

The presence of contaminants of emerging concern (CECs) have been affecting the water quality over recent years. The United States Environmental Protection Agency (U.S EPA) defines CECs as toxic chemicals without regulatory status and with adversely impact on the wildlife and people. Nonylphenols (NPs) have been considered as CECs and they have been frequently found in the environment because of its applications in products including plastics, paints, pesticides, additives in lubricants, personal care products, textiles, cleaning products, emulsifiers, and solubilizers. NPs are

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being detected in almost all water environments and wastewater treatment plants (WWTPs) are not designed to remove them. As the market production of NPs is expected to increase within these coming years, it is needed to develop methods to effectively remove NPs from wastewater. This study proposed the use of an ecofriendly absorbent beads made from alginate and activated carbon (AlgC) aimed to remove NPs from water. These preliminary results show the ability of the AlgC beads to remove close to 100% NPs from aqueous solution within 1 hour. Further studies will focus to optimize the absorption capacity of AlgC and the removal of NPs from wastewater samples.

014.003 U **Stop escargo in San Antonio: developing best methodology for detecting *Pomacea maculata* using environmental DNA (eDNA).** Southwestern University, Georgetown, Texas. **Cynthia Bashara**, Lillian Dolapchiev, Matthew Barnes, and Romi Burks
Spread of invasive species can occur rapidly or relatively slowly. Since their establishment in the early 2000's, apple snail (i.e., *Pomacea maculata*) populations primarily occurred in the greater Houston metropolitan area and spread slowly westward. However, in 2019, the San Antonio River Authority (SARA) started taking steps to combat *P. maculata* spread within the San Antonio River. Beyond routine field work, quantifying environmental DNA (eDNA) provides additional means of detecting invasive species. We tested how a combination of factors (N=5) influenced *P. maculata* eDNA detection success. In June 2021, we visited an established site and filtered water samples using different filter types (1.2 µm Millipore versus Smith-Root self-preserving and regular filters), filter sizes (1.2 µm and 5 µm), and locations (upstream of the snails' known location). We extracted one set of filter samples using chloroform or a Qiagen kit to compare extraction methods. We used qPCR to amplify eDNA with species-specific primers and statistically compared mean eDNA concentrations. With filter size, we found 1.2 µm filters captured significantly more eDNA than their 5 µm counterparts. With location, as expected, we found positive detections in the downstream site, but surprisingly found detections upstream beyond the snails' known boundary. Of extraction methods, chloroform resulted in significantly more eDNA than kit extraction. These results indicate the need to standardize methods utilized to detect eDNA. Combining eDNA with ongoing collaboration efforts with SARA will hopefully promote the stop of *P. maculata* spread in San Antonio and beyond.

014.004 U **Evaluation of complex and defined media for isolating representative bacteria from tributaries to Galveston Bay.** University of Houston-Clear Lake. **Jackeline Rodriguez** and Michael G. LaMontagne
The Houston-Galveston metroplex experiences severe weather events that can expose people to floodwater that contains a mixture of runoff and receiving waters in tributaries to Galveston Bay. Little is known about the bacteria in these bayous, or aquatic systems in general because the majority of bacteria in aquatic systems are not readily cultured with conventional microbiological methods. Recently a defined media formulation - JW1 - was developed specifically to isolate bacteria from bayous connected to the Gulf of Mexico; however, this media has not been evaluated, to our knowledge, for isolating representative bacteria from tributaries to Galveston Bay. In this study, a slightly modified formulation of JW1 and a commercially available conventional media (R2A) were used to isolate bacteria from water sampled from a bayou near the University of Houston – Clear Lake campus. A library of 56 bacteria were isolated on R2A and JW1. These isolates were identified with matrix-assisted laser desorption – time of flight (MALDI-TOF) mass spectrometry. MALDI-TOF results showed different bacterial species were isolated with the different media. A total of 18 of 19 bacteria isolated with JW1 media were identified with the MALDI-TOF system. *Pseudomonas* sp. dominated the library generated with this defined media. A total of 17 of 37 bacteria isolated with R2A media were identified with the MALDI-TOF system. *Acidovorax* species dominated the library generated with this complex media. R2A media showed double the number of colony forming units. This suggests that JW1 media can isolate bacteria that are not readily culturable with conventional complex media.

014.005 U **Keep Austin snail-free: ongoing removal of *Pomacea maculata* and evaluation by eDNA.** Southwestern University, Georgetown, TX. **Katherine Henderson**, Abigail White, Lillian Dolapchiev, Cynthia Bashara, David Christie, and Romi Burks
Removal efforts of undesirable species can help combat spread, but often suffer from incomplete success or a lack of subsequent monitoring. The genus *Pomacea*, commonly called apple snails, includes more than one invasive species. These can be detected and distinguished using environmental DNA (eDNA). To investigate a reported presence of apple snails in Travis County, TX, we visited the site where we collected four snails for genetic barcoding to verify the suspected species, *Pomacea maculata*. We generated total genomic DNA (tDNA) with three different means of extraction and then amplified products with HCO2198/LCO1490 primers. All snails collected from this pond identically matched existing sequences in Texas, thereby confirming their identity as *P. maculata*. After genetic confirmation, we returned to the site and collected water to determine if eDNA revealed an overall low abundance of apple snails. To demonstrate sensitivity of our eDNA primers for detecting apple snails in the field, we compared these results to other known high abundance locations. We also received extensive historical removal data from a local homeowner. From March 2020 to November 2021, hand removal efforts by concerned citizens resulted in 4872 snails removed and 1719 egg clutches eradicated from the six-acre retention pond. However, apple snails quickly establish in favorable conditions and can shut down their metabolism for several weeks, therefore warranting ongoing monitoring. Using eDNA informs homeowners and managers regarding success of the removal efforts and evaluates the urgency for continual efforts to combat invasive apple snails, ultimately keeping Austin snail-free.

014.006 G **Assessing the prevalence of leech attachment in a population of the federally-endangered Houston toad (*Bufo houstonensis*).** Texas State University, San Marcos, Texas. **Lawrence Bassett**, Ferris Zughaiyir, Dennis Richardson, Charlotte Hammond, Chris McAllister, and Michael Forstner
The prevalence of leech attachment on anuran taxa is largely uncharacterized. When parasitic, such relationships may regulate amphibian populations and function as an obstacle to the recovery of imperiled species. We evaluated the prevalence of leech attachment in a population of endangered *Bufo (Anaxyrus) houstonensis* (Houston Toads) in Bastrop County, Texas, during the spring of 2021. Of 192 toads examined, 2 (~1%) were each infested with a single leech. Molecular analysis of the cytochrome c oxidase subunit I gene identified one of those leeches as *Helobdella austinensis*. This constitutes the first reported association of *H. austinensis* with a vertebrate host and extends the known range of *H. austinensis* ca. 50 km eastward. Leech attachment in this Houston Toad population is rare and the nature of the association remains unclear.

014.007 G **Expression of Oxidative/Nitrative Stress Biomarker and Renin Enzyme During RoundUp Exposure in Goldfish.** University of Texas Rio Grande Valley. **Md Imran Noor** and Md Saydur Rahman
Growing population, urbanization, and heavy anthropogenic activities amplified interaction with the environment, leading to exponential exploitation of natural resources, resulting in environmental pollution. We frequently destroy aquatic environments with toxic chemicals. One of the significant sources of noxious chemical effluent in the aquatic environment is the ever-growing classification of different pesticides used in agriculture. Our study examined the dose-dependent (low dose: 0.5 mg/L, high dose: 5 mg/L) effects of Roundup, a glyphosate-based herbicide, on nitrative stress and renin expression in the kidney of goldfish "*Carassius auratus*", a model teleost species. Histopathological analysis showed widespread damage, including fusion of secondary lamellae, long thin filaments like primary lamellae, deterioration of tubular epithelium, rupture of the epithelial layer, reduction in glomerular area, and hemorrhaging in kidney tissues in Roundup exposure groups compared to control. Immunohistochemical analysis showed a significant increase in Nitrotyrosine protein (NTP, a biomarker of reactive nitrogen species) and renin expressions in kidney tissues under Roundup exposure groups. Overall, our findings suggest that glyphosate-based herbicide Roundup increases RNS, leading to damaged kidney tissues and impairing osmoregulatory functions in teleost species.

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014.008 U **Effect of stormwater management on terrestrial invertebrate biodiversity.** The University of Texas at San Antonio, San Antonio, Texas. **Morgan Leach**, Erika Dyèr, Isaiah Hernandez, Isabella Pangilinan, Felipe Urrutia, Tom McKissick V, Brian Laub
During its construction in the early 1970s, the University of Texas at San Antonio Main Campus was designed to drain stormwater offsite using the best industry practices at the time. Advances in stormwater management using Low Impact Development (LID) necessitated an upgrade for the campus. Constructed in 2020, the Main Campus bioretention basin and bioswale captures storm water and allows it to slowly seep into the ground, removing pollutants from the water before entering the Leon Creek. However, there is insufficient data on the impacts of these stormwater basins on terrestrial invertebrates. This research aims to determine the effects of UTSA's LID stormwater management on the biodiversity of terrestrial invertebrates. Terrestrial invertebrates were sampled using malaise traps, sweep nets, and light traps at the UTSA bioretention basin, bioswale, and an undisturbed grassy channel during pre-construction in June 2019 and post-construction in June 2021. There was an overall significant effect of site on biodiversity of ground-dwelling insects collected via sweep net, whereas malaise trap sampling suggests aerial invertebrates were not as affected. Insect diversity should continue to be surveyed at these sites in the future to monitor the effects of LID stormwater management on insect biodiversity.

014.009 U **Invertebrate environmental DNA is more concentrated in the water column than the sediment in a freshwater lake.** Texas Tech University, Lubbock, Texas. **Paton Willbanks** and Matthew A. Barnes
Invertebrates fulfill many roles in the movement of carbon and energy through ecosystems, exemplified by diverse functional feeding groups including shredders, filterers, grazers, and predators, among others. Furthermore, invertebrates serve as bioindicators of habitat quality. For example, insects such as mayflies, stoneflies, and caddisflies are intolerant of pollution and other disturbance, so their presence can correlate with environmental health. Therefore, invertebrate surveys represent critical tools in the study of freshwater ecosystems that warrant development of sensitive methods. Environmental DNA (eDNA) is genetic material that is released from an organism into its environment, and the collection and analysis of invertebrate eDNA may represent an effective tool for rapidly surveying invertebrates in a freshwater environment. To maximize the effectiveness of eDNA analysis as an invertebrate survey tool, we conducted an experiment to determine where the highest concentrations of invertebrate eDNA occur in a freshwater lake. Based on research in fish, we hypothesized that more eDNA would be present in the sediment than in the water column. To test this hypothesis, we collected paired samples from each of ten sites, one from the sediment and one from the water column directly above the sediment to compare the difference in the amount of eDNA in each sample type. We also collected invertebrates using dipnets at each site to compare eDNA results to local invertebrate identities and abundances. We quantified invertebrate eDNA in each sample using a qPCR assay targeting the invertebrate mitochondrial COI gene. We observed higher concentration of eDNA in the water column than in the sediment. Based on our results, we recommend water sampling to maximize success of eDNA surveys for invertebrates in freshwater ecosystems.

Geosciences Posters:

014.010 G **Geochemical Signatures of Martian Shocked Calcium Phosphate Minerals: Impacts and Implications.** University of Houston – Clear Lake, Houston, Texas. **Ane Slabić**, Daniel Bryant Imrecke
Shock metamorphism describes the physical and chemical changes that occur to structures, rocks, and minerals that have been subjected to hyper-velocity impact events. All Martian meteorites have been subjected to shock; though the degree of shock, and subsequent changes to the physical and chemical characteristics of these rocks, is highly variable. Though impact events are punctuated in nature, they are characterized by extreme temperature and pressures spikes, along with extreme rates of quenching and strain; thereby producing shock features. Extensive chemical and isotopic heterogeneities may occur as a result of shock metamorphism and have been shown to be associated with shock features. However, these chemical and isotopic heterogeneities are not well constrained. Here we show how shock metamorphism causes chemical heterogeneities in phosphate minerals of shock-impacted rocks. Uranium (U), thorium (Th), and chlorine (Cl) elemental compositions of Martian (NWA 998, Tissint, ALH84001) shocked calcium phosphate minerals were targeted to evaluate the effect of shock metamorphism (and resulting shock features) on elemental distributions. Components targeted in this study included individual phosphate minerals (i.e., apatite and merrillite), surrounding phases, and shock melted regions. These works demonstrate that shock induced metamorphism may cause extensive chemical heterogeneities within individual shocked phosphate grains. The implication of this work would be that, in areas that contain shocked phosphate minerals, U, Th and Cl mobilization may occur at the mineral scale. Variations in isotopic and elemental compositions may then complicate interpretations of the volatile abundances on Mars, along with Martian geochronological and thermochronological histories.

014.011 U **Satellite and Drone mapping of fossil collecting areas of the Weches Formation in Nacogdoches County, Texas.** Stephen F. Austin State University, Nacogdoches, Texas. **Jacob Moore**, Luke Whitenburg, James McDaniel, Rick Shaw, David Kulhavy, and Russell LaReil Nielson
Analysis of the Weches Formation in Nacogdoches County was conducted using satellite imagery to identifying areas where outcrops that contain fossil faunas that could be collected and studied. The identification of the Weches Formation outcrops is dependent on finding areas that lacked vegetation where the formation was exposed as outcrops in reservoir shorelines, stream beds, road cuts and quarries. After outcrops were identified on the satellite images, satellite imagery software was then used to measure the height and width of each outcrop. Fossil localities and images of the locations were then plotted on a map and field checked. Drone technology was used to provide imagery of these locations and areas not accessible to the public. This data was then used to construct a map of the Weches Formation showing fossils collecting locations in Nacogdoches County. This will allow future geological investigations and fossil collecting in Nacogdoches County.

014.012 U **Drone Mapping and Outcrop Modeling of the Ladonia Fossil Park area, on the North Sulphur River, Texas.** Stephen F. Austin State University, Nacogdoches, Texas. **James McDaniel**, Luke Whitenburg, Jacob Moore, Rick Shaw, David Kulhavy, Russell LaReil Nielson
Drone technology was used to map and study Ladonia Fossil Park on the North Sulphur River. Drones including DJI Phantom 4, DJI Phantom 4 RTK, and the DJI Mavic Mini 2, were used to identify and map the depositional and erosional surfaces in the collecting area. Pix4DCapture software was used to create drone derived three-dimensional and two-dimensional orthomosaic digital images, based on the exposures in the area of interest. Drone data provided useful information by capturing digital images, videos, and allowing the construction of a three-dimensional model, digital elevation model, and multispectral digital images for analysis of the collecting area. The geologic features and processes that were studied and mapped in the Ladonia Fossil Park are: weathering of the collecting area surfaces, slope retreat of the cliffs along the river, fluvial downcutting of the North Sulphur River, fossil collecting locations along the river and distributions of sedimentary structures in the river channel. Mapping using drones at this location showed the locations in the Ozan Formation of Late Cretaceous age that contains an extensive fossils fauna that can be collected.

014.013 G **Assessment of the Shannon information content of reflective solar hyperspectral radiances for cirrus cloud retrievals.** Texas A&M University, College Station, TX. **Jeffrey Mast**, Ping Yan
Clouds are important modulators of the Earth-atmosphere radiation budget. To better understand the radiation balance, reduction in cloud feedback uncertainty is essential. In the case of cirrus clouds, significant uncertainties stem from the microphysics of ice crystals, the incorporation of the microphysics into the radiative processes, and the representation of the microphysics in radiative transfer models. Hyperspectral measurements, with their abundant information content in a multitude of channels, offer a potential modality for reducing uncertainties in cloud microphysical property retrievals. We investigate the potential a future reflective solar hyperspectral imagers for cirrus cloud microphysical retrievals, the Hyperspectral Imager

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for Climate Science (HySICS) with spectral coverage of 350-nm to 2300-nm at a 6-nm spectral resolution and a planned systematic uncertainty of 0.3%. In this presentation, we present results from sensitivity studies (cloud optical depth, effective particle size, and crystal habit uncertainty) and uncertainty studies (temperature and water vapor vertical profile uncertainties and instrument uncertainties). We model the measured radiances using the Line-by-Line Radiative Transfer Model (LBLRTM) to calculate gas optical depths, followed by using Discrete Ordinate Radiative Transfer Model (DISORT) for multiple scattering calculations. Finally, we use information theory to analyze the potential of hyperspectral imagers for ice cloud retrievals. The Shannon information content of each channel is calculated for various scene types. This is used as a figure of merit to determine the optimal selection of channels is for cirrus cloud retrievals.

014.014 G **Analysis of Microplastics in Hailstones from Two Supercell Thunderstorms.** University of Texas at San Antonio, San Antonio, Texas. **Thomas Nordstrand**, Andre Felton, Stephen Ackley, Jeffrey Hutchinson, Yongli Gao
The presence of microplastics (MPs) in ecosystems across the globe is thought to be partly due to atmospheric transport and have been projected to operate differently as either wet or dry deposition. Yet understanding of how MPs behave and interact in the atmosphere is still in its infancy. There is a lack of data in identifying whether atmospheric MPs are collected as precipitation falls or if they behave like other particulate matter that influence the formation and dynamics of precipitation events. There are no known reports of MPs in hailstones. A pilot study using hailstones ($n = 4$) collected from two different supercell thunderstorms which occurred in Texas of 2020 were analyzed for MPs to determine potential suspension in atmospheric water vapor. Vacuum filtration was used to extract MPs on 45 μ m filter membranes followed by visual microscopy. Potential MPs were marked and analyzed using Fourier Transform Infrared Spectroscopy (FTIR) and Raman Spectroscopy for confirmation and polymer identification. MP fibers were identified in all samples and one fragment in one hailstone. MP fibers accounted for 80% of the total MPs identified. This study is the first to report MPs in hailstones and provides evidence that MP fibers circulate in the upper troposphere and lower stratosphere.

Marine Science Posters:

014.015 U **Superorder Batoidea (Skates and Rays) Biodiversity Along the Texas Gulf Coast.** Texas Tech University, Waco, Texas. **Alyssa Brooke Clay**, Camille Marie Gonzalez, Stephanie Anne Lockwood
Superorder Batoidea (Skates and Rays) face population declines due to bycatch rates and vulnerable habitats. Gaining a better understanding of species diversity is important for ecological sustainment and species protection. This study compiled data from the organization iNaturalist, which allows individuals to participate in non-invasive citizen science by recording encounters with organisms at specific locations. Research grade Batoidea observations along the Texas Gulf Coast were collected. Specific locations and species names were used to collate maps and the percentage diversity of each species observed. Thirteen species were observed in this study. The most prevalent species was the Atlantic Stingray (*Hypanus Sabinus*; *Dasyatis Sabina*), accounting for 48.31% of all species observed. This species is found prevalently along the Texas Gulf Coast and was expected to be observed in large quantities. The lowest abundance of species observed was the Roundel skate (*Raja Texana*; *Rostroraja Texana*), Spotted Eagle Ray (*Aetobatus narinari*), and the Western Atlantic Torpedo (*Tetronarce occidentalis*; *Tetronarce nobiliana*). Each accounting for only 0.42% of all species observed. The Roundel skate was expected to be more prevalent. This research attempted to evaluate the efficacy of citizen science on Batoidea species prevalence and diversity across the Texas Gulf Coast. While the data represented mostly expected outcomes there were discrepancies with species expected to be more prevalent than observed. More analysis and research are needed to understand the biodiversity of skates and rays along the Texas Gulf Coast. More extensive research is needed to determine the validity of iNaturalist as a helpful citizen science tool in analyzing biodiversity.

014.016 G **Ocean Phytoplankton as an essential variable in climate system: An Earth System Model Study.** Texas A&M University, College Station, Texas. **Jian Wei**, Ping Yang
Ocean chlorophyll concentration, a proxy for the quantity of phytoplankton, has attracted increasing attention in climate science due to phytoplankton influences on climate systems. New earth system models have improved simulations of future climate change and variability by considering biological feedbacks in a coupled physical-ecosystem model. Here, we incorporate an improved ocean surface albedo parameterization (a chlorophyll-based algorithm) into the Community Earth System Model (CESM) version 2.1.3, and investigate the impact of phytoplankton, which is usually ignored in current climate models. We conduct two comparative types of climate simulation experiments with the fully coupled ocean-atmosphere mode of CESM, with and without the Marine Biogeochemistry Library. The two experiments are the modified CESM run (M-CESM, with the marine biochemistry module modified so phytoplankton responds to ocean surface optical absorption) and the control CESM run (C-CESM, with no optical absorption). Simulations with a realistic radiative forcing scenario reveal that accounting for phytoplankton increases shortwave radiation penetrating into the ocean, which traps more heat flux and warms the ocean surface layer. The warmer sea surface triggers feedbacks that warm the atmosphere through a corresponding increase in longwave radiation emitted by the surface, and additional heating contributions from variations of physical quantities (cloud fraction, water vapor, atmospheric dynamic, etc.). Our results indicate that the climate response of marine phytoplankton is a crucial potential driver of climate warming.

014.017 U **Handling of Sharks by Recreational Tournament and Nontournament Fishers on the Texas Gulf Coast: Differences in Shark Lengths, Injuries, and Illegal Species Captured.** Baylor University, Waco, Texas. **Maria Calcote**, Yunji Xu, and Dr. Susan Bratton
Shark populations are declining globally due to over-fishing. US states have placed more restrictions on recreational shark fishing, including size limits and bans on retaining declining species. This study examines whether Texas Gulf Coast recreational tournament participants fishing specifically for sharks are more likely than non-tournament anglers to handle sharks in ways that reduce physiological stress and injuries. The study utilizes shark photos posted online to determine: the species and length of sharks retained for photography, how the sharks are held for photos, and whether they are bleeding or display cuts. The average nontournament shark length was 46.44 inches, and the average tournament shark length was 57.67 in. ($p < .001$). Overall, adult anglers displayed larger sharks with an average length of 56.32 in., compared to lengths of 40.42 in. and 43.90 in. displayed by children and teenagers, respectively ($p < .001$). Tournament fishers are more likely to keep sharks in the water for photography (87%) versus nontournament (26%) ($p < .001$) and less likely to hold sharks by placing hands or equipment in the gills or over the eyes 4% versus 36% ($p < .001$). Visible injuries were significantly fewer for tournament captures. Nontournament photos had 35.03% of sharks exhibiting injuries, whereas 12.07% of tournament photos exhibited injuries ($p < .001$). Of species banned from retention by fishers, *Carcharhinus plumbeus* (Sandbar shark) was the most frequently photographed. The results suggest that further education of recreationists including children can improve catch and release handling of sharks, particularly of small sharks more prone to physiological stresses.

014.018 N **Hypoxia-induced cellular apoptosis, ssDNA/dsDNA breaks and DNA methylation in red snapper.** University of Texas Rio Grande Valley, Brownsville, Texas. **Md Saydur Rahman**
Epigenetic modifications such as DNA methylation and histone acetylation impact developmental processes in vertebrates. However, little is known about the epigenetic modifications occurring in aquatic vertebrates during exposure to environmental hypoxia. In this study, we investigated the changes in global DNA methylation and regulation of the related enzyme, DNA methyltransferase (DNMT), in hepatic tissues of red snapper after chronic exposure to hypoxia (dissolved oxygen 1.7 mg/L for 4 weeks). Chronic hypoxia exposure caused marked increases in the immunoreactive (IR) expression of ssDNA, dsDNA, and 8-hydroxy-2-deoxy guanosine (8-OHdG, a key marker of oxidative DNA damage) and decreases the mRNA levels of insulin-like growth factor (IGF-I and IGF-II) in hepatic tissues. The IR intensities of DNMT-1 and 5-methylcytosine (5-mC, a methylated form of DNA base

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cytosine) were markedly increased in hepatic tissues after hypoxia exposure. Collectively these results suggest that hypoxia leads to induction of DNA methylation through the related enzyme, DNMT, which might be involved in epigenetic modifications during exposure to environmental hypoxia in aquatic vertebrates.

014.019 G **Effects of tributyltin on oxidative-nitrative stress, 8-OHdG and dsDNA expressions in the American oyster.** University of Texas Rio Grande Valley, Brownsville, Texas. **Mohan Kumar Dash** and Md Saydur Rahman
Environmental pollution increases due to anthropogenic activities. Different types of pollutants and/or chemicals impair growth, reproduction and development in aquatic organisms. Tributyltin (TBT, an organotin compound) is a tremendously toxic substance which widely uses as antifouling paints used in boats, hulls, and ships. The toxic effect of TBT is well documented in teleost species. The American oyster (*Crassostrea virginica*) is an ideal shellfish species to study on TBT exposure DNA lesion and oxidative/nitrative stress. In this study, the effects of TBT on 8'-hydroxy-2'-deoxyguanosine (8-OHdG, a molecular marker), dsDNA, dinitrophenyl protein (DNP, a biomarker of reactive oxygen species, ROS), 3-nitrotyrosine protein (NTP, an indicator of reactive nitrogen species, RNS), catalase (CAT, an antioxidant) in gills and digestive glands of oysters. We also analyzed extrapallial fluid (EPF) conditions in oysters. Immunohistochemical results showed that TBT exposure significantly increased 8-OHdG, dsDNA, DNP and NTP expressions in gills and digestive glands of oysters compare to control. However, EPF pH and protein concentration were decreased in TBT exposure oysters. Collectively, these results suggest that antifouling biocides-driven ROS/RNS induces DNA damage which may lead to decreased various physiological functions in oysters.

014.020 G **Genetic Ecology of the Dwarf Seahorse (*Hippocampus zosterae*) in Texas.** ¹University of Houston – Clear Lake, Houston, Texas, Environmental Institute of Houston, ²University of Houston – Clear Lake, Houston, College of Science and Engineering, ³U.S. Fish and Wildlife Service – Dexter, NM, Southwestern Native Aquatic Resources and Recovery Center, ⁴The Pew Charitable Trusts – Washington, District of Columbia. **William Greyson Dennis**^{1,2}, Steven Mussmann³, Nathan Fedrizzi⁴, Brian Stephens^{1,2}, Jenny Oakley¹, George Guillen^{1,2}
The Dwarf Seahorse (*Hippocampus zosterae*) is the only seahorse found in North America that has evolved a dwarfed morphology. Dwarf seahorses have been well documented in Florida seagrass beds, where the clearer waters are more hospitable to seagrasses, but they are also found throughout Texas bays where seagrass are present. Due to the small size and cryptic nature of the Dwarf Seahorse, little information has been collected about this species, particularly within Texas. Previous studies have explored the genetic ecology of the Florida Dwarf Seahorse populations, but the genetics of the Texas populations is unknown. Tissue samples from 72 Dwarf Seahorses were collected from 5 different bay systems in Texas. Additionally, 127 Florida samples, from 8 distinct bay systems, obtained from a previous study, were assessed to compare and contrast the genetic diversity of Dwarf Seahorse populations along the Gulf Coast. DNA was isolated from these samples, quantified, and then sequenced using double digest restriction site-associated DNA sequencing (ddRADseq). The ddRADseq is a sequencing method which uses two restriction enzymes simultaneously to select for a specific size of DNA fragments which are then sequenced. This method allows a large amount of data to be generated from a small amount of genetic material, which is helpful when working with small specimens. Using the sequenced DNA this project seeks to determine if there are two genetically-distinct populations of Dwarf Seahorses between the Florida and Texas using the Stacks genetic analysis programs. This project also seeks to understand if gene flow is occurring among the relatively geographically isolated bay systems found along the Texas coast using the BayesAss program. Understanding the genetic diversity and ecology of Dwarf Seahorses will be important to inform management efforts and consideration of this species for federal listing under the Endangered Species Act.

Mathematics and Computer Science Posters:

014.021 U **Supraventricular Tachycardia Study Using a Dynamic Computer-Generated Atrium.** Tarleton State University, Stephenville, Texas. **Gavin McIntosh**, Avery Campbell, Bryant Wyatt
The leading cause of death globally is heart disease, followed by strokes. Supraventricular Tachycardia (SVT), though not in itself deadly, is a leading cause of strokes, heart attacks, and heart failure. Therefore, one could argue that SVT is indirectly a leading global killer. SVT is a term used to describe all events where the atria beat too rapidly or out of sync with the ventricles. This out-of-sync beating between the atria and the ventricles can cause blood to pool in the atria creating clots that can then travel to the brain or coronary arteries resulting in a stroke or heart attack. SVT events also greatly reduce the stroke volume of the heart, and if they persist for extended periods of time they can cause a permanent reduction in ejection fraction, possibly resulting in congestive heart failure.

In a normally functioning heart, the sinus node acts as an orchestra conductor and methodically sends out a periodic electrical impulse. This electrical pulse starts a chain reaction throughout the heart causing the heart muscles to rhythmically contract and produce an orchestrated beat. Rogue electrical impulses can cause chain reactions to occur at the wrong place and at the wrong time, disrupting the sinus rhythm. The beating heart is a multi-dimensional nonlinear dynamical system that is sensitive to initial conditions. Hence, SVT events can produce chaotic outcomes that are impossible to predict with great accuracy. Doctors and researchers need a computer-generated dynamical model of the atria that they can perform experiments on. This research creates such a model. The model beats in real-time and can be adjustable down to the individual muscle level. This will allow researchers to create initial conditions that will produce SVT events that they can attempt to eliminate with simulated ablations. This work will greatly increase our understanding of what causes SVT events and how to eliminate them.

014.022 U **Making Unbiased Maps to Pass the Eyeball Test via MCMC Redistricting.** Tarleton State University, Stephenville, Texas. **Vianey Rangel**, Cody Drolet, Scott Cook
Political gerrymandering is a complex and pressing threat to our system of government. Release of 2020 Census results triggered the once-per-decade process of redrawing the boundaries of election districts. This highly charged political process profoundly affects elections for the following decade and invariably brings accusations of gerrymandering, where a party gains disproportionate political advantage by manipulating district boundaries. How can the degree of gerrymandering in a proposed districting plan be quantified? One option is to statistically compare it against a large ensemble of alternative districting plans. Generating such an ensemble is a difficult task for which mathematicians have developed powerful Markov Chain Monte Carlo (MCMC) based algorithms. However, without guidance, the resulting maps typically fail the “eye-ball” test by producing districts with highly irregular boundaries that wantonly ignore political borders like county lines. We present techniques that encourage Recombination MCMC to respect these borders and pass the “eye-ball” test while still producing unbiased ensembles of legally viable districting plans that provide context for evaluating fairness of a proposed districting plan.

Neuroscience Posters:

014.023 U **Optimizing 6-Hydroxydopamine Concentrations for induction of a Parkinson's Disease Like Behavior in Zebrafish.** University of Texas at Tyler, Tyler, Texas. **Adrian Romero**, Justin Hunt, Brent R. Bill, Ayman K. Hamouda
Parkinson's disease is an increasing problem that affects the quality of life for over 10 million people worldwide. Affected individuals undergo worsening symptoms that begin with motor function impairment and can eventually result in death. Parkinson's Disease is associated with the loss of Tyrosine Hydroxylase (TH) expressing dopaminergic neurons. TH is the rate limiting enzyme in catecholamine neurotransmitter synthesis including dopamine. Therefore, chemically induced animal models have focused on mitigation of movement abnormalities and loss of dopaminergic neurons as indicators for

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drug screening. We chose the 6-hydroxydopamine (6-OHDA) chemically induced Parkinson's Disease model in zebrafish as a tool for drug screening. Previous work on this model had been conducted with varying drug concentrations and methodologies. All demonstrated reductions in TH expressing neurons; however, the behavioral assessments varied in both method, dose of OHDA (1-750 μ M 6OHDA), and whether behavioral abnormalities were observed. The objective of the current study is to determine the minimal 6-OHDA dosage that is sufficient to induce a significant difference in behavioral effects while minimizing morphological toxicity. Zebrafish larvae were treated daily with 6-OHDA with ascorbic acid from 2 to 5-day post fertilization (dpf). We observed significant difference in behavior at ~20 μ M 6-OHDA, and developmental delays in swim bladder formation at 85 μ M 6-OHDA. The swim bladders were developed by 5 dpf when we assessed swim behavior; however, other signs of delay may still be present that would complicate results. Several studies focused on doses of 150 μ M 6-OHDA or higher; however, at these doses we observed severe morphological issues including edema, curved spines, and death. Future work will focus on the TH-expressing neuron pathology as assessed by immunohistochemical and Western blotting methodologies.

014.024 U **A Proposed Mechanism Involving the Transporter VMAT Putatively Mediating Responses to Environmental Drug-Paired Cues.** University of Texas at El Paso, El Paso, TX. **Alexa Tellez**, Valeria Garcia, Stephen Collins, Brittney Brito, Eddie Castañeda Ph.D. Elucidating mechanisms that drive drug craving is crucial to developing pharmacological interventions for addiction. Repeated exposure to psychostimulants produces an enhanced behavioral and neurochemical sensitivity to both the drug and drug-paired cues, known as sensitization. Evidence suggests that drug craving is driven by the enhanced release of dopamine produced by the pharmacokinetic effects of stimulant drugs and the activation of exocytosis in response to environmental drug-associated cues. However, the neural mechanism which mediates sensitization of dopamine release is unknown. Here we show behavioral data that supports the hypothesis that a Vesicular Monoamine Transporter (VMAT)-mediated mechanism contributes to sensitization of behaviors evoked by electrical stimulation previously shown to activate exocytotic-like dopamine release (depolarization- and calcium-dependent) in rats previously sensitized to amphetamine. We found that 1) Electrically Stimulated Rotational Behavior (ESRB) is sensitized to repeated AMPH treatment and 2) pretreatment of tetrabenazine (TBZ), a VMAT blocker, during the induction phase of sensitization prevents access by amphetamine to VMAT and, ultimately, the expression of behavioral sensitization of ESRB. These results identify a novel target for the pharmacotherapeutic treatment of addiction and paves the way for future research to determine whether blocking VMAT before exposure to amphetamine blocks sensitized dopamine exocytosis. This research has scientific merit for its promise to develop pharmacotherapeutic treatments for stimulant drug misuse.

014.025 U **Ethanol tolerance in honey bees.** University of Texas Rio Grande Valley, Edinburg, Texas. **Angel Salinas** Alcohol use disorder is a condition which affects millions of people yearly, including teens, in the US alone. It is characterized by one not being able to stop or control the use of alcohol despite negative social, economic, or health ramifications. Alcohol tolerance, which is when the intake of alcohol must be increased to achieve the same desired effect, is a hallmark of addiction and a deteriorating behavior. Because the genes and proteins involved in tolerance are also present in invertebrates, tolerance can be studied in animal models to identify the underlying cellular mechanisms involved. This project is aimed at studying and analyzing the molecular biology in the mechanisms involved in ethanol tolerance, using the honey bee as a model system. Using an activity monitor to quantify locomotion, this project is aimed at observing the development of tolerance and studying it using GABA receptor agonists and antagonists (known involved pathway in tolerance development). Preliminary tolerance assay experiments are in progress, in which development of tolerance using ethanol concentrations ascertained are expected. Anticipated results include the involvement of GABA receptor in tolerance development, with the effects of the agonist/antagonists being central.

014.026 U **Creation of a CRISPR/CAS9 Construct to Mutate *stox2* in Zebrafish.** The University of Texas at Tyler, Tyler, Texas. **Armando Sanchez**, Zoe Rain Williams, and Brent Roy Bill *STOX2* is a transcription factor that is associated with pre-eclampsia, a condition characterized by maternal high blood pressure and vascular abnormalities in the placenta. As a result, babies do not get the nutrition they need, and there is an increased risk of premature birth with low birth weight. Consequently, this impacts the development of the brain, and could lead to anxiety, depression, and schizophrenia in later life. *STOX2* is expressed in the placenta and within the brain of adults. The question that we are addressing is if the impacts on neurodevelopment are associated only with nutritional deficiency or if the protein is playing a larger role in the development of the brain. Zebrafish provide a unique system to assess the function of *STOX2*, because they develop outside the mother's womb and their genome is easily manipulated. Our lab has demonstrated the zebrafish homolog is expressed in the brain of developing larvae. Here we show our attempts to design and produce a CRISPR/CAS9 construct to mutate *stox2* in zebrafish. Future work will focus on mutation of *stox2* and assess impacts on neurodevelopment.

014.027 U **CRISPR/CAS9 Generation for the Zebrafish, *ahdc1* Gene.** The University of Texas at Tyler, Tyler, Texas. **Bethany Marie Woolman** and Brent Roy Bill Autism Spectrum disorder (ASD) is a behavioral diagnosis given to individuals that have difficulties with social communication, restricted interests, and repetitive behaviors. One to two percent of the population are diagnosed with ASD making it a major health and educational concern. Around 200 genes are highly associated with ASD; however, the role of many of these genes in neurodevelopment is not clearly understood. *AHDC1* is characterized by 2 AT-hook binding domains. Dominant gene mutations in *AHDC1* causes Xia-Gibbs syndrome, a syndromic form of ASD characterized ASD, severe intellectual disability, and vision issues. The zebrafish provides a unique tool to look at the function of this gene given its transience during larval development and its genetic malleability. While the overall conservation of this gene is less than 50%, domains retain greater than 70% identity. Here we show the creation of three CRISPR/CAS9 constructs that will be utilized for mutating the *ahdc1* locus of zebrafish. Based on previous work, the CRISPR/CAS9 system generates mutations at a sufficient frequency to observe phenotypes in the founder generation; therefore, future work will screen potential founder phenotypes.

014.028 U **Photoreception in the aquatic oligochaete, *Lumbriculus variegatus*.** University of the Incarnate Word, San Antonio, TX. **Emma Vequist** and Veronica Martinez Acosta Annelids can register light using photoreceptive cells to avoid predators and perform other phototactic responses. These cells are not always a part of a traditional eye-structure but instead serve as light sensing receptors that stimulate movement. In this study we use the annelid, *Lumbriculus variegatus* to investigate phototactic responses to different light stimuli. Photoreception in *Lumbriculus* is poorly defined, thus the main goal of this work is to characterize photoreception in a model system that also demonstrates remarkable capabilities for regeneration. Behavioral experiments utilizing different wavelengths of light were performed on both regenerating and non-regenerating worms at different time points post-amputation. A testing arena was set up in a controlled light environment where worms were allowed to initially adapt to the dark for 15 seconds, and then were exposed to a different light source, consisting of white (500-600nm), blue (460-470nm), green (515-520nm), UV (395-405nm), and red light (615-640nm). Preliminary data suggests that anterior regenerating fragments respond more robustly to light stimulus than posterior fragments, suggesting the presence of photoreceptive cells along the anterior and posterior body segments. Worm fragments also demonstrate differences in phototactic responses to green light, being far less responsive than white light. Continued investigation of responses to other wavelengths of light within the visible light spectrum, should help develop a better understanding of which wavelengths result in increased phototaxis. Lastly, we have identified using

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transcriptome analysis a putative LVA-opsin4 gene that was cloned recently to serve as a marker for these photoreceptive cells. We hope to use this sequence for gene expression analysis in non-regenerating and regenerating worm fragments.

014.029 U **Expression of rhodopsin and opsin in late-stage epigeal and hypogeal salamander embryos.** Texas State University San Marcos, Texas. **Evelyn Delcid-Morales**, Diana Emely Wiebe, Ruben Tovar, David M. Hillis, Dana M. Garcia
Evolutionarily, sensory systems have undergone extreme diversifications that have allowed vertebrates to survive diverse environments. The San Marcos salamander (*E. nana*) and the Barton Springs salamander (*E. sosorum*) live above ground in springs and streams whereas the Texas blind salamander (*E. rathbuni*) occupies caves and recesses in the Edwards Aquifer. From an evolutionary perspective, it is thought that the hypogeal state is derived, but what remains a mystery is the developmental adaptation of its sensory system to life under ground. The habitational broadening of the Eurycea salamander has been associated with the phenotype of reduced eyes exhibited in the Texas blind salamander. It is not clear whether this phenotype represents incomplete development, regression, or a combination of both. The Eurycea clade is a prime model for comparing the molecular mechanisms that are involved in diverging neural systems, since species within the same clade present two extremes of phenotypes that are associated with their environment. Retinal development in embryonic *E. rathbuni* has been observed; however, the extent to which the retina develops is unknown. We identify retinal rod and cone photoreceptor cells along with their associated visual proteins (rhodopsin and opsin, respectively) in blind species and in epigeal salamanders with fully developed eyes. Immunohistochemistry followed by confocal microscopy was applied for the investigation of sections of late embryonic stages of these salamander species. The results suggest opsin is expressed in the retina of *E. nana* and *E. sosorum*, and rhodopsin is expressed in all three species. Based on previous work indicating absence of visual pigments in adult Texas blind salamanders, we conclude expression of rhodopsin is transient or variable in this species. In future studies we will examine the expression of visual pigments at other stages to get a clearer picture of the time course and species-level variability in expression.

014.030 G **Investigating the mechanisms responsible for turnover of the ER stress sensing protein PERK.** University of Texas Health Science center, San Antonio, Texas. **Hema Manogna Gudlavalleti**, Brian Stoveken, Rathipriya Viswanathan, Srikanth Reddy Polusani, James Lechleiter
PKR like endoplasmic reticulum (ER) Kinase (PERK) is an early ER stress sensor. It is a transmembrane protein that activates the unfolded protein response (UPR), first by luminal-dependent dimerization, followed by autophosphorylation of the cytosol domains and subsequent phosphorylation eIF2 α . This early stress response reduces eIF2 α -mediated translation in cells when there is an accumulation of unfolded proteins to help restore homeostasis. PERK variants associated with tauopathies have been identified that show increased turnover rates and decreased kinase activity. However, the underlying mechanisms of PERK turnover have not been clearly resolved, which could help explain how PERK variants increase the risk of developing neuropathology. Preliminary studies indicate that pharmacological inhibition of autophagy with the drug chloroquine increases detectable levels of PERK using western blot analysis. Early estimates suggest chloroquine treatments (50 μ M) of cultured mouse embryonic fibroblasts (MEFs) increase PERK levels by 8-fold over a 28-hour period. Thus far, treatment of cultured MEFs with the proteasomal inhibitor MG-132 (25 μ M), does not appear to significantly affect total PERK levels at similar timepoints. Experiments are currently underway to use photoconvertible fluorescent proteins (PCFPs) fused to PERK. These studies will permit us to monitor protein turnover by imaging changes in converted fluorescent protein (green to red in response to near-UV irradiation). Following the total fluorescence of converted PCFPs is the experimental equivalent of measuring radioactivity in pulse chase methodology. The primary advantages of PCFP measurements are both total levels and the spatial location of PCFP-PERK can be monitored in live cells. Preliminary measurements indicated significant loss of PCFP-PERK, 24 hours after photoconversion. We plan to investigate the impact of various PERK mutations on turnover. Data generated from these studies may lead to new pharmacological targets for treating neurodegenerative disorders associated with PERK.

014.031 U **Changes in myelination during neural regeneration in *Lumbriculus variegatus*.** University of the Incarnate Word, San Antonio, TX. **Journie Gaeta** and Veronica Martinez Acosta
Lumbriculus variegatus is an aquatic oligochaete that is an excellent model for regeneration. Our lab utilizes *Lumbriculus* to study regeneration within the nervous system. *Lumbriculus* demonstrates two different patterns of regeneration: epimorphosis and morphallaxis. Epimorphic regeneration is described by the reemergence of amputated tissue through the recruitment of stem cells to the wound site. Morphallaxis is characterized by the transformation of a body part or piece of tissue into a new structure without the use of stem cells. A conserved feature of all oligochaete nervous systems are the presence of three giant neuronal fibers that run the length of the body, positioned just beneath the dorsal surface of the ventral nerve cord (VNC). The ventral nerve cord contains segmental nerves that extend to the periphery and are the site of sensory input and motor output. The VNC impinges upon a cerebral ganglion or "brain" that is found in the anterior most segments. The three giant fibers undergo significant changes in diameter over the course of regeneration. This change in diameter is marked by notable changes within the myelin sheathing that is associated with each of the giant nerve fibers. In this study we utilize transmission electron microscopy to measure changes in the number of myelin layers associated with each giant fiber and characterize changes in this number post-regeneration. Differences in compaction will also be analysed at 12hr, 24hr, and 72hr post-amputation. This is the first in-depth study of myelin found in *Lumbriculus* and the first description of changes in myelin organization during regeneration.

014.032 U **Changes in synaptic protein expression during neuronal regeneration.** University of the Incarnate Word, San Antonio, TX. **Kaelin Connolly** and Veronica Martinez Acosta
Regeneration is a property that is characterized broadly within the invertebrates. Some are capable of full body regeneration, while others are only capable of regenerating specific body regions. We utilize an annelid model system for regeneration, *Lumbriculus variegatus*, which displays incredible capacity for regeneration, being able to reform full body structures when as little as three segments worth of tissue remain. In addition to being excellent regenerators, *Lumbriculus* also fully recovers function in less than 24 hrs after amputation. In this time period after injury, medial giant fibers within the worm exhibit activity; suggesting the presence of pre-existing synapses within the nervous system, which become active following injury. To examine these silent synapses, synaptic protein levels associated with the recovery of synaptic function have been explored through immunohistochemical analysis and fluorescent labeling. One successful antibody, Anti-DSAP 47 is found along the lateral giant fibers within the ventral nerve cord. Additionally, we characterize serotonergic and FMRFamide positive neurons within the nervous system. Identifying neurotransmitters and their locations in the nervous system will allow for a more extensive understanding of their function during regeneration, as well as the contribution of synaptic proteins to this remarkable recovery of function. This investigation will contribute to existing research concerning regeneration in annelids and to our knowledge of the structure and function of nervous systems in general.

014.033 U **Efficacy of a transcranial photobiomodulation (PBM) light-emitting diode (LED) device on oxygenated hemoglobin and oxidized cytochrome c oxidase using broadband Near-Infrared Spectroscopy (bbNIRS).** The University of Texas at Austin, Austin, Texas. **Allan Frederick**, Roger Davis, Douglas W. Barrett, Patrick O'Connor, Turner Lime, and Francisco Gonzalez-Lima
Photobiomodulation (PBM) of the prefrontal cortex is typically conducted using non-invasive modalities like transcranial infrared laser stimulation (TILS) to induce hemodynamic and metabolic changes. In the mitochondrial respiratory chain, cytochrome c oxidase (CCO) catalyzes oxygen reduction for energy metabolism. We have previously measured dose-dependent increases of oxidized CCO and oxygenated hemoglobin (HbO) in the prefrontal cortex using innovative broadband near-infrared spectroscopy (bbNIRS). PBM via a safe, non-invasive 1064-nm infrared laser low-level light therapy

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(LLLT) has shown therapeutic promise by improving brain oxygenation, cognition and emotional function in humans. However, relative non-portability of the laser and extensive personnel training are practical limitations of administering this conventional laser-based LLLT. Here we assess the efficacy of a novel, wearable, light-emitting diode (LED)-based LLLT device that we developed as an alternative, safe and portable technology for PBM and to monitor blood oxygen saturation. The 3D-printed LED LLLT device is worn on the subject's forehead and consists of LED arrays, ambient light sensors, temperature sensors, a pulse oximetry sensor, and a mobile device software interface. We will use our group's validated bbNIRS technology for efficacy trials of our novel LED LLLT device, to determine whether it adequately administers PBM and sufficiently measures blood oxygen saturation. Furthermore, bbNIRS may detect whether the LED LLLT device has induced hemoglobin oxygenation or CCO oxidation indicative of adequate PBM. We will investigate whether the LED LLLT device may function as an alternate portable device for PBM and evaluation of brain oxygenation. This non-invasive wearable LED LLLT device with onboard neuromodulation assessment technology may overcome barriers of clinical and research access to PBM. Supported by the Oskar Fischer Project and Elhapa Foundation.

014.034 G **Electrophysiological Effects of Transcranial Infrared Laser Stimulation.** University of Texas at Austin, Austin, Texas. **Dariella Fernandez**, Douglas W. Barrett, Laura Gamboa, Allan Frederick, Francisco Gonzalez-Lima
Transcranial Infrared Laser Stimulation (TILS) is a non-invasive intervention that has been found to modulate mitochondrial respiration and cellular functions in the brain. In healthy adults, eight minutes of TILS to the right prefrontal cortex has been shown to improve memory and attention. However, little is known about the electrophysiological effects of TILS on the brain. Thus, the objective of this study is to map and image electrophysiological effects using electroencephalography in the cerebral cortex during and after TILS to the right prefrontal cortex. We will analyze the results of 22 participants that underwent 8 minutes of TILS or sham treatment. We will compare the density of alpha and beta waves between the TILS and sham group during and after TILS was administered and expand the analysis to include other brain oscillations such as the theta and gamma bands. The results from this study will help us to further understand the mechanistic link between photobiomodulation, its influence on various brain waves, and the cognitive enhancing benefits from TILS, which can help guide future clinical applications of TILS. Supported by the Oskar Fischer Project and Elhapa Foundation.

014.035 G **Beneficial effects of transcranial infrared laser stimulation on mitochondrial cytochrome c oxidase and cerebral oxygenation in older bipolar patients.** The University of Texas at Austin, Austin, Texas. **Douglas W. Barrett**, Courtney M. O'Donnell, Patrick O'Connor, and Francisco Gonzalez-Lima
There is growing evidence of mitochondrial dysfunction and prefrontal cortex (PFC) hypometabolism in bipolar disorder (BD). Older adults with BD exhibit greater decline in PFC-related cognitive functions than is expected for age-matched controls, and clinical interventions intended for mood stabilization are not targeted to prevent or ameliorate mitochondrial deficits and cognitive decline in this population. Transcranial infrared laser stimulation (TILS) is a non-invasive novel form of neuromodulation, in which photons delivered to the PFC photo-oxidize the mitochondrial respiratory enzyme, cytochrome c oxidase (CCO), the major intracellular photon acceptor in photobiomodulation. TILS at 1064-nm can upregulate CCO and increase differential levels of oxygenated vs. deoxygenated hemoglobin (HbD), an index of cerebral oxygenation. The objective of this study was to use non-invasive broadband near-infrared spectroscopy to assess if TILS to bilateral anterior PFC (Brodmann area 10) produces beneficial effects on mitochondrial oxidative energy metabolism (oxidized CCO) and cerebral oxygenation (HbD) in older (>45 years of age), euthymic adults with BD. The treatment procedure involved 2 minutes of baseline, 5 minutes of sham treatment, 10 minutes of TILS, and 5 minutes of follow-up, with interleaved bbNIRS measurements once per minute. This first sham-controlled study found that TILS to the PFC in adults with BD (N=15, 9 females) increased both oxidized CCO and HbD concentrations after a single session of TILS. By increasing these indices of brain metabolic activity, TILS has the potential to stabilize mitochondrial energy production and prevent oxidative damage in the PFC of adults with BD. In conclusion, TILS was both safe and effective in enhancing metabolic and hemodynamic functions in the PFC, which might help to alleviate the accelerated cognitive decline and mitochondrial dysfunction present in BD. Supported by the Oskar Fischer Project and Elhapa Foundation.

014.036 G **Impacts of transcranial infrared laser stimulation (TILS) on prefrontal cortex functional connectivity and cognition in patients with bipolar disorder.** University of Texas, Austin, Texas. **Laura Gamboa**, Roger E. Davis, Douglas W. Barrett, Patrick O'Connor, Turner Lime, and Francisco Gonzalez-Lima.
Bipolar disorder is a progressive, fluctuating mood disorder characterized by mania. Even with psychopharmacologic treatment, patients with bipolar disorder may experience recurrent depressive episodes and cognitive impairment. Hypotheses for mood dysregulation and cognitive deterioration underlying bipolar disorder include prefrontal cortex hypoactivation, as well as mitochondrial metabolic disruptions. Transcranial infrared laser stimulation (TILS) of the prefrontal cortex is a safe, non-invasive method of photobiomodulation. TILS photoactivates cytochrome c oxidase (CCO), a key enzyme in the mitochondrial respiratory electron transport chain, to catalyze oxygen reduction for energy metabolism. TILS has shown therapeutic potential by improving brain oxygenation, cognition, and mood in healthy adults. However, the impact of TILS on prefrontal cortex functional connectivity or cognition in patients with bipolar disorder is unknown. In an outpatient setting, we will assess whether TILS augments functional connectivity or cognition in patients with bipolar disorder. We will use validated instruments for diagnostic assessment of psychiatric illness, mania and depression. For non-invasive imaging of cerebral blood flow changes, patients will wear a functional Near-Infrared Spectroscopy (fNIRS) device before and after eight minutes of either sham or TILS treatment with a 1064-nm transcranial infrared laser. A general linear model will assess cortical changes at rest. Patients will also complete cognitive tests that assess deficits prevalent in bipolar disorder before and after either sham or TILS treatment. We will investigate if patients with bipolar disorder who receive TILS exhibit altered prefrontal cortex functional connectivity or cognitive performance changes. Non-invasive wearable functional brain imaging like fNIRS may uncover dysfunctional connectivity in psychiatric conditions like bipolar disorder. Supported by the Oskar Fischer Project and Elhapa Foundation.

014.037 G **Quantifying bilateral prefrontal photoneuromodulation via broadband near-infrared spectroscopy.** The University of Texas at Austin, Austin, Texas. **Patrick O'Connor**, Turner Lime, Douglas W. Barrett, and Francisco Gonzalez-Lima
Transcranial infrared laser stimulation (TILS) is a novel, non-invasive intervention to neuromodulate metabolic and hemodynamic responses that enhance cognitive function via photobiomodulation of cortical tissue. TILS to the prefrontal cortex has been shown to augment memory, attention, executive function, and learning in healthy adults. The primary molecular mechanism by which TILS is hypothesized to act is the photo-oxidation of cytochrome c oxidase (CCO), the terminal and rate-limiting enzyme in the mitochondrial electron transport chain. By increasing oxidized CCO, TILS results in increased oxygen consumption and production of metabolic energy. Studies utilizing broadband near-infrared spectroscopy (bbNIRS) have demonstrated dose-dependent increases in oxidized CCO, oxygenated hemoglobin (HbO), total hemoglobin (HbT), and differential hemoglobin (HbD) as well as a dose-dependent decrease in deoxygenated hemoglobin (HHb) in the TILS-treated (ipsilateral) anterior prefrontal cortex. However, the spatial specificity of these effects remains understudied. Here we show that TILS caused significant ($p < 0.05$) dose-dependent increases in HbO, HbD, and HbT in the ipsilateral prefrontal cortex, which continued to increase through the post-stimulation period. No significant hemodynamic or metabolic effects of TILS were found in the contralateral prefrontal cortex. These findings support the hypothesized neuromodulation mechanism by which TILS results in cognitive enhancement: dose-dependent photo-oxidation of cytochrome c oxidase that induces a robust hemodynamic oxygenation response, thereby promoting cognitive function in the prefrontal cortex. Data collection is presently ongoing to provide for an investigation of left vs. right prefrontal cortex stimulation. This study may advance bbNIRS as a novel brain mapping modality and guide research into future neuromodulation applications of TILS. Supported by the Oskar Fischer Project and Elhapa Foundation.

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014.038 G **Effects of transcranial infrared laser stimulation (TILS) on sustained attention in adults with attention deficit hyperactivity disorder (ADHD).** The University of Texas at Austin. **Roger Davis**, Zachary Wade, Douglas W. Barrett, and Francisco Gonzalez-Lima. The prominent features of inattentiveness and impulsivity found in adults with attention deficit hyperactivity disorder (ADHD) diminish quality of life more than the less prevalent symptom of hyperactivity. While an adult ADHD diagnosis is made when other psychological or psychiatric disorders are excluded, adult patients with ADHD experience significant barriers due to deficits of sustained attention. Hypotheses for inattentiveness of adults with ADHD include prefrontal cortex hypoactivation. Photobiomodulation via transcranial infrared laser stimulation (TILS) safely and non-invasively activates the prefrontal cortex. TILS photoactivates the terminal mitochondrial respiratory electron transport chain enzyme, cytochrome c oxidase (CCO), to catalyze oxygen reduction for energy metabolism. TILS has already shown therapeutic potential by improving brain oxygenation, cognition, and mood in healthy adults. The impact of TILS on sustained attention in adults with ADHD are unknown. Here we assess whether prefrontal cortex TILS in adults with ADHD augments attention. We will employ the validated instrument Adult ADHD Self-Report Scale (ASRS-v1.1) for the eighteen DSM-IV-TR criteria of ADHD. Blinded participants will complete a 14-minute, computer-based Conner's Continuous Performance Task-3 (CPT-3) both before and after 8-minute prefrontal cortex treatment with either sham or TILS using a 1064-nm transcranial infrared laser. We will investigate whether adults with ADHD who receive TILS improve in CPT-3 measures of inattention, impulsivity, sustained attention or vigilance. We anticipate our study to be a starting point to analyze any measurable effect of TILS on dimensions of attention in adults with ADHD traits. Coupling sensitive measurements of attention with TILS may assess the utility of reversing prefrontal cortex inhibition via TILS in individuals with psychiatric conditions like adult ADHD. Supported by the Oskar Fischer Project and Elhapa Foundation.

014.039 N **Determining the duration of effect of transcranial infrared laser stimulation with functional near-infrared spectroscopy.** The University of Texas at Austin, Austin, Texas. **Turner Lime**, Patrick O'Connor, Roger E. Davis, Douglas W. Barrett, Francisco Gonzalez-Lima. Functional Near-Infrared Spectroscopy (fNIRS) is a non-invasive brain imaging modality that utilizes light to monitor cerebral blood flow in real time by measuring changes in oxygenated and deoxygenated hemoglobin. Transcranial Infrared Laser Stimulation (TILS) facilitates increases in frontal cortical brain metabolic activity by photonic oxidation of cytochrome-c-oxidase, the rate-limiting enzyme for metabolic oxygen consumption and primary intracellular photon acceptor from near-infrared light. Though previous studies have corroborated these claims, there is no generally accepted duration of effect for TILS on prefrontal cortical activity and functional connectivity. This study seeks to establish a timeline for the duration of elevated prefrontal cortical activity and functional connectivity due to stimulation via 1064-nm transcranial-infrared laser. Using a wearable fNIRS device, we will record cerebral blood-flow data for one session pre-TILS at rest, and during a 2-back cognitive performance task. We will then record cerebral blood flow data during the same rest period and 2-back cognitive performance task, repeated post-TILS for day one, and for 4 consecutive days without TILS. Rest-period cortical activity will be evaluated using a general linear model. We will employ a graph theory analysis to assess differences in prefrontal cortex functional connectivity during the activation period (during the 2-back cognitive performance task). We aim to establish a duration of effect that can later be used to inform treatment regimen for clinicians and researchers as TILS becomes more widely implemented. Supported by the Oskar Fischer Project and Elhapa Foundation.

014.040 G **Metabolic mapping of rat brain activity after transcranial infrared laser stimulation.** The University of Texas at Austin, Austin, Texas. **Zachary S. Wade**, Douglas W. Barrett, Sindhu Venkat, F. Gonzalez-Lima. Photobiomodulation via transcranial infrared laser stimulation (TILS) is a novel intervention for non-invasively stimulating mitochondrial enzyme cytochrome c oxidase (CCO). CCO is the terminal enzyme in the mitochondrial electron transport chain, which catalyzes oxygen reduction for the metabolism of energy; the photoactivation of this enzyme is associated with improved cerebral oxygenation and cognition. This experiment aims to measure the duration of effects of TILS in rat brains up to 4 weeks after a single stimulation session. The rats' brains were collected 1 day, 2 weeks, or 4 weeks post-stimulation, and untreated brains were collected 1 day after the sham procedure. The brains were frozen immediately and will be sectioned using a cryostat, then subsequently stained using cytochrome oxidase histochemistry. Digital imaging will be used to capture images for the purpose of optical densitometry, to quantify group differences in CCO activity, in order to determine how long the metabolic effects of TILS persist after a single session. Supported by the Oskar Fischer Project and Elhapa Foundation.

Physics and Engineering Posters:

014.041 U **Density Perturbation of the Early Universe.** University of Houston - Clearlake, Houston, Texas. **Aleisha Warren**, Dr. David Garrison. The Cosmic Microwave Background, or CMB, is the radiation that spreads throughout the universe. The radiation we know as the CMB was created when the universe was around 380,000 years old. The universe has anisotropy, meaning it is not uniformly bright, it is also not uniform in temperature or density. Therefore, we can calculate the historic density perturbations based on the anisotropy of the CMB. The density perturbation is the average variance of densities throughout the universe. Using the simulation made by Dr. David Garrison and ran on the Singularity cluster at The University of Houston at Clear Lake, the density perturbation was calculated and tested. First, the density perturbation for when the universe was about 1 second old was calculated at 1.3×10^{-4} . Then using the code, tests were done to build a simulation where the universe was successfully developed, and the density perturbations resulted in the calculated value. These simulations started during the Electroweak Phase Transition when the universe was about 10^{-12} seconds old. This brings us a better understanding of the universe and how it transitioned from radiation dominated to matter dominated. The perturbations also help solve the initial conditions of the universe when it was less than 1 second old.

014.042 U **Effect of Weak Magnetic Fields on Protein Structure.** University of Houston - Clear Lake, Houston, TX. **Dillon Cline**, Kathryn Rutherford, and Samina Masood. Magnetic fields have been shown to exert certain effects on bacteria, including growth inhibition and major structural changes. We apply a quantum mechanical approach to describe structural changes of proteins in the presence of weak magnetic fields. As a preliminary study of this project, we use the double-well potential to find the probability of radical attachments to a protein chain. We start by studying the available energies and potentials relevant to standard relations for the replacement processes. Then we plan to apply it to actual protein structures and find out how the external field or radiation may change the existing structure of proteins under differing conditions.

014.043 U **PIG Pipe Cleaning Device.** University of Houston-Clear Lake, Houston, Texas. **Glenda Rubio**, Jaseem Muhammad, Aline Lira, Martin Demaret, Ryan Jarnagin, Ariful Bhuiyan. This report discusses a solution to the cleaning of the interior of a pipe that is resting on a storage rack. The portable pig device will use high pressure water to clean the interior of the pipe while traversing the length under its own power. The target market for the portable pig is businesses that own laydown yards for steel piping, and piping resellers. The design solution will incorporate a larger water reuse system while maintaining a financially lucrative outcome for the business. This design will help the economic and ecological aspects of the company using the product.

014.044 U **Ultrasonic Thickness Measurement - Telescoping Attachment Bracket.** University of Houston - Clear Lake. **Modesto Rojas**, James Colson, Reid Mills, Nancy Ainslie, Wagmee Fernando, Dr. Ariful Bhuiyan

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Ultrasonic Thickness Measurement (UTM) testing is a widely recognized method of testing the wall thickness of pipes, tanks, and pressure vessels in various industries. The main purpose of UTM testing in this environment is to check for corrosion and erosion over a predetermined period of time as a way of measuring remaining life of equipment as part of the mechanical integrity process, therefore avoiding untimely and costly equipment failures. The goal of this project was to find a safe, time and cost-effective method to conduct UTM testing at heights that are outside of arms reach for the average technician. Through brainstorming and customer feedback, it was decided that a telescoping pole-mounted application that could disperse the required couplant, take multiple readings per deployment at heights of up to 15', and could be used by a single technician would be the preferred route. Early cost-savings analysis indicated that if such a product were properly utilized it could save the customer well over \$100,000 per year. Through customer feedback sessions, team brainstorming sessions, and research into the specifics of UTM applications, several initial designs were developed. While the final design is still a work-in-progress, several key features were identified as design requirements, including optimal entry angle of the UTM transducer, the need for a high coefficient of friction material to be utilized to prevent slippage, the minimizing of metal components and overall design weight, and a support harness capable of allowing the technician to keep one hand free to perform the steps necessary to operate the UTM equipment. These design requirements along with project budgetary restraints also impacted the team's decision to make a concerted effort to focus on off-the-shelf parts wherever possible.

014.045 U **Human Knee Joint Simulator.** University of Houston-Clear Lake, Houston, Texas. **Salvador Talavera-Mejia**, Daniel Ponce, Matthew Paine, Colton Picazo, Linda Jimenez, Miguel Guzman

The Anterior Cruciate Ligament (ACL) is a complex and important part of the knee. Damage to this portion of the knee can cause serious issues to a person's ability to walk if unaddressed. There is an interest in researching if height of a tibial eminence can directly impact strain on an ACL based on a history and prevalence of non-contact ACL injuries in sports. Different tibial eminence geometries generate different angles of normal forces resulting in differences in friction at bone interfaces. Currently, no non-invasive or cost-effective procedure exists to test this portion of the knee. This report describes a testbed design to be used in conjunction with an off-the-shelf robotic arm to allow testing of ACL strain from differing tibial eminence heights. This will allow the design's intended customer base of University of Houston – Clear Lake's engineering faculty to conduct research on phenomena and possibly provide solutions to the problem. The design consists of one major system utilizing the robotic arm and two sub-assemblies which support the tibia and femur. Design specifications were guided by current engineering codes and standards that deal with uncertainty of testing apparatuses, as well as ASTM standards regarding in-vitro testing. Design aspects were selected and evaluated with the goal of maximum operational efficiency and minimal cost of fabricating the device. The completed system design's cost per unit is estimated to be \$1,230.00 in total.

Plant Biology Posters:

014.046 U **Patterns of Historical Migration in *Mentzelia thompsonii* (Loasaceae) Based on Climate Niche Reconstructions.** Abilene Christian University, Abilene, Texas. **Brianna Douglas**, Gracie Granados, Katie Howe, and Joshua Brokaw

Mentzelia thompsonii is a self-compatible annual plant found along the Colorado-Utah border within the badland slopes and valleys of the Mancos Shale Formation. Previous studies of cpDNA variation have found that lower elevations in the northwestern half of the distribution of *M. thompsonii* possess highest genetic diversity, whereas the eastern populations at higher elevation have much lower diversity. We hypothesized that Pleistocene climate change and complex topography led to changes in distribution patterns that shaped the genetic structure of these populations. To test the hypothesis that these ranges represent distinct refugia, we used current and paleoclimate data from the WorldClim database to create climate niche models in Maxent to trace migration patterns based on climate alone. We found that the current distribution of *M. thompsonii* is substantially smaller than the potential distribution based on climate, suggesting that soil specialization has substantially affected distribution patterns. Further, when compared to the potential distribution during the last glacial maximum, *M. thompsonii* has spread further east and south into Colorado, and most of the favorable habitat in the past was located northwest of the Colorado River where much of the genetic diversity is currently located. Further research accounting for soil types is needed to test these conclusions.

014.047 U **DNA Barcoding of Plant Specimens in Poaceae from Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Crystal Rauschuber**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez

Poaceae, the grass family, is a diverse family in which species are difficult to identify. The main purpose of this study was to determine if molecular techniques could accurately identify three grass specimens collected in Guadalupe County, Texas. The original identifications of the three specimens were *Panicum coloratum*, *Panicum dichotomiflorum* and *Paspalum laeve*. For the molecular technique, the DNA of each specimen was extracted from their leaves or stems. DNA regions, which included *rbcl* (*ribulose-1,5-biphosphate carboxylase-oxygenase, large subunit*), *matK* (*maturase K*) and *ITS2* (*internal transcribed spacer 2*) were amplified using PCR. The PCR products of these genes were then visualized with gel electrophoresis, sequenced, then analyzed using the BLAST and the GenBank database. When the sequences were examined with BLAST, the resulting *rbcl*, *matK* and *ITS2* sequences with the highest similarities to GenBank sequences were considered the possible candidate identities. The list of possible candidate species for each specimen was then ranked based on three criteria: 1) whether the species had been found previously in or adjacent to Guadalupe County, 2) support of identity based on morphological characteristics, and 3) how closely the plant sequences matched to GenBank sequences. For example, the *Panicum coloratum* specimen was evaluated using the three criteria and reidentified as *Panicum capillare*. For the other two specimens, *Panicum dichotomiflorum* and *Paspalum laeve*, the three DNA markers did not provide enough information to definitively change the original identification. Future studies will need to use additional DNA markers and additional specimens of each species to evaluate grass specimens.

014.048 U **DNA Barcoding of *Amaranthus* Plant Specimens from Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **JaMaurey Webster**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez

The genus *Amaranthus* (Amaranthaceae) is comprised of 60-70 species and is difficult to identify morphologically. To help with this problem, DNA barcoding can be used to identify organisms. When using DNA barcoding on plants, certain genes are commonly utilized. The commonly used barcodes are *rbcl* (*ribulose-1,5-biphosphate carboxylase oxygenase -large subunit*), *matK* (*maturase K*), and the nuclear encoded marker, *ITS2* (*internal transcribed spacer 2*). The purpose of this experiment was to apply DNA barcoding to eight specimens belonging to three species within *Amaranthus* to see if the plants were correctly identified using morphological traits alone. All specimens were housed in the herbarium at Texas Lutheran University. To perform DNA barcoding, DNA was extracted from each plant specimen. Then the *matK* and *ITS2* regions were amplified with PCR. After visualization of the PCR results by gel electrophoresis, the *matK* and *ITS2* regions were sequenced. Using BLAST, the sequences of the eight samples were compared to each other and to previously-identified *Amaranthus* species in the GenBank database. The molecular results confirmed the earlier morphological identification of the eight specimens showing DNA barcoding is a useful tool. Interestingly, when comparing the Guadalupe County samples of the same species to each other, there was 100% similarity in the DNA sequences. However, when comparing the Guadalupe County samples of the same species to sequences submitted to GenBank by other researchers, there were greater intraspecies differences. From this, we concluded that comparing the sequences of our plant specimens to GenBank sequences that were from other geographical regions was less helpful than comparing amongst our own samples from Guadalupe County.

014.049 U **Induced Defenses in Sorghum Defense Mechanisms And their Effects on Aphid Growth and Reproduction.** University of Texas Rio Grande Valley. **Jessica Ayala**, Isabella Rodriguez, Rupesh Kariyat, Sajjan Grover, and Joe Louis

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Sorghum (*Sorghum bicolor*) is a widely used cereal crop that is commonly used as livestock feed and is typically preyed on by aphids. While previous studies have focused on the impact of individual aphid species' feeding on sorghum, we examined the effects of sequential herbivory by aphids on sorghum to gain a further understanding of the differential defense responses in sorghum following sugarcane (*Melanaphis sacchari*) aphid and greenbug (*Schizaphis graminum*) feeding. We used bioassays in which sorghum plants were infested with either sugarcane aphids or greenbugs, then after 48 hours the aphids were removed and replaced with either sugarcane aphids or greenbugs which were then counted after 96 hours. To estimate the differential defense responses in sorghum after sugarcane aphid and greenbug herbivory, we employed a gene expression study in which sorghum plants were infested with either sugarcane aphids or greenbugs for 48 hours and analyzed using qrt-PCR. For qrt-PCR, the housekeeping primer, Tubulin, was compared to pathogenesis related target genes *PR1* and *PR10*. Our results show that there was a significant difference in the salicylic acid produced between sugarcane aphid infested plants and greenbug infested plants. *PR1* expression was lower in sugarcane aphid infested plants than in uninfested plants and *PR1* expression is much higher in greenbug infested plants than uninfested plants. Collectively, our results suggest that greenbug infested sorghum plants are more resistant to sugarcane aphids and that greenbugs induce stronger defense responses in sorghum plants than sugarcane aphids

014.050 U **DNA Barcoding of Plant Specimens in Fabaceae from Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Mattison Young**, Mark Gustafson, Alan Lievens, Danielle Grove, Stephanie Perez

DNA barcoding is a form of molecular analysis that is helpful in plant species identification. DNA barcoding is not only a powerful tool for plant identification, but it can also answer important questions in ecology, evolution, and conservation biology. A DNA barcode uses a short universal segment of the genome that is compared to other known sequences in a database. The plant family investigated in this project was Fabaceae. The plants of the family are sometimes difficult to identify morphologically. This study utilized *ribulose-1,5-biphosphate carboxylase-oxygenase large subunit (rbcL)* and *maturase K (matK)*, two chloroplast genes. The goals of the project were to determine which DNA barcode had the best discriminatory power for species-level identification, and to classify unknown specimens. The methods used in this study included 1) DNA extraction, 2) PCR of *rbcL* and *matK*, 3) gel electrophoresis, 4) sequencing, and 5) comparison of specimen sequences to GenBank sequences using BLAST. An example of sequence analysis results from three specimens in this project were the following three specimens that were all previously identified as *Galactia volubilis* (L.) Britton using traditional morphological methods. Upon further analysis using DNA barcoding, it was discovered that Specimen 1 was a 100% match to *Strophostyles leiosperma* (Torr. & A. Gray) Piper using *rbcL* and *matK*, Specimen 2 was a close match of 99.82% to *Galactia volubilis* (L.) Britton, and Specimen 3 was a 100% match to two species within the genus *Rhynchosia* (Lour.) for *rbcL* and *matK*. These results show that DNA barcoding could identify specimens that needed further morphological analysis of the plant vouchers. Using both molecular and morphologically techniques, the specimens were identified to the species level.

014.051 U **Geographic Patterns of Genetic Diversity in *Mentzelia thompsonii* (Loasaceae).** Abilene Christian University, Abilene, Texas. **Megan Howard**, Brianna Douglas, Katie Howe, and Joshua Brokaw

Mentzelia thompsonii is a small annual plant from the family Loasaceae found in badlands along the Colorado-Utah border. Its small flowers and barbed hairs on leaves and fruits suggest that *M. thompsonii* is a ruderal with adaptations for colonizing new habitats by frequent seed dispersal via animal activity. However, preliminary studies have suggested substantial geographic divisions among cpDNA haplotype clades across its distribution. *M. thompsonii* exhibits highest haplotype diversity at lower elevations north and west of Grand Junction, Colorado, whereas high elevation canyons to the east and south possess a distinct clade of cpDNA with much lower diversity. For the first time in this study, we determine a precise geographic boundary between the 'West' and 'East' cpDNA clades near Fruita, Colorado, and report new rare haplotypes in each clade. Furthermore, we report the first evidence of possible long-distance migration based on a single 'West' haplotype sample recovered in the far eastern portions of the *M. thompsonii* range. Based on substantially expanded sampling within populations, we find that the co-occurrence of multiple haplotypes in a single contiguous population appears to be very rare in *M. thompsonii*, despite the recovery of different haplotypes in nearby locations or the same locations in different sampling years, suggesting that most populations are established by a single dispersal event. Together these patterns suggest that populations of *M. thompsonii* experience relatively low gene flow despite the appearance of ruderal morphology.

STEM Education Posters:

014.052 N **Learning through Writing: A Three-Phase Project to Improve the Performance of Student Lab Report Writing in Undergraduate Chemistry Lab Courses.** University of the Incarnate Word, San Antonio, Texas. **Alakananda Ray Chaudhuri**, Betsy Leverett, Kayla Brown, and Rafael Adrian

Writing lab reports is an integral part of chemistry education at all levels and has been associated with increased student engagement in learning. Deficiencies in lab report writing skills and a lack of understanding among chemistry students about the importance of lab protocols have remained persistent issues in our chemistry lab courses. Student attitudes toward writing have often reflected the department's overall lack of focus in this area of chemistry pedagogy, and therefore, significant developments in student writing have been unusual, even in the upper-division lab courses. As a result, a typical students' conception is that writing in lab courses is a tiresome and optional burden rather than an educational tool. To address these issues, a three-phase laboratory writing program has been designed and implemented to improve lab writing skills, classroom preparedness, and curriculum engagement. The program involves restructuring the lab curriculum to be more focused on writing skills development by incorporating writing practice, lab report scaffolding, and peer evaluation of student protocols. The study is ongoing and examines the chemistry lab report writing practices in successive lab courses: Chemical Principles (general chemistry), Organic Chemistry, and Quantitative Analysis. Lab report grades are used to assess direct writing improvement, and exit surveys are employed to qualitatively gauge how students feel about writing lab reports. Preliminary findings indicate that students feel more prepared for lab and confident about lab report writing.

014.053 U **Chemical composition of copper-tin-aluminum alloys from a system of three equations in three variables via non-destructive sample analysis.** Sam Houston State University, Huntsville, TX. **Ariel Van-Sertima**, Raul Zablah-Vasquez, Sandra Simmons, Adrian Villalta-Cerdas

To foster the interconnectivity between the macroscopic and the symbolic levels of chemistry in the laboratory, we designed a learning experience that guides students into solving three equations in three variables concerning a chemical composition analysis. In the laboratory experience, students are asked to determine the chemical makeup of alloys made of copper, tin, and aluminum. The experimental process consists of determining two physical properties of the alloy samples: density (d) and heat capacity (C_p). The procedures are non-destructive and efficiently completed within the standard time of laboratory sessions at the college level. Once the data is collected, the students are presented with three linear equations connecting the percent mass of the elements in the alloy (three unknown variables) to the total composition, density, and heat capacity of the alloys. The system of three equations in three variables is then solved for the percent mass composition of each metal in the alloy. To complete the laboratory experience, students need to collect data from many samples and share their collective results for all the class to compile and interpret. In this way, the laboratory experience is better aligned with several desired goals of laboratory education put forth by the National Research Council in 2005: "development of scientific reasoning, understanding of the nature of science, developing practical skills, and supporting mastery of subject matter." The experimental results of students' analyses of several alloys samples showed differences of +/-10% to the actual percent compositions of the samples. A discussion of the

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laboratory procedures, data, and results will be presented in light of their design and implementation for the General Chemistry laboratory program at Sam Houston State University.

014.054 N **Learning through teaching: incorporating community engagement into biology classes.** Sam Houston State University, Huntsville, TX. **Diane Neudorf**

Academic Community Engagement (ACE) is a method of teaching that combines classroom instruction with community engagement activities. Students use skills learned in the classroom to work with community partners to benefit the community. At Sam Houston State University, classes that incorporate community engagement are designated as "ACE classes". For a typical three credit hour class students are required to participate in at least nine hours outside the classroom working on the community engagement activity. Students gain the ACE designation for those courses on their transcripts. I have been "ACEing" two of my classes for the last 10 years. Ornithology is a graduate class and Honors Zoology is a freshman class. In both classes students have provided various displays and programs for school age children and the general public on various topics in organismal biology. Both classes are conducive to educational programs for children that facilitate student learning through exploring topics in depth and gaining presentation skills. I will share my strategies for incorporating community engagement in biology classes and the potential benefits to STEM education.

014.055 U **Teaching the Fourier Transform to senior students in Instrumental Analysis using Microsoft Excel.** Stephen F. Austin State University, Nacogdoches Texas. **Hailey Rene Marion, Darrell Ray Fry**

The Fourier Transform can be a challenging topic for senior level chemistry students because the material is often unfamiliar to them. In this presentation we describe a relatively simple laboratory exercise. The exercise has three parts: 1) the Fourier Synthesis, 2) the Fourier Transform and 3) the impact of the time step and the number of data points used on the resolution. In part 1, the students build a "complex" time dependent signal in Microsoft Excel by adding together several sin and/or cosine waves. The students are able to visualize their input signal before carrying out part 2. In part 2, the Fourier Transform, students use the built in Excel function to perform a Fourier Transform on their "complex" signal they created in part 1. The output shows students the frequencies used to make their "complex" signal in part 1. In part 3, students are given three closely spaced frequencies and guided in how to perform a Fourier Transform to resolve the frequencies using the time step and the number of data points used. Student made demonstration videos have been created for the exercise. In the future, we hope to evaluate student perceptions of the exercise and the videos.

014.056 U **Understanding density and viscosity of aqueous solutions in the chemistry laboratory.** Sam Houston State University, Huntsville, Texas. **Raul Zablah-Vasquez, Jacqueline Jimenez, Adrian Villalta-Cerdas**

Many chemistry laboratories are designed as one-week learning experiences focused on specific concepts and techniques. This segmentation often causes students to overlook the interconnection between chemistry concepts, laboratory techniques, and the overarching ideas of the laboratory curriculum. The work presented herein focuses on a multi-week interconnected laboratory design to foster clear connections between chemistry concepts (i.e., density, viscosity, and volume contraction) and the laboratory techniques. The laboratory work consisted of preparing binary mixtures of organic solvents (i.e., methanol, ethanol, isopropanol, and acetone) with water and determining the density and viscosity of the resulting solutions. Central to the laboratory design is the connection between the measurements, data collection, and binary systems' properties. Thus, data gathered during the determination of density and viscosity are integrated to explain the observed volume contraction in the four binary systems. In particular, molecular volume (and shape) and intermolecular forces are critical concepts in constructing the explanation. Furthermore, molecular mechanics calculations were performed in Gaussian to determine the aqueous solutions' physical properties and contrast the results against the empirical data. Laboratory procedures, data, and results will be presented and discussed in light of their design and implementation for chemistry laboratory programs.

Systematics and Evolutionary Biology Posters:

014.057 G **The origin and evolution of beta-keratins.** The University of Texas at Tyler, Tyler, Texas. **Amanda R. Odom, Matthew J. Greenwald**

Vertebrate epidermal appendages are comprised of fibrous structural proteins known as keratins. While alpha (α)-keratins are found in all vertebrates, beta (β)-keratins are only found in birds and reptiles. Beta-keratins comprise epidermal structures such as feathers, beaks, spurs, claws, turtle shells, and scales. Beta-keratins have been previously described in birds, crocodylians, and turtles, but less so in squamates. One squamate species whose β -keratins have been previously studied is the green anole, (*Anolis carolinensis*) where Alibardi (2010) identified 40 β -keratin sequences. Using these sequences, we performed a comparative bioinformatic analysis to identify β -keratin sequences within the genomes of over two dozen lepidosaurian species, including that of the tuatara. Using previously published avian, crocodylian, turtle and newly identified lepidosaurian sequences, we performed ancestral state reconstruction and phylogenetic analyses to provide insights into the origin and evolution of β -keratins.

014.058 U **Pax6 expression among sighted and blind salamanders of the genus Eurycea.** Texas State University, San Marcos, Texas & The University of Texas, Austin, Texas. **Brittany Dobbins, Emily Floyd, Muhammad Rehan, Emely Wiebe, Ruben Tovar, David Hillis, and Dana Garcia** Central Texas is home to several species of aquatic salamanders in the genus *Eurycea* that inhabit a range of habitats including surface and subterranean environments. In contrast with their surface-dwelling relatives (e.g. *E. sosorum* and *E. nana*), subterranean species (e.g. *E. rathbuni*) exhibit characteristics associated with life in perpetual darkness, including reduced eyes and pigmentation. Subterranean environments can exert strong selective pressures while relaxing others. Eye reduction in subterranean species is thought to be a product of relaxed selection, while positive selection may result in the augmentation of other sensory systems. Pax6 is a conserved protein involved in central nervous system development in all vertebrates and serves as a master gene guiding eye development. Here we visualize Pax6 of the aforementioned species during a late stage of embryonic development using immunohistochemistry followed by confocal microscopy. Pax6 labeling was observed in the developing eyes of all three species. Interestingly, areas of highly localized Pax6 expression were observed in clusters of cells within the epidermal layer as well. The shape and position of these cells suggests they are neuromasts, sensory organs that make up the lateral line organ of aquatic vertebrates. To our knowledge this is the first observation of Pax6 expression in neuromasts. We aim to quantify neuromast distribution and map their development in these species to determine if subterranean life has led to increased selective pressure for a more extensive lateral line system.

014.059 U **Assessment of fossil rodent dentary elements found in Friesenhahn Cave (San Antonio, Texas).** Concordia University Texas, Austin, Texas. **Logan Eric Durrenberger** and Mary Kay Johnston

Large-scale changes in Earth's climate, including anthropogenic climate change, have affected organisms and their environments around the globe. Ecological principles such as Bergmann's rule and Allen's rule suggest a relation between climate and an organism's body size. The small rodents, such as mice, rats, gophers, and voles, are particularly sensitive to climate conditions and can give us insight into the community structure, ecosystems, and climate of ancient environments. Lundelius (2003) suggests that the east-west climatic gradient observed in Texas was less pronounced during the Pleistocene era than that of the modern era. To help assess these hypotheses, we conducted a preliminary assessment of lower dentary elements of rodents collected from Friesenhahn Cave, an important site of Pleistocene fossils in San Antonio. We identified 209 specimens, representing eight genera of rodents (*Perognathus*, *Sigmodon*, *Neotoma*, *Dipodomys*, *Microtus*, *Peromyscus*, *Reithrodontomys*, and *Thomomys*). A majority of this collection consisted of *Perognathus* (33%) and *Sigmodon* (25%). Further, we conducted a field survey of modern rodents in Central Texas. Body size of modern-day *Sigmodon* live-captures were compared with predicted body sizes of fossil collections. We found there to be no significant difference in body

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size between Pleistocene *Sigmodon* and modern-day specimens. This preliminary work provides a foundation for future investigations of the Pleistocene rodents of Central Texas. Future work includes species-level identification and using landmark-based geomorphometry to quantify and assess intra- and inter-species variation among rodent species, thereby allowing researchers further insight into these hypotheses.

014.060 U **Skull Anatomy of a Gecko from Australia (*Ophidiocephalus*)**. Sam Houston State University, Huntsville, Texas.

Makayla Hernandez, Eric Pianka, Aaron M. Bauer, Juan D. Daza

Pygopods are a group of snake-like geckos from Australia and New Guinea. Today there are 46 species described in the family Pygopodidae. The skull anatomy of pygopods has been studied in detail for several species. Nonetheless, the monospecific genus *Ophidiocephalus* has not yet been described. Here we provide a 3D model of the head for the first time, where all the bones have been separated using the commercial software Avizo Lite.

Ophidiocephalus possesses the general characters of pygopods, including a skull narrow and long, prefrontal and postorbitofrontal bones in contact excluding the frontal from the orbit, broad frontal bones with ample olfactory tracts, deep choanal groove in the palatine, and a rectangular retroarticular process. However, the skull is different in having a pointed nasal process of the premaxilla, nasal bones shaped like a parallelogram, and parietal bones diverging posterolaterally. One conspicuous characteristic is the long parabasisphenoid rostrum that approaches without contacting the subolfactory process of the frontal bones. This is a character also seen in some species of the pygopod genus *Aprasia*. Based on the current molecular hypothesis of their relationships, this character would have evolved twice in the group. This project fills a gap in the knowledge of pygopod anatomy and helps us understand better the morphological variation and evolution of this strange group of lizards.

014.061 U **Morphometric characterization of a hybrid gecko from Puerto Rico**. Sam Houston State University - Huntsville, TX. **Olivia**

Heide, Alexandra Herrera-Martínez, Tony Gamble, Brendan Pinto, and Juan Diego Daza

Hybridization is a rare event, usually reported for parthenogenetic reptiles. There is a stable hybridization zone in south Puerto Rico between *Sphaerodactylus townsendi* and *S. nicholsi*. The hybridization between these species was first documented using electrophoretic data, and recently was studied using genetic sequence data. Despite the fact that this hybrid zone is well known, the phenotypic changes associated with this evolutionary event have not been documented. Here we use morphometric data from digital X-Rays to examine specimens of the two parental species (21 *S. nicholsi*, 14 *S. townsendi*) and the hybrids (6). We took 15 measurements from the skeleton of all individuals, and used them in Principal Components Analysis. Results from this analysis show that the hybrids occupy an intermediate position on the morphospace, for the skull length and width, and the 4th toe length. Nonetheless, hybrids differentiated from its parental species in humerus and ulna length. The use of linear morphometrics allows to document the phenotypic similarities and differences between hybrids and its parental species in this particular case.

014.062 U **Bioengineering Microbes Using Natural Selection to Terraform Mars**. Texas Lutheran University, Seguin, TX. **Spencer A. Lee**, Robert M. Jonas

As the future of life on Earth continues to look less promising due to climate change, expanding the reach of biological life to other planets is a theoretical solution. Mars, the only other planet in the habitable region around our sun, has multiple reasons it cannot support life, including its low temperature. This study aimed to evolve organisms to live in extremely cold temperatures. Temperature selection experiments were performed on *P. fluorescens* and *E. coli* to select for growth at lower temperatures. The *P. fluorescens* temperature selection experiment selected for cells that can grow at a new minimum temperature which is over 20°C lower than the optimal growth temperature (25-30°C). Previous experiments discussed cells that could grow at 4°C but not below. The *E. coli* temperature selection experiment confirmed previous findings that 7°C is *E. coli*'s minimum growth temperature. The genomes of selected and reference strains of *P. fluorescens* were sent for sequencing, and the results showed differences in protein sequence between the two strains. This experiment is the first step in creating bacteria that are able to survive in the inhospitable regolith of Mars.

Terrestrial Ecology and Management Posters:

014.063 G **Mechanical disturbances have differential effects on *Solanum elaeagnifolium*, making it a Super Weed Candidate by**

Improving Fitness and Defense Traits in the Lower Rio Grande Valley. University of Texas Rio Grande Valley. **Alejandro Vasquez**, Jesus Chavana, S. Singh, B. O. Christoffersen, A. Racelis, and Rupesh Kariyat

Studies have shown that disturbances can lead to patterns of accelerated growth in weeds; however, these studies have primarily been focused on soil disturbances and not on mowing and how mowing can impact weed traits. In this study, we used *Solanum elaeagnifolium*, Silverleaf Nightshade, as a model via extensive field, greenhouse, and laboratory experiments to examine whether continuous mowing of this weed influences growth and plant defenses, and whether these influences cascade into offspring. Our studies found that mowed plants produce significantly less total number of seeds per plant, lower number of fruits, but seeds had higher mass, faster germination, and higher germination rates. In herbivory feeding experiments, *Manduca sexta* (tobacco hornworm) larvae gained more mass on seedlings from unmowed plants, while another generalist herbivore *Aphis craccivora* (cow pea aphid) established better on mowed seedlings. A third herbivore, the Texas Potato Beetle (*Leptinotarsa texana*) did not show any differential feeding effects. And specific root length, and important root trait was also found to be significantly higher in first generation seedlings from mowed plants than those from unmowed plants. Taken together, our studies show that mowing operates as a selective pressure that can potentially produce superweeds by enhancing and modifying some fitness and defense traits.

014.064 U **Climate sensitivity and missing rings in Douglas fir (*Pseudotsuga menziesii*) tree-rings near Cloudcroft, NM**. Wayland Baptist University, Plainview, TX. **Bruna A. Moureira**, Matthew S. Allen

Variability in tree-ring growth often reflects annual variation in climate or environmental conditions. In periods of extreme stress (e.g., drought), trees may fail to produce a complete ring, resulting in "missing" rings from a tree-ring series. In this study we sought to understand both the climate sensitivity and the patterns of missing rings in Douglas fir trees (*Pseudotsuga menziesii*) from a site near Cloudcroft, NM in the Sacramento Mountains. We cored 23 trees, crossdated the tree-ring series, and recorded the calendar year of missing rings. Core age ranged from 95 to 210 years, with 1812 as the earliest calendar year. Tree-ring growth patterns were highly intercorrelated ($r = 0.796$), indicating that trees responded similarly to environmental conditions. Growth was correlated with growing season precipitation ($P = 0.014$) and the occurrence of droughts was reflected by episodes of suppressed growth and missing rings. All missing rings occurred in recent decades (post 1950s, mostly after 2000), perhaps reflective of increasing stress due to climate change or reduced growth rates due to aging trees. Continued work will focus on resolving the factors that cause trees to fail to produce a ring in some years. We also plan to extend the chronology further back in time through more sampling.

014.065 U **Interaction between co-occurring populations of raccoons (*Procyon lotor*) and Virginia opossums (*Didelphis virginiana*) in an urban ecosystem**. East Texas Baptist University. **Cameron Castles** and Troy A Ladine

From 15 October 2014 to 1 November 2021 activity of raccoons (*Procyon lotor*) and Virginia opossums (*Didelphis virginiana*) was obtained with trail-cameras located randomly in the urban forest of the East Texas Baptist University's Environmental Studies Area. The study site is located within the city limits of Marshall, TX. The objective of this study is to assess the interactions occurring between Raccoons and Virginia opossums in the urban ecosystem. Interactions between the two species were assessed through temporal, vegetative, geographical, and lunar variables. Niche separation between the two species was indicated through a logistic regression model. The estimate in importance of selection for raccoons and p-value in parentheses following each variable. Model: Species = Distance to Permanent Water (0.0009, <0.0001) + Nearest House (0.0013, <0.0001) +

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Summer Understory Cover (-0.0036, <0.0001) + Number of Canopy Trees (0.0053, <0.0001) + Hours of Dark (-0.0107, <0.0001) + Moon Phase (3rd quarter - 0.0210, 0.0004; New moon - 0.0224, 0.0056; Full moon - 0.0086, 0.2633) + Activity During Lunar Rise (0.0128, 0.842) + Standardized Time (-0.0199, 0.0168). Our data indicate competition between the two species is reduced by both temporal and spatial means.

014.066 U **Comparison of Bacteria Growth in Different Dog Bowls.** Howard Payne University, Brownwood, Texas. **Kaitlyn Drewniok**
Dogs are one of humankind's closest companions and live side by side with us in our homes. We share our space with them and provide shelter, water, and food. Many people feed their dogs inside or outside, but how often do you wash your dog's bowl? The dog bowl has been identified as the third most contaminated spot in the house. This can raise the chance that you, your dog, or your children can contract an illness from a plethora of bacteria. This study is to help identify how fast bacteria can accumulate through common types of dog bowls such as stainless steel, plastic, ceramic, and silicone. By feeding a variety of dogs for 14 days, the pending results will be used to provide a bacteria growth rate among the different materials, the effect of washing dog bowls and bowls inside versus outside. This study, results pending, will examine if the different kinds of dog bowls can contribute to the hygiene of the bowl. In water bowl trials, stainless steel had the fastest bacteria growth, while after 14 days, plastic had the most bacteria present. Ceramic had the least bacteria in the water bowls. We hypothesize that outdoor bowls will have the most bacteria compared to inside bowls or bowls washed. Among the materials tested, stainless steel is expected to have the fastest bacteria accumulation. Plastic should have the most bacteria after 14 days. Ceramic should be the most hygienic bowl with the lowest count of bacteria, and silicone is hypothesized to resemble stainless steel.

014.067 U **Helminth parasites and body condition in brown-headed cowbirds (*Molothrus ater ater*).** Sam Houston State University, Huntsville, Texas. **Maria Hendrickson**, Tamara Cook, and Diane Neudorf
The understanding of how common avian parasites affect the health and condition of their hosts is crucial to understanding how populations are affected. We documented parasite load of helminths in brown-headed cowbirds (*Molothrus ater*) and related it to body condition in 24 male and female brown-headed cowbirds. The brown-headed cowbird is a commonly occurring species of brood parasite that reproduces by laying an egg within the nests of other species of birds, leading to the decline of many endangered bird species, as the cowbird young absorb all the attention of the parents. Cowbirds feed largely on seeds but also include insect prey in their diet. There are few studies that have examined cowbird body condition in an attempt to link it to parasite load. We found very few internal parasites in the cowbirds we examined. We will discuss the parasites found and relationships with cowbird condition.

014.068 U **Effects of Huisache Removal in Areas of Blackland Prairie Restoration in Guadalupe County, Texas.** Texas Lutheran University, Seguin, Texas. **Michael Anthony Lopez**, Mark Gustafson, and Alan Lievens
Huisache (*Vachellia farnesiana* (L.) Wight & Arn.) is a native yet invasive shrub that outcompetes smaller plant species including grasses in the Blackland Prairies of southern Texas. We began an experiment in 2019 to determine if the removal of huisache can increase plant diversity. The modified Whittaker method was used to measure the plant diversity in two control plots and two plots where huisache was removed. In this study, one of the control plots was compared with one of the removal plots. One year after huisache removal, plant diversity was higher in the huisache removal plots. Jaccard's coefficient of similarity was 0.27 for the two plots. Future monitoring of these plots of Blackland Prairie will be used to determine if prairie restoration can be achieved by the removal of this invasive shrub.

014.069 N **A global account of scale insects on grasses.** Texas A&M University-Kingsville (TAMUK), Kingsville, TX. **Richard James Wilson Patrock**
Scale insects (Hemiptera: Coccoidea) are a large, diverse group of phytophagous insects. Many are considered pests and a brief accounting of their host usage based on these species suggests the group is one of the most generalist of insects with respect to host families utilized. This presents a delightful paradox in that as a whole, their active mobility is one of the slightest in the Insecta. An overview of known host usage for all species (N= 7369 spp. using the database *Scalenet*), however, suggests that ca. 70% of all species are associated with only one family and less than 9% around found on more than five (5) families. More scales are associated with grasses (1353) than any other plant family and of these scales ca. 74% are host specific to grasses. A cross-tabulation analysis of host usage of all scales and their host families shows that those scales associated with grasses have the lowest host breadth among scales found in families where at least 50 scales species are found and among the lowest for all plant families where any host usage is known. I follow-up this analysis by next mapping plant part usage for these scales and then layering the groups of scales on a recent phylogeny of the Poaceae to examine the level of scale host specificity or generalization within the grasses.

014.070 U **Chigger Mite Prevalence in Texas Chirping Frogs Based on Citizen Science.** Southwestern University, Georgetown, Texas. **Sydney Cole**, Emma Kesterson, Claire Bason, Gina Ramirez, Benjamin Pierce
Hannemania mites have been found on a number of amphibian species. In this study, we investigated the presence of *Hannemania* mites on two species of chirping frogs, *Eleutherodactylus marnockii* and *E. cystignathoides*. Using research-grade records on iNaturalist, a social network for citizen scientists, we examined photographs of 265 *E. marnockii* collected from August 10, 1985 through May 7, 2019. We also examined photographs of 347 *E. cystignathoides* collected from August 10, 1985 through January 21, 2018. We scored photographs for the presence of mites on the two species, and examined their association with visibility of extremities, seasonal changes, and geography. We found that 43.36% of *E. marnockii* and 1.24% of *E. cystignathoides* were visibly infected with mites, a highly significant difference. Among *E. marnockii* infected with mites, 64.29% of frogs had mites on the front legs, 74.49% had mites on the hind legs, 7.14% had mites on the head, and 23.46% had mites present on the trunk. There were no significant differences in the presence of mites among frogs that exhibited differences in visibility of their legs. The proportion of *E. marnockii* infected with mites during fall/winter (October-March) was 48%, while the proportion of frogs with mites during spring/summer (April-September) was 42%; these differences were not significant. Of the 22 Texas counties where *E. marnockii* were observed, mites were observed on the frogs in all but 6 counties and we did not observe any obvious geographic pattern of mite infection. Our results demonstrate that mites are common in *E. marnockii* but rare in *E. cystignathoides* and provide information about seasonal and geographic patterns of mite prevalence. This study provides baseline information that can lead to further investigations of why these types of mites are more prevalent in some species.

014.071 G **Efficacy of late summer prescribed burn and growing season grazing as a prairie restoration technique in south Texas.** University of Texas at San Antonio, San Antonio, TX. **Tom McKissick V**, Gwen Young, O. W. Van Auken, Brian G. Laub
Alteration of disturbance regimes, such as reduction in fires over the past several decades, has altered prairie vegetation communities in South Texas. Land managers are considering prescribed fires as part of restoration programs, with a goal of promoting native grasses and forbs. Late-summer fires have the potential to suppress invasive C₄ grasses by causing direct damage to aboveground structures during a period of maximal growth and reproduction. Suppression of C₄ grasses may in turn promote increased species diversity. However, whether fire and/or grazing will facilitate a shift in the plant community from invasive C₄ grasses is unknown. We evaluated the effectiveness of a late-summer prescribed burn, in terms of suppressing C₄ grasses and promoting species diversity, on a grazed prairie in Floresville, Texas. We surveyed plant community composition within four plots, each consisting of three treatment subplots (burned and grazed, grazed, control), before and after fire treatment was applied to the burned and grazed subplots. PERMANOVA indicated a significant difference in community composition from before to after across all treatments (p=0.005), meaning there were shifts in plant communities after fire treatment, but shifts were likely driven by larger scale, non-treatment effects, such as drought. A mixed-effects analysis of Simpsons Diversity Index indicated no significant interactive effect between before/after and treatment, but there was a significant effect of

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treatment ($p=0.0009$). Lack of an interaction effect indicated diversity was responding similarly to burning across all treatment types, but both burned and grazed and grazed only treatments differed from the control, indicating that grazing likely had an effect on diversity. This study suggests restoring dominance of native grasses in exotic-invaded grasslands will require additional management, such as repeated fires or seeding.

