

# **122<sup>nd</sup> Annual Meeting of the Texas Academy of Science**



**March 1-2, 2019**

**Howard Payne University**

1000 Fisk St.

Brownwood, TX 76801

**Official Program**

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**Abbreviated Program Schedule: FRIDAY MARCH 2**

8:00 am - 11:30 pm	<b>TAS Board of Directors Meeting</b>	Mabee Center Balcony
10:00 am - 6:00 pm	<b>Meeting Registration &amp; Presenter Check-in</b>	Mabee Center Foyor
10:00 am - 1:00 pm	<b>Poster Sessions Setup</b>	Winebrenner Science Building Corridor and Labs
11:30 pm - 12:30 pm	<b>Section Chairs Pre-Session Lunch Meeting</b>	Maybe Center Balcony
1:00 pm - 3:00 pm	<b>Oral Paper Sessions I</b>	Winebrenner and FLC Buildings Various Rooms
3:00 pm	<b>Coffee and Refreshments</b>	Winebrenner Science Building Corridor
3:00 pm - 4:30 pm	<b>Judging Poster Sessions 1</b>	Winebrenner Science Building Corridor and Labs
4:30 pm - 6:30 pm	<b>Oral Paper Sessions 2</b>	Winebrenner and FLC Buildings Various Rooms

**SATURDAY, MARCH 3**

7:00 am - 12:00 pm	<b>Meeting Registration Presenter Check-in</b>	Mabee Center Foyor
7:00 am - 8:00 am	<b>Past Presidents' Breakfast</b>	Mabee Center Balcony
8:00 am - 9:30 am	<b>Judging Poster Sessions 2</b>	Winebrenner Science Building Corridor and Labs
9:30 am	<b>Coffee and refreshments</b>	Winebrenner Science Building Corridor and Labs
10:00 am - 12:00 am	<b>Graduate Competition</b>	Mims Theater Hall
12:00 pm - 1:15 pm	<b>Lunch</b>	Mabee Center
1:30 pm - 2:30 pm	<b>Science Jeopardy</b>	Mims Theater Hall
1:30 pm - 2:00 pm	<b>Section Chairs Post-Session Metting</b>	Winebrenner Science Building Room 121
3:00 pm - 3:30 pm	<b>Texas Outstanding Educator Award and Lecture</b>	Mims Theater Hall
3:30 pm - 4:00 pm	<b>Distinguished Texas Scientist Award and Lecture</b>	Mims Theater Hall
6:00 pm - 7:00 pm	<b>Reception</b>	Hanger
7:00 pm - 9:00 pm	<b>Awards Banquet</b>	Hanger

**The Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University**

**Table of Contents**

About the Texas Academy of Science	4
Letter from the President, Dr. Keith Pannell	5
Welcome Letters:	4
About Brownwood and HPU	8
Local Eateries	10
TAS Board of Directors and Contacts	11
2018 -2019 Section Officers	12
Texas Journal of Science: Update from Andrew Kasner	13
Meeting noted and Poster Guidelines	14
Luncheon Speaker, Bill Bynum (with appearance of Local Host Tom Ready)	15
2018 Outstanding Texas Educator	Maegan Gabriel 16
2018 Texas Distinguished Scientist	Purnendu (Sandy) Dasgupta 17
2018 TAS Vice President:	Shannon Hill 18
2018 TAS Academic Director:	David Lemke 19
2018 TAS Non-Academic Director:	June Wolfe 20
2018 Student Director:	A H M Zuberi Ashraf 21
2018 TAS Fellow	Lisa Goering 21
Graduate Student Competition	22
Complete Technical Program & Schedule	23
Presentation Abstracts	36
Author Index	105

**Welcome and Acknowledgements from the Program Chair**

Welcome to the premier student-oriented, multidisciplinary, scientific research meeting in the State of Texas, namely the annual meeting of the Texas Academy of Science. This year, the first time, we are in Midland, Texas at Midland College. I am sure you will be impressed by the wonderful facility at the College, but may not recognize the hard work, enthusiasm, and time that our hosts, Professor of Chemistry Tom Ready and Dean Margaret Wade, have distilled into the meeting. And of course, behind them are the faculty and staff of the College. When you see them at the meeting reach out and say thank-you.

As Program Chair, with a short history within the Academy, I must state that without the phenomenal expertise, time, energy, and good nature of Chris Vitek my job, and job it was, would have been impossible. Also the constant and always amiable availability of our President, Neil Gray, was invaluable. I congratulate all Section Chairs and Vice Chairs for their efficient abstract screening and, where needed, editing. Special thanks to Shannon Hill and Kathy Early for leading the judging teams, Graduate and Undergraduate, respectively.

This year the Graduate Competition stands alone so make sure you listen to these future Science Stars of Texas. Please enjoy the multi-disciplinary nature of the meeting and visit sections outside your immediate expertise – you will be surprised and stimulated by what you see and hear.



Keith H. Pannell, President Elect of the 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. Since 1949 TAS has published a peer-reviewed journal (The Texas Journal of Science), conducts an annual meeting that highlights research across 16 sections across the various science disciplines, 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 500 individuals, with a large portion of the membership being 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 that continues to evolve.

### Strategic Planning

The Texas Academy of Science (TAS) Board of Directors recently 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.

THE TEXAS ACADEMY OF SCIENCE  
INCORPORATED IN 1929; AFFILIATED WITH THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

Welcome to the 122<sup>nd</sup> Annual Meeting of the Texas Academy of Science, this year on the campus of Howard Payne University, Brownwood, Texas. The annual meeting is organized to highlight the research presentations of undergraduate and graduate students from across the spectrum of science in Texas. In this regard, I imagine there is no greater gathering of multi-disciplinary scientists in the region, and I urge each of you to attend sessions that are not directly in your discipline. In this manner you will be developing your own scientific repertoire and gaining unexpected insights. Given the ever-increasing multi-disciplinary nature of science and scientific research, this diversity of information can open unique opportunities for personal growth and career development.



Again, this year we are providing a distinct time frame for our graduate student research competition and placing a spotlight on this activity, organized by our Graduate Academy Counselor **Travis LaDuc**. Your participation by listening attentively, and asking questions, will provide a stimulation for the competitors and demonstrate that putting themselves out in this manner is both appreciated and worthwhile, win or not. It is not easy to stand up and present at the best of times, but in a competition it is even more stressful and an appreciative audience provides a great incentive to do well. I offer a personal “good luck” to the participants, *buena suerte a todos*.

A meeting innovation this year is a student-organized function immediately preceding the plenary talks on Saturday afternoon. The activity is the product of student TAS Board members **Zuberi Ashraf** and **Devin Corbitt** and hopefully will be the first of a regular student-organized function at the annual meeting. Zuberi and Devin are incorporating the members of the various local TAS chapters to draw attention to these chapters within TAS; and a page will be added to our TAS Website to highlight the local chapter activities.

Our Outstanding Texas Educator and Texas Distinguished Scientist Awardees are **Celene Rosen** from the Plano Independent School District and the **Professor David Lambert** of the U. T. Austin Astronomy Department, respectively. Celene has been nominated to represent Texas at the Annual Presidential Awards for Excellence in Mathematics and Science Teaching, and David recently retired from the Directorship of the world famous McDonald Observatory in Fort Davis. Their talks will be awesome.

This past year saw a major accomplishment by the editors of *The Texas Journal of Science*. Under the dynamic leadership of Professor **Andy Kasner**, ably assisted by **Kathryn Perez**, the Journal is now up to date, and available on-line thereby significantly increasing its international visibility. The *Journal* will also introduce the possibility of selected reviews, and in this regard, we anticipate an annual review by the Texas Distinguished Scientist Awardee. Andy was recently appointed Editor of *Waterbirds*, the international journal published by the Waterbird Society. Congratulations Andy! However, that new responsibility required him to resign for our *Journal*, but as always in the world of science, a new page turns and we welcome a new Managing Editor, **Jason Locklin**, a Past President of TAS with much experience. Exciting times ahead!

Finally, as at every meeting, please remember that TAS is organized by a purely volunteer army. President Elect **Alyx Frantzen** and Howard Payne University host faculty member **Craig Younce**, and new Coordinator of IT **Ricardo Bernal** are thanked royally for the energy, effort and efficiency of their work making this a successful meeting. Thanks to all the section Chairs and Vicechairs, and all the various TAS Board Members. The latter will sport name tags with a golden circle for ready identification. Please engage them in conversation, thank them personally and discuss any aspects of the TAS that you feel would be useful and timely. It is your Academy! Finally, make sure to welcome to **Shannon Hill** as our New President Elect from March 2, 2019.

Cheers, Keith Pannell, President, Texas Academy of Science 2018-2019

## Brownwood, Texas

Brownwood is on Pecan Bayou at the intersection of U.S. highways 67, 84, and 377, Farm Road 2524, and the Atchison, Topeka and Santa Fe Railway in south central Brown County. The city and the county are named for Henry Stevenson Brown. The area was originally settled by farmers and cattle ranchers. When the sparsely populated county was organized in 1857, the hamlet of Brownwood was chosen as county seat. As late as 1872 Brownwood was a small community of two stores, a log courthouse, and about five dwellings. In 1876, when the town had an estimated 120 inhabitants and Cumberland Presbyterian, Presbyterian, and Baptist churches, the first bank was opened and a schoolhouse was built that also served as a town hall and a church. Because Brownwood lay on a feeder line of the Great Western Trail, stores and saloons served the needs of the cowboys who drove the herds through town. A cotton gin was built in town in 1877 as the state of Texas began to offer the land to farmers.



The 1880s and 1890s were decades of dramatic growth for the community, as the population increased from 725 in 1880 to 2,176 in 1890 and 3,965 in 1900. The town became a center of the Farmers' Alliance with the building of the West Texas District Alliance Cotton Yard and the establishment of an alliance paper, the weekly *Freemans Journal*. There were also significant developments in education during these years. Several local schools were consolidated to form the Brownwood Independent School District in 1883. In 1889 two colleges opened their doors in Brownwood—Daniel Baker College, founded by the Presbyterians, and Howard Payne College, a Baptist institution. Daniel Baker closed, and its campus became part of Howard Payne College in 1953.

Brownwood went through two boom periods in the first half of the twentieth century, the first stimulated by the oil industry, the second by the building of a military installation during World War II. Oil was first discovered near Brownwood in 1917, but the town did not become a major oil-industry site until the 1920s. The population of the city shot up from 8,223 in 1920 to 12,789 in 1930, and estimates from the late 1920s indicate it might have been as high as 15,000. At one time during the boom the city had twenty-five manufacturing and industrial plants in operation.

The growth of nearby Early, located at the old site of Brownwood on the east side of Pecan Bayou has kept the combined population of the two cities at around 20,000; they comprised almost three-quarters of the county inhabitants in 1970. After the old city auditorium, the Memorial Hall, burned in 1960, the city built Brownwood Coliseum in 1963. In the 1970s Brownwood manufactured industrial and transportation equipment, furniture,



Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

clothing, woolen goods, crushed stone, livestock drenches, feeds, and also food, glass, plastic, and leather products. In the 1980s important businesses included meat packing, commercial printing, and the manufacture of plumbing fixtures, leather gloves, oilfield machinery and construction equipment. In 2000, with the development of other county communities, the Brownwood-Early area held only 57 percent of Brown County's population, but the city remained an important distributing center for the county and the region. Area attractions included Lake Brownwood State Recreation Area, Camp Bowie Memorial Park, and the Brown County Museum of History.



A Christian liberal arts institution, **Howard Payne University** prides itself on fostering a close community where personal connection is valued. Through teaching, learning and service, the faculty and staff truly invest in students' success. At HPU, students choose from more than 100 majors, minors and pre-professional programs in seven schools: Business, Christian Studies, Education, Humanities, Music and Fine Arts, Nursing, and Science and Mathematics. The Guy D. Newman Honors Academy challenges students with a multidisciplinary curriculum and exciting travel opportunities. Co-curricular organizations include the Model UN, Moot Court and Student Speaker Bureau, and more than 25 student organizations round out the school's extracurricular options. HPU's eighty-acre, tree-lined campus in Brownwood perches on the northern side of the Texas Hill Country. Off-campus activities include visits to nearby Lake Brownwood. Students who enjoy athletics take part in well-attended intramural sporting competitions. Student athletes at HPU compete in six men's and six women's sports through the American Southwest Conference.



Figure 1. The Mabee University Center and Winebrenner Memorial Building on the HPU campus.

### Local Eateries

<i>Restaurants within a 5 minute drive of</i>	<i>Restaurants within a 5 minute drive of</i>	<i>Restaurants within a 5 minute drive of</i>
<b>Midland College</b>	<b>Midland College</b>	<b>Midland College</b>
<b>Cattle Barron's Steakhouse</b>	<b>Swensen's Ice Cream</b>	<b>Chipotle Mexican Grill</b>
418 W Wadley Ave, Midland, TX 79705	900 W Loop 250 N Ste C, Midland, TX 79705	2820 Loop 250 Frontage Rd #210, Midland, TX 79705
Phone: (432) 683-2334	Phone: (432) 570-7271	Phone: (432) 699-0173
<b>Dos Compadres Mexican Restaurant</b>	<b>Jorge's Mexican Café</b>	<b>Palio's Pizza Café</b>
2200 W Wadley Ave #1, Midland, TX 79705	4400 N Big Spring St #14, Midland, TX 79705	2900 N Loop 250 West #100, Midland, TX 79707
Phone: (432) 203-6490	Phone: (432) 683-6303	Phone: (432) 699-1388
<b>The Garlic Press</b>	<b>Outback Steakhouse</b>	<b>Mr. Gatti's Pizza</b>
2200 W Wadley Ave # 6, Midland, TX 79705	2314 W Loop 250 N, Midland, TX 79705	614 W Wadley Ave, Midland, TX 79705
Phone: (432) 570-4020	Phone: (432) 684-1152	Phone: (432) 688-3977
<b>Venezia Italian Restaurant</b>	<b>Cotton Patch Café</b>	<b>Dickie's Barbeque</b>
2101 W Wadley Ave #20, Midland, TX 79705	2320 Loop 250 Frontage Rd, Midland, TX 79705	600 W Wadley Ave, Midland, TX 79705
Phone: (432) 547-4046	Phone: (432) 618-0070	Phone: (432) 704-5080
<b>Ray's Italian Bistro</b>	<b>Chili's Bar &amp; Grill</b>	<b>Mulberry Café</b>
2300 W Wadley Ave, Midland, TX 79705	2100 Loop 250 Frontage Rd, Midland, TX 79705	2101 W Wadley Ave #8, Midland, TX 79705
Phone: (432) 682-7297	Phone: (432) 687-3744	Phone: (432) 704-5221
<b>Manny's Italian Village Ristorante</b>	<b>Jason's Deli</b>	<b>Jumburrito</b>
3211 W Wadley Ave, Midland, TX 79705	4610 N Garfield St, Midland, TX 79705	2101 W Wadley Ave, Midland, TX 79705
Phone: (432) 684-6595	Phone: (432) 682-2200	Phone: (432) 683-7017
<b>Strawberry Field's Café</b>	<b>International House of Pancakes</b>	<b>Firehouse Subs</b>
2311 W Wadley Ave, Midland, TX 79705	2507 Loop 250 Frontage Rd, Midland, TX 79705	2900 Loop 250 Frontage Rd #162, Midland, TX 79705
Phone: (432) 684-5869	Phone: (432) 684-5759	Phone: (432) 689-6500
<b>Murray's Deli</b>	<b>Olive Garden Italian Restaurant</b>	<b>Five Guy's Burgers &amp; Fries</b>
3211 W Wadley Ave #24, Midland, TX 79705	2705 Loop 250 Frontage Rd, Midland, TX 79705	2816 Loop 250 Frontage Rd #300, Midland, TX 79705
Phone: (432) 697-3433	Phone: (432) 687-4400	Phone: (432) 699-2036
<b>Subway Sandwiches</b>	<b>Panera Bread Restaurant</b>	<b>Restaurants of Note:</b>
2300 W Wadley Ave Ste B, Midland, TX 79703	2804 Loop 250 Frontage Rd, Midland, TX 79705	<b>Luigi's Italian Restaurant</b>
Phone: (432) 682-5541	Phone: (432) 689-0933	111 N Big Spring St, Midland, TX 79701
<b>Pizza Hut</b>	<b>Abuelo's Mexican Restaurant</b>	Phone: (432)-683-6363
2200 W Wadley Ave, Midland, TX 79705	2908 Loop 250 Frontage Rd, Midland, TX 79705	<b>Michael's Charcoal Grill (Barbeque)</b>
Phone: (432) 683-2240	Phone: (432) 685-3335	723 W Wadley Ave, Midland, TX 79705
		Phone: (432) 686-9030



Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

## 2018-2019 TAS Board of Directors and Contacts

### President

Keith H. Pannell  
Department of Chemistry  
University of Texas El Paso  
[kpannell@utep.edu](mailto:kpannell@utep.edu)

### President Elect

Alyx Frantzen  
Department of Chemistry  
Stephen F. Austin State University  
[afrantzen@sfasu.edu](mailto:afrantzen@sfasu.edu)

### Vice President

Shannon Hill  
McLennan Community College  
[shill@mclennan.edu](mailto:shill@mclennan.edu)

### Treasurer

Kathleen Wood  
Department of Biology  
Univ. of Mary Hardin-Baylor  
[kwood@umhb.edu](mailto:kwood@umhb.edu)

### Coll. Acad. Counselor

Cathleen Early  
Department of Biology  
Univ. of Mary Hardin-Baylor  
[cearly@umhb.edu](mailto:cearly@umhb.edu)

### Coll. Acad. Co-Counselor

Karen Grant  
Department of Biology  
Univ. of Mary Hardin-Baylor  
[kgrant@umhb.edu](mailto:kgrant@umhb.edu)

### Chair, Board of Dev.

Raelynn Deaton  
St. Edward's University  
[paulad@stedwards.edu](mailto:paulad@stedwards.edu)

### 2017-2019 Student Representative

Devin Corbitt  
Department of Biology  
Temple College  
[corbittd305@stu.templejc.edu](mailto:corbittd305@stu.templejc.edu)

### 2018-2020 Student Representative

Zuberi Ashraf  
Department of Biology  
Texas A&M University Central Texas  
[aa038@my.tamuct.edu](mailto:aa038@my.tamuct.edu)

### Executive Secretary

Chris Ritzi  
Sul Ross State University  
[critzi@sulross.edu](mailto:critzi@sulross.edu)

### Corresponding Secretary

Marsha E. May  
Texas Parks and Wildlife Dept.  
Wildlife Diversity Program  
[Marsha.May@tpwd.texas.gov](mailto:Marsha.May@tpwd.texas.gov)

### 2019 Local Host Coordinator

Craig Yonce  
Howard Payne University  
[cyonce@hputx.edu](mailto:cyonce@hputx.edu)

### Coordinator of Information Technology

Ricardo Bernal  
Univ. of Texas El Paso  
[rbernal@utep.edu](mailto:rbernal@utep.edu)

### Int'l Program Coordinator

Hugo A. Barrera-Saldaña  
Autonomous Univ. of Nuevo Leon  
[habarrera@gmail.com](mailto:habarrera@gmail.com)

### Historian, TX Academy of Science

Raymond C. Mathews, Jr.  
Lady Bird Johnson Wildflower Center  
[oceanrayaustin@gmail.com](mailto:oceanrayaustin@gmail.com)

### Graduate Academy Counselor

Travis LaDuc  
University of Texas at Austin  
[travieso@austin.utexas.edu](mailto:travieso@austin.utexas.edu)

### Managing Editor of TJS

Jason Locklin  
Temple College  
[Jason.locklin@templejc.edu](mailto:Jason.locklin@templejc.edu)

### AAAS Representative

Sandra Moody West  
Texas State University  
[sw04@txstate.edu](mailto:sw04@txstate.edu)

### AAAS Representative

James Westgate  
Lamar University  
[James.westgate@lamar.edu](mailto:James.westgate@lamar.edu)

### 2016-2018 Academic Director

Danette Vines  
Schreiner University  
[DRVines@schreiner.edu](mailto:DRVines@schreiner.edu)

### 2017-2019 Academic Director

Francisco Gonzalez-Lima  
University of Texas at Austin  
[gonzalezlima@utexas.edu](mailto:gonzalezlima@utexas.edu)

## 2017-2018 TAS Board of Directors and Contacts (cont.)

### 2018-2021 Academic Director

David Lemke  
Texas State University  
[david.lemke@txstate.edu](mailto:david.lemke@txstate.edu)

### Immediate Past President

Neil Gray  
The University of Texas - Tyler  
[ngray@uttyler.edu](mailto:ngray@uttyler.edu)

### Manuscript Editor of TJS

Kathryn Perez  
University of Texas - RGV  
[kathryn.perez@utrgv.edu](mailto:kathryn.perez@utrgv.edu)

### Junior Academy Counselor

Vince Schielack  
Texas A&M University  
[vincs@math.tamu.edu](mailto:vincs@math.tamu.edu)

### Jr. Academy Assoc Couns.

Nancy Magnussen  
Texas A&M University  
[nancy@science.tamu.edu](mailto:nancy@science.tamu.edu)

### 2018-2021 Non-Academic Director

June Wolfe  
TAMU Extension Center, Temple  
[mgrusak@bcm.edu](mailto:mgrusak@bcm.edu)

### 2017-2019 Non-Academic Director

Paul Fleming  
Texas Parks & Wildlife Dept.  
[Paul.fleming@tpwd.texas.gov](mailto:Paul.fleming@tpwd.texas.gov)

### 2016-2018 Non-Academic Director

Margaret Russell  
Austin Parks and Rec. Dept  
[Margaret.Russell@austintexas.gov](mailto:Margaret.Russell@austintexas.gov)

## 2017-2018 Section Officers

### ANTHROPOLOGY

**Chair:** Tim Campbell  
Texas A&M University  
[camp8943@tamu.edu](mailto:camp8943@tamu.edu)

### Vice Chair:

Paloma Cuello Del Pozo  
Texas A&M University  
[palomacuello@tamu.edu](mailto:palomacuello@tamu.edu)

### BIOMEDICAL

**Chair:** Joni H. Ylostalo  
University of Mary Hardin-Baylor  
[jylostalo@umhb.edu](mailto:jylostalo@umhb.edu)

**Vice Chair:** Brent Bill  
University of Texas at Tyler  
[bbill@uttyler.edu](mailto:bbill@uttyler.edu)

### GEOSCIENCES

**Chair:** Erin M. Keenan Early  
The University of Texas Austin  
[keenaneearly@utexas.edu](mailto:keenaneearly@utexas.edu)

**Vice Chair:** James Westgate  
Lamar University  
[james.westgate@lamar.edu](mailto:james.westgate@lamar.edu)

### CHEMISTRY & BIOCHEMISTRY

**Chair:** Brian Barngrover  
Stephen F. Austin University  
[barngrovbm@sfasu.edu](mailto:barngrovbm@sfasu.edu)

**Vice Chair:** Adrian Zapata  
Schreiner University  
[alzapata@sfasu.edu](mailto:alzapata@sfasu.edu)

### MARINE SCIENCE

**Chair:** Stephanie Lockwood  
Texas Tech  
[stephanie.lockwood@ttu.edu](mailto:stephanie.lockwood@ttu.edu)

### PHYSICS AND ENGINEERING

**Chair:** Kim Arvidsson  
Schreiner University  
[kdarvidsson@schreiner.edu](mailto:kdarvidsson@schreiner.edu)

**Vice Chair:** Steve Alexander  
Southwest University  
[john.mcclain@templejc.edu](mailto:john.mcclain@templejc.edu)

### PLANT BIOLOGY

**Chair:** Kathy Wood  
U. Mary Hardin Baylor  
[kwood@umhb.edu](mailto:kwood@umhb.edu)

**Vice Chair:** Rick Hammer  
Hardin Simmons University  
[rhammer@hsutx.edu](mailto:rhammer@hsutx.edu)

### SCIENCE EDUCATION

**Chair:** Phillip Greco  
Temple Junior College  
[phillip.greco@templejc.edu](mailto:phillip.greco@templejc.edu)

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**CELL & MOLECULAR BIOLOGY**

**Chair:** Susan Klinedinst  
Schreiner University  
[sklinedinst@schreiner.edu](mailto:sklinedinst@schreiner.edu)

**Vice Chair:** James Harper  
Sam Houston State Univ.  
[jmharper@shsu.edu](mailto:jmharper@shsu.edu)

**CONSERVATION ECOLOGY**

**Co-Chair:** Chris Distel  
East Schreiner University  
[cadistel@schreiner.edu](mailto:cadistel@schreiner.edu)

**Co-Chair:** Troy Lidine  
E. Texas Baptist University  
[tladine@etbu.edu](mailto:tladine@etbu.edu)

**FRESHWATER SCIENCE**

**Chair:** Matthew Barnes  
Texas Tech University  
[matthew.a.barnes@ttu.edu](mailto:matthew.a.barnes@ttu.edu)

**Vice Chair:** Thomas Ready  
Midland College  
[tready@midland.edu](mailto:tready@midland.edu)

**MATHEMATICS & COMPUTER SCIENCE**

**Chair:** Scott Franklin  
Wayland Baptist University  
[prudence.yorkhammons@templejc.edu](mailto:prudence.yorkhammons@templejc.edu)

**Vice Chair:** Kevin Hannay  
Schreiner University  
[khannay@schreiner.edu](mailto:khannay@schreiner.edu)

**NEUROSCIENCE**

**Chair:** Danielle Grove  
Texas Lutheran University  
[dgrove@tlu.edu](mailto:dgrove@tlu.edu)

**Vice Chair:** Carlos Garcia  
University of Incarnate Word  
[cagarci9@uiwtx.edu](mailto:cagarci9@uiwtx.edu)

**SYSTEMATICS & EVOLUTIONARY BIOLOGY**

**Chair:** Andrea Jensen  
Hardin-Simmons University  
[ajensen@hsutx.edu](mailto:ajensen@hsutx.edu)

**Vice Chair:** Simon Scarpetta  
University of Texas at Austin  
[scas100@utexas.edu](mailto:scas100@utexas.edu)

**TERRESTRIAL ECOLOGY & MANAGEMENT**

**Chair:** Richard Patrock  
University of Texas-Austin  
[rpatrock@gmail.com](mailto:rpatrock@gmail.com)

# THE TEXAS JOURNAL OF SCIENCE

---

## Call for Manuscripts

---

The *Texas Journal of Science* is a publication of The Texas Academy of Science and is sent to most members and all subscribers. 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 back on schedule and actively seeking manuscripts!**

The Journal is now available online. Accepted papers are published immediately and a single print volume will be 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.texasacademyofscience.org](http://www.texasacademyofscience.org)

If all authors are TAS members at the time an article is submitted and published, page charges will be waived for the manuscript. PeerTrack online manuscript submission, tracking, and peer review is setup and running. We are looking for good manuscripts, so visit [www.texasacademyofscience.org](http://www.texasacademyofscience.org) and check out the Author Guidelines to submit your manuscript via this new digital system.

<b>Managing Editor</b>	Jason Locklin, Temple College
<b>Manuscript Editor</b>	Kathryn Perez, University of Texas Rio Grande Valley
<b>Associate Editors</b>	Frank Dirrigl, University of Texas Rio Grande Valley Jim Goetze, Laredo College Andrew Kasner, Wayland Baptist University Travis LaDuc, University of Texas at Austin Russell Minton, Gannon University Allan Nelson, Tarleton State University Keith Pannell, University of Texas at El Paso Adam Reinhart, Wayland Baptist University Tim Walsh, Wayland Baptist University

## Meeting Notes and Poster Guidelines

**Registration.** The Registration area, in the lobby of the Mabee Center, will be open from 10:00 am on Friday March 1 until 4:00 pm, and again on Saturday March 2 from 7:00 am until 10:00 am.

**Parking.** Parking anywhere, except specifically reserved or handicapped sites, is possible on the Howard Payne University Campus.

**Posters.** Posters will be set up in the Winebrenner Science Building Corridor and Laboratories Friday commencing at 10:00 am. The first set of posters will remain up until Friday, March 1, 2019 at 6:00pm. These posters must then be taken down. At this same time, posters for the Saturday, March 2, 2019 judging can be set up. All poster for Saturday must be in place by 8:30am Saturday morning. The take-down period will be after 11:30 am on Saturday March 2.

**Poster Judging** will be between 3:00 – 4:30 pm on Friday for the following sections:

Anthropology; Conservation Ecology; Freshwater Science; Geosciences; Mathematics & Computer Science; Neuroscience; Physics & Engineering; Plant Biology; Science Education; Terrestrial Ecology & Management.

**Poster Judging** for the remaining sections: Biomedical; Cell & Molecular Biology; Chemistry & Biochemistry; Marine Science; Systematics & Evolutionary Biology, will be on Saturday between 8:00 – 9:30 am.

Since we anticipate, and encourage, more poster viewing and readership outside the judging time periods, we suggest that contact emails (or other contact details you are comfortable with) associated with the presenter, be clearly noted on the poster to encourage further communication during the meeting.

### **Saturday Lunch**

Lunch will begin at 12:00pm on Saturday in the Mabee Center.

### **Saturday Reception and Banquet**

The Reception and Awards Banquet will be held at the Brownwood Regional Airport Hanger. The address for this facility is 6251 Airport Rd, Brownwood, TX 76801. (approximately 6.4 miles from HPU)



## 2019 Outstanding Texas Educator



Ms. Celene Rosen  
Barksdale Elementary School, Plano, Texas

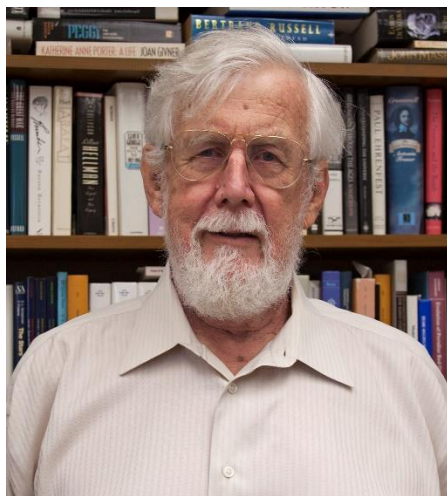
Ms. Celene Rosen earned a Bachelor of Arts in Early Childhood Education from the University of Wisconsin, Milwaukee in 1980 and a Master of Education in Teaching Leadership from Lamar University in 2010. She joined Barksdale Elementary School in the Plano Independent School District in 2002 and has spent the last 16 years as a 3<sup>rd</sup> grade science teacher. Beyond this role, Ms. Rosen taught for the Summer Institute for Gifted Students, Plano ISD, from 2008-2017. Ms. Rosen supports her school and district outside of the classroom by serving on and chairing a multitude of committees, mentoring new teachers and student teachers, developing science and mathematics curricula and presenting novel teaching pedagogy to her peers.

Ms. Rosen provides an engaging classroom environment with rigorous, student-centered lessons for over 100 3<sup>rd</sup> graders annually. Her personal educational ideology of Relationships, Relevance, Real Word Connectedness and Rigor is stressed within the classroom to facilitate growth for all learners.

For her exceptional skills in science education, Ms. Rosen was nominated for the Presidential Award for Excellence in Mathematics and Science Teaching, the nation's highest honor for teachers of science, technology engineering and mathematics, in 2018. She was awarded the Barksdale Elementary Teacher of the Year award in 2006 and the Barksdale PTA Lifetime Member award.

Some of the most meaningful and cherished praise has come from her students. In the words of a former student, "Mrs. Rosen, changed my life in the small period of one year that I spent with her. She was the first teacher I had that was able to see the energy in me and turn it towards an academic goal. Not only that, but with her teaching methods and enthusiasm, she ignited the spark inside me to pursue science."

## 2019 Texas Distinguished Scientist



Dr. David L. Lambert  
McDonald Observatory, UT Austin

David L. Lambert, a native of England, was educated at the University of Oxford from which he received his BA and D.Phil degrees. After post-doctoral years at Oxford and the California Institute of Technology, he joined the astronomy faculty at the University of Texas at Austin. From his initial appointment in 1969 as a Faculty Associate to his retirement in 2016 as the Isabel McCutcheon Harte Centennial Chair, his research was (and remains) largely driven by observations obtained at UT Austin's W.J. McDonald Observatory near Fort Davis. From 2003 to 2014, Lambert was Director of the McDonald Observatory.

Inspiration for Lambert's research into the evolution of stars and the origins of the chemical elements is traceable to the book 'Frontiers of Astronomy' by Fred Hoyle awarded as a school prize in 1956. In his time at UT Austin, His collaborators have included UT graduate students and postdoctoral fellows attracted to UT from the US and across the world. Visiting appointments at universities and observatories have led to valuable and diverse collaborations.

Lambert's work has been recognized by the Dannie Heinemann Prize in 1987 and the Henry Norris Russell Lectureship in 2007, both awarded by the American Astronomical Society. Other awards include a Guggenheim Fellowship in 1981. He is a Foreign Member of the Royal Society of Sciences of Uppsala (Sweden) and an Honorary Fellow of the Indian Institute of Astrophysics.

## Graduate Student Competition

A single session will be held, Saturday March 2, 10:00 – 11:40 am, in the Mimms Theater Hall without any conflicting sessions, thereby enabling maximum participation. The participants are:

Assessing species-specific responses to forest restoration interventions in the Lower Rio Grande Valley  
**Faeqa Mohsin**, The University of Texas Rio Grande Valley

Agriculture and urbanization activities have wiped out over 95% of the original vegetation of the Lower Rio Grande Valley (LRGV) including 99% of the native brush in riparian areas. Since the 1990s, various initiatives have been taken to restore the original vegetation of the LRGV. However, over the next few decades an increase in the incidence of prolonged droughts is expected, creating unprecedented challenges for restoration initiatives. Research that elucidates species-specific responses to restoration interventions (RIs) aimed at minimizing seedling mortality post-planting is scarce, particularly among the native species of the LRGV. Therefore, in August 2018, we initiated a study to evaluate seedling survivorship of 24 native species in response to RIs incorporating some combination of physical seedling shelters, 5 gallons of slow-release moisture, and mycorrhizae in a semi-factorial design. Seedlings were planted in October – November of 2018. Preliminary assessments indicate large treatment differences in survivorship due to mammalian herbivory, with large species differences in survivorship as well. A comprehensive understanding obtained through studying the plant traits associated with higher seedling survivorship would facilitate the modification and implementation of sustainable restoration strategies in the future.

Comparison of snail communities of the lower Rio Grande Valley of Texas in urban and wild areas **Briante Najev**, University of Texas Rio Grande Valley

The lower Rio Grande Valley (LRGV) of Texas and Mexico has one of the highest rates of urbanization in the world and the last remaining Tamaulipan Thornforest of Texas. In LRGV, most faunal urban ecology research focuses on vertebrates. We used snails as an example of an invertebrate fauna that resides in wild Tamaulipan Thornforest and one major type of urbanized habitat (urbab yards) to determine if urbanized habitats can provide a refugia for native invertebrate fauna. We found that diversity measures for urban snail communities (n=84; mean species richness = 4.8; mean species evenness = 0.6; mean Shannon-Wiener diversity index = 0.8) were not significantly different compared to wild sites (n=26; mean species richness = 5.03; mean species evenness = 0.6; mean Shannon-Wiener diversity index = 0.7). However, while urban yards are a safe haven for many introduced and synanthropic species, they contained fewer native species compared to native habitats. The urban habitats in this study were traditional lawn-style yards dominated by non-native grass and characterized by low plant diversity. However, additional research is needed to determine whether “natural yards”, which are usually designed to benefit butterflies and birds, can also sustain viable populations of native snail fauna in the LRGV and other ecoregions experiencing rapid urbanization.

Data collection methods and species traits influence species distribution model predictions **Elizabeth Roesler**, Texas Tech University

For effective conservation, managers first must understand where species occur. A useful tool for understanding ranges are species distribution models (SDMs), which predict potential ranges by relating known occurrences with environmental factors. SDMs assume that occurrence data provide an accurate representation of a species range; however, SDMs commonly use museum specimens or self-reported data, which may not meet this assumption. Therefore, we assessed the influence of data collection methods on SDM performance and further evaluated whether performance differed between taxa with different life history and physical traits. We used a suite of fish species found in the Texas Gulf representing a variety of characteristics that could influence SDM performance. We compared the systematic and random sampling data provided by the Coastal Fisheries Division of Texas Parks and Wildlife (TPWD) and the opportunistic sampling data provided by the Fishes of Texas Database (FoTx). SDMs of the Gulf fishes demonstrated that both data source and species traits affected model predictions. The AUC values (indicators of model strength) for FoTx were higher than TPWD for all fish species, indicating strong predictive performance. However, these data were more haphazardly collected than TPWD, likely causing model overfitting. Model performance was highest for species with longer lifespans, lower dispersal ability, and ones that were less common. Overall, our research demonstrated the impact of data collection method and species traits on SDM performance. Thus, consideration of these factors will improve the effectiveness of predictions from SDMs

for conservation, management, and research.

### Miocene modernization of North American lizard fauna **Simon Scarpetta**, University of Texas at Austin

Previously reported fossil evidence suggests that extant North American lizard genera first appeared during the Miocene, concurrent with modernization of global climate and ecosystems. However, the identifications of those fossils were not supported by evolutionarily-derived (apomorphic) features, and many extant taxa are poorly represented in pre-Pleistocene sediments. Here, I report on the first-known fossils of some lizards (*Uma*) and augment the known fossil record of others (*Crotaphytus*, *Gambelia*, *Sceloporus*). I use rigorous apomorphy-based diagnoses to support my identifications. I performed integrated divergence-time analyses of fossil data and molecular data, and confirmed that many extant lizard lineages currently inhabiting North America did evolve during the Miocene. I also found important ecological and biogeographic differences between the modern lizard biota and the Miocene lizard biota. For example, while extant *Uma* are sand-dune specialists, the clade was not restricted to that habitus during the Miocene. Modern *Gambelia* are largely found in the American southwest, but inhabited the Great Plains as recently as 16 Ma. Additionally, representatives of iguanian lizard clades that are now largely confined to the tropics (e.g. *Dactyloidae*, *Iguanidae*) were found far north of their extant distribution at least until the middle Miocene. Based on those findings, I encourage caution when using the modern biota to make direct inferences about past environments and biogeography.

### Using diceCT as a novel approach to the comparative anatomy of degenerate neural structures **Ruben Tovar**, The University of Texas

The paedomorphic *Eurycea* salamander clade of Central Texas exemplifies a continuum of morphological characteristics associated with aquatic-subterranean living: the surface-dwelling Texas salamander (*E. neotenes*) exhibits typical optic anatomy and acuity; the intermediate Comal blind salamander (*E. tridentifera*) maintains reduced but non-functional eyes; and the obligate subterranean Texas blind salamander (*E. rathbuni*) has an incompletely developed optic system. Together this genus represents a transformation series of karst phenotypes and a potentially exemplar system for using comparative approaches to understanding vertebrate ocular evolution in the face of relaxed selective pressures. More than a century ago Eigenman described ocular histology in *E. rathbuni* adults as a focal stygobite; yet, neither the extent of optic-nerve persistence in this taxon nor among its congeners has since been documented. In this study we employed gross and micro-scale imaging techniques to elucidate features of *Eurycea* optic anatomy with a particular interest in the central nervous system. Specimens from aforementioned taxa were fixed with 100% EtOH, contrast-enhanced with alcoholic iodine (I2E), micro-CT scanned, and digital reconstructed using 3D rendering software for comparison to histological sections. Here we report on the 3D, internal soft-tissue systems of the eye in each taxon, documenting habitat-specific configurations of optic musculature and neuroanatomy for the first time—including for *E. rathbuni*, which surprisingly appears to retain complete bilateral optic nerves even though it lacks the mid-line decussations associated with an optic chiasm.

**FRIDAY, MARCH, 1**

**001. TAS Board Meeting**

Texas Academy of Science Annual Meeting  
8:00 to 11:30 am  
Mabee Center: Balcony

**002. Section Chairs Pre-Session Lunch Meeting**

Texas Academy of Science Annual Meeting  
11:30 to 12:30 pm  
Mabee Center: Balcony

**003. Biomedical Sciences Oral Session 1**

Biomedical Sciences  
Paper Session  
1:00 to 2:00 pm  
Winebrenner Science Building: Floor first - 121

Participants:

- 1:00 Alterations of cellular metabolic pathways in 4T1 breast cancer cells in response to 8-shogaol *Luke Brown, Wayland Baptist University; Jai'Cee Tudman, Wayland Baptist University; Parvin Mirzaei, Center for Biotechnology and Genomics, Texas Tech University; Masoud Zabet-Moghaddam, Center for Biotechnology and Genomics, Texas Tech University; Gary Gray, Wayland Baptist University; Adam Reinhart, Wayland Baptist University*
- 1:15 Determining lipid composition of carotid artery plaques using multimodal imaging: Predictive analysis to enhance risk factor assessment of carotid atherosclerosis *Divya Nagaraj, William P. Clements High School*
- 1:30 Histological analysis of muscular atrophy in *Nauphoeta cinerea* *Megan Alexander, Grant Winner*
- 1:45 In vivo selection of human breast cancer cells that endogenously overexpress Her-2 *Valerie Gallegos, UTEP; Paloma Valenzuela, UTEP; Karla Parra, UTEP; Karen Chavez, UTEP; Natzidielly Lerma, UTEP; Shan Man, Sunnybrook Research Institute; Ping Xu, Sunnybrook Research Institute; Guido Bocci, University of Pisa; Urban Emmenegger, Sunnybrook Research Institute; Robert Kirken, UTEP; Robert Kerbel, Sunnybrook Research Institute; Giulio Francia, UTEP*

**004. Terrestrial Ecology & Management Oral Session 1**

Terrestrial Ecology and Management  
Paper Session  
1:00 to 2:00 pm  
Winebrenner Science Building: Floor first - 123

Participants:

- 1:00 Chronic Sloughing Shell Disease in the Chihuahuan Mud Turtle, *Kinosternon hirtipes murrayi* and other Subtropical and Tropical Mud Turtles *James Learned Christiansen, University of Texas, Austin; D R Davis, University of Texas Rio Grande Valley; Travis LaDuc, University of Texas at Austin*
- 1:15 Grassland bird diversity and habitat associations in the Southern High Plains, Texas *Sharon Leigh Ann DeMerritt, Wayland Baptist University; Andrew Kasner,*

*Wayland Baptist University*

- 1:30 Habitat associations and population estimates for the Texas horned lizard (*Phrynosoma cornutum*) in the Southern High Plains of Texas *Sara Andea van der Leek, Wayland Baptist University; Andrew Kasner, Wayland Baptist University*
- 1:45 Historic Land Use Effects on Ecosystem Health: Use of Aerial and Satellite Imagery *Julianna Kurpis, UTRGV*

**005. Anthropology Oral Session and Section Meeting**

Anthropology  
Paper Session

1:00 to 2:15 pm  
Winebrenner Science Building: Floor second - 218

Participants:

- 1:00 Balancing climatic and energetic demands within the human nose *ALEXA PENNAVARIA KELLY, University of North Texas Health Science Center; Scott D. Maddux, University of North Texas Health Science Center*
- 1:15 Early Onset Anthropocene. Control of the Landscape by the ancient Maya in Northwestern Belize. *Thomas Guderjan, University of Texas at Tyler*
- 1:30 Preliminary Analysis of Fossil Avifaunal Humeri from Swartkrans *Reagan Van Coutren, Department of Anthropology, Baylor University; Thomas A. Stidham, Key Laboratory of Vertebrate Evolution and Human Origins, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences; Timothy L Campbell, Department of Anthropology, Baylor University*
- 1:45 Stable isotope signals as proxy for mobility amongst ancient Canary aboriginals: creating a strontium and oxygen baseline for Gran Canaria *Paloma Cuello, Texas A&M University*
- 2:00 Taxonomic Assessment of Modern and Fossil African Rodent Femora *Timothy L Campbell, Department of Anthropology, Baylor University*
- 2:15 Anthropology Section Meeting *Timothy L Campbell, Department of Anthropology, Baylor University*

**006. Physics & Engineering Oral Session & Section Meeting**

Physics and Engineering  
Paper Session

1:00 to 2:15 pm  
Winebrenner Science Building: Floor second - 219

Participants:

- 1:00 Analysis of free and underdamped oscillation of metallic cantilever beams *Hendra Jaya Tarigan, Howard Payne University*
- 1:15 Creating a Heliocentric Lunar Forming Impact Model *Bryant Wyatt, Tarleton State University*
- 1:30 Evolutionary Algorithm Optimization of Lattice Towers *Wyatt Beck Young, Tarleton State University*
- 1:45 Stabilized Adobe Brick – Physical and Optical Properties *Gerald J. Mulvey, Univer of the Incarnate Word; Sreedev*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

*J. Ande, Univer of the Incarnate Word*

2:00 Physics and Engineering Section Meeting *Kim Arvidsson, Schreiner University*

**007. Plant Biology Oral Session and Section Meeting**

Plant Biology

Paper Session

1:00 to 3:00 pm

*Winebrenner Science Building: Floor second - 220*

Participants:

- 1:00 A new species in *Mentzelia* section *Bicuspidaria* (*Loasaceae*) from Baja California Sur and Cedros Island. *Destiny J. Brokaw, Abilene Christian University; Joshua Michael Brokaw, Abilene Christian University*
- 1:15 An updated vascular flora of the Runningwater Conservancy, Hale County, TX with comparisons to regional floristic records *Krista S. Epley, Wayland Baptist University; Matthew S. Allen, Wayland Baptist University*
- 1:30 Comparison of plant communities from two rivers in the West Cross Timbers ecoregion of Texas *Allan Nelson, Tarleton State University; Randall Rosiere, Tarleton State University; Kim Gamez, Tarleton State University; Turner Cotton, Tarleton State University; Sarah Brown, Tarleton State University; Keagan Lowey, Tarleton State University*
- 1:45 Exploring the potential for communication of learned behavior in populations of the sensitive plant (*Mimosa pudica*) *Nickolas G. Robinson, Northwest Vista College, CIMA-LSAMP*
- 2:00 Investigations of the mycoflora inhabiting the bark of *Juniperus ashei* (*Cupressaceae*) in central Texas *Jessica Bernardin, Texas State University; Trina Guerra, Texas State University; David Rodriguez, Texas State University; Dittmar Hahn, Texas State University; David E Lemke, Texas State University*
- 2:15 Vegetation survey of the Yegua Knobbs Preserve, Bastrop and Lee Counties, Texas *Diana K. Digges, Texas State University; David E Lemke, Texas State University*
- 2:30 Plant Biology Section Meeting *Kathleen Wood, University of Mary Hardin-Baylor*

**008. Conservation Ecology Oral Session and Section Meeting**

Conservation Ecology

Paper Session

1:00 to 3:00 pm

*FLC: Floor second - 221*

Participants:

- 1:00 Body Condition in Natural Populations of the Georgetown Salamander (*Eurycea naufragia*) *Benjamin Allen Pierce, Southwestern University*
- 1:15 Correlates of Snake Entanglement in Erosion Control Blankets *Sarah Elizabeth Ebert, Department of Biology, Stephen F. Austin State University; Kasey L. Jobe, Department of Biology, Stephen F. Austin State University; Christopher Schalk, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University; Daniel Saenz, Southern Research Station,*

*USDA Forest Service; Cory Adams, Southern Research Station, USDA Forest Service; Christopher Comer, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University*

- 1:30 Updating the conservation status ranks for Texas land snails (Mollusca: Gastropoda) *Jeff Nekola, University of New Mexico; Briante Najev, University of Texas Rio Grande Valley; Alison Schofield, University of Texas Rio Grande Valley; Ben Hutchins, Texas Parks and Wildlife; Kathryn Perez, University of Texas Rio Grande Valley*
- 1:45 Updating the known ranges of Texas's endemic, freshwater cavesnails (Mollusca; Gastropoda; "Hydrobiidae") *Dominique Alvear, University of Texas Rio Grande Valley; Pete Diaz, U. S. Fish and Wildlife Service; Randy Gibson, U. S. Fish and Wildlife Service; Ben Hutchins, Texas Parks and Wildlife; Benjamin Schwartz, Texas State University; Kathryn Perez, University of Texas Rio Grande Valley*
- 2:00 Use of Biodiversity Collections in Conservation of Species of Greatest Conservation Need *Gary Pace Garrett, University of Texas; Adam Cohen, University of Texas; Dean Hendrickson, University of Texas*
- 2:15 Variation in Arthropod Community on a Prairie-Style Green Roof Relative to vegetation and slope position *Sydney Jackson, Austin College; Loriann Garcia, Austin College; Brooke Byerley Best, Botanical Research Institute of Texas*
- 2:30 Section Meeting Conservation Ecology *Chris Distel, Schreiner University*

**009. STEM Education Oral Session 1**

STEM Education

Paper Session

1:00 to 2:15 pm

*FLC: 222*

Participants:

- 1:00 A Guide to Improve the Mathematical Skills of Students in General Chemistry *Elizabeth Antohi, University of Texas at El Paso; Ryan Floresca, University of Texas at El Paso; Geoffrey B. Saupe, University of Texas at El Paso; James El Becvar, University of Texas at El Paso*
- 1:15 Improving Networking Skills by Implementing Study Pages into the Chemistry Workshop Workbooks *Anthony Ramirez, University of Texas at El Paso; Elizabeth Antohi, University of Texas at El Paso; Juan C. Noveron, University of Texas at El Paso; Geoffrey B. Saupe, University of Texas at El Paso; James El Becvar, University of Texas at El Paso*
- 1:30 Peer leaders facilitate teachable moments in interactive workshops dedicated for students acquiring general chemistry *Cassandra Lissett Orozco, University of Texas at El Paso; Mary Adu-Gyamfi, University of Texas at El Paso; Andrea McWilliams, University of Texas at El Paso; Ryan Floresca, University of Texas at El Paso; Mahesh Narayan, University of Texas at El Paso; James El Becvar, University of Texas at El Paso*
- 1:45 PLTL: Science for the Artsy *Ajuma Michelle Alfred, University of Texas at El Paso; Juan C. Noveron, University of Texas at El Paso; Geoffrey B. Saupe, University of Texas at El Paso; James El Becvar,*



Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

*University of Texas at El Paso*

- 2:00 Understanding Conflicts over Evolution Through a Historical Lens: A Historiography of the Major Trends in Evolution Education in the United States *Sarah Jenevein, The University of Texas at Austin*

**010. Chemistry and Biochemistry Oral Session 1**

Chemistry and Biochemistry

Paper Session

1:00 to 3:00 pm

FLC: Floor first - Jackson A

Participants:

- 1:00 2019: The United Nations designated International Year of the Periodic Table of the Chemical Elements: A personal assessment and exploration *Keith H Pannell, the university of texas at el paso*
- 1:15 A Comparative Metagenomic and Spectroscopic Analysis of Soils from an International Point of Entry between the US and Mexico *Abdiel Keni Cota-Ruiz, UTEP; Yosef López de los Santos, dINRS-Institut Armand-Frappier, Université du Québec; José Ángel Hernández-Viezcas, UTEP; Marcos Delgado-Rios, Universidad Autónoma de Ciudad Juárez; José Ramón Peralta, UTEP; Jorge Luis Gardea-Torresdey, UTEP*
- 1:30 Contact Conductivity Detection in On-column Suppressed Open Tubular Ion Chromatography *Bikash Chouhan, University of Texas at Arlington; Purnendu K Dasgupta, University of Texas at Arlington*
- 1:45 Hierarchical Porous Carbon Fabric Membrane Derived from ZIF-8/PAN: Electrospinning Synthesis and Application as Anode for Sodium-Ion Battery *Yanfeng Yue, Sul Ross State University; Monica Argueta, Sul Ross State University; Hong-Yu Guan, GouangZhou University*
- 2:00 Time-of-Flight Nano Flow Sensor for Instrumentation Development and Troubleshooting *Chuchu Qin, UT Arlington; Purnendu K Dasgupta, University of Texas at Arlington*
- 2:15 TiS<sub>2</sub>-based Electrocatalysts for Hydrogen Evolution Reaction: Synthesis, Fundamental Understanding, Engineering, and Optimization *Aruna Narayanan Nair, University of Texas at El Paso; Saptasree Bose, UTEP; Sreeprasad Sreenivasan, UTEP*
- 2:30 Vibrational and Electronic Spectra of 2-Nitrobenzanthrone: An Experimental and Computational Study *Kefa K Onchoke, Stephen F. Austin State University*

**011. Chemistry and Biochemistry Oral Session 2**

Chemistry and Biochemistry

Paper Session

1:00 to 3:00 pm

FLC: Floor first - Jackson B

Participants:

- 1:00 A Field-Ready Colorimetric Assay for the Determination of Arsenic Concentrations in Freshwater Samples Containing Mixed Metal Contaminants *Hannah Gloden, Midland College*
- 1:15 Applications of STA *Courtney Harris, Stephen F. Austin*

*State University; Alyx Frantzen, Stephen F. Austin State University*

- 1:30 Fundamental Growth Mechanism of Thiolate Protected Platinum Nanoparticles *Alexandria Cook, Stephen F. Austin State University; Brian Barngrover, Stephen F. Austin State University*
- 1:45 Latent Fingerprint Development: Reaction Mechanism Observation of 5-MTN and Serine using DFT *Javier V. Castaneda II, Stephen F. Austin State University; Brian Barngrover, Stephen F. Austin State University*
- 2:00 Optimization of a Solution Calorimeter *Pete Camacho, Jr., Stephen F. Austin State University; Alyx Frantzen, Stephen F. Austin State University*
- 2:15 The Development and Validation of an LC-MS Method for Analysis of Nineteen Bile Acids in Human Plasma *Mayte Gonzalez, Schreiner University; Adrian L Zapata, Schreiner University*
- 2:30 Theoretical Stereochemistry of Co(II) IDA with Histidine Tags to Identify Binding Energies Utilizing DFT *Lindsey Ohmstede, Stephen F. Austin State University; Brian Barngrover, Stephen F. Austin State University*
- 2:45 ZrP Immobilized Cobalt Porphyrins as Heterogeneous Electrocatalysts for Oxygen Evolution Reaction *Isabel Barraza, The university of Texas at El Paso*

**012. Cell and Molecular Biology Oral Session & Section Meeting**

Cell and Molecular Biology

Paper Session

2:00 to 3:00 pm

Winebrenner Science Building: Floor first - 123

Participants:

- 2:00 Investigating Synergy Between PA28 $\gamma$  and IKK $\epsilon$  *Hannah Butterfield, Austin College; Lance Barton, Austin College*
- 2:15 Isolation and characterization of novel antibiotic producing soil isolates *Luis Grado, Sam Houston State University*
- 2:30 Isolation and characterization of novel bacteriophages *Tiffany Lujan, Tarleton State University*
- 2:45 Section Meeting Cell and Molecular Biology *Susan Klinedinst, Schreiner University*

**013. Neuroscience Oral Session and Section Meeting**

Neuroscience

Paper Session

2:15 to 2:45 pm

Winebrenner Science Building: Floor first - 121

Participants:

- 2:15 Hemodynamic mechanisms for augmentation of cognitive brain functions with transcranial lasers *Francisco Gonzalez-Lima, The University of Texas at Austin; Emma Holmes, The University of Texas at Austin; Douglas W. Barrett, The University of Texas at Austin*
- 2:30 Neuroscience Section Meeting *Danielle D Grove, Texas Lutheran University*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**014. Poster Presentation and Judging: Anthropology, Conservation Ecology, Freshwater Science, Geoscience, Mathematics and Computer Science, Neuroscience, Physics and Engineering, Plant Biology, STEM Education, Terrestrial Ecology and Management**

3:00 to 4:30 pm

Winebrenner Science Building: Winebrenner Science Building, Corridor

**014-1. Poster Presentation and Judging: Anthropology, Conservation Ecology, Freshwater Science, Geoscience, Mathematics and Computer Science, Neuroscience, Physics and Engineering, Plant Biology, STEM Education, Terrestrial Ecology and Management**

Texas Academy of Science Annual Meeting  
Poster Session

**014-2. Conservation Ecology Poster Session**

Conservation Ecology  
Poster Session

Participants:

Aquatic habitat survey for the Jollyville Plateau salamander (*Eurycea tonkawae*), a threatened endemic of Central Texas. Sean Rangel, Concordia University Texas; Courtney Findley, Concordia University; Alyssa Kaylynn Olivarez, Concordia University Texas; Mary Kay Johnston, Concordia University Texas

Carolina wren (*Thryothorus ludovicianus*) nesting success in urban and rural habitats Gabriel Alexander Barragan, Sam Houston State University; Diane Neudorf, Sam Houston State University

Flight Initiation Distance in Eastern Fox Squirrels (*Sciurus niger*) Varies with Threat Assessment in Urban and Rural Environments. Krista Joy Ward, Stephen F. Austin State University

Invasive Plant Impact On Tadpole Survivability Joshua Vincent Medovich, Schreiner University

The Effects of the Reintroduction of Native Grasses on Native Bird Populations in West Texas Francisco A Velasco, Hardin Simmons University; Bryson T Holcomb, Hardin Simmons University; Kayli A Bragg, Hardin Simmons University; Wendi K Wolfram, Hardin Simmons University

The Infection of the Protozoan Parasite, *Ophryocystis elektroscirrha*, in the Monarch Butterfly, *Danaus plexippus*, across Central Texas. Brad Burden, Texas A&M University - Central Texas; Jackelyn Ferrer-Perez, Fort Hood AIM Program; Charlie Plimpton, Fort Hood AIM Program; Chelsea Blauvelt, Fort Hood AIM Program; Laura Weiser Erlandson, Texas A&M University - Central Texas

**014-3. Freshwater Science Poster Session**

Freshwater Science  
Poster Session

Participants:

Bullseye! Hitting the target on primer optimization Shellsea Elizabeth Miller, Southwestern University; Lauren Elizabeth Muskara, Southwestern University; Matthew A. Barnes, Texas Tech University; Romi L Burks, Southwestern University

Determining the effect of agricultural pollutant accumulation on Guadalupe river water quality Dalton Rollins Reid, Schreiner University; Jacob Vargas, Schreiner University

Evaluating the health of saline lakes via environmental DNA analysis of microbial communities Matthew Owen Jones, Texas Tech University; Kristen Heath, Texas Tech University; Warren C Conway, Texas Tech University; Matthew A. Barnes, Texas Tech University

Highway to shell: Troubleshooting methods of genetic detection and identification in two invasive species, *Cipangopaludina chinensis* and *C. japonica* Nicole Kelly, Southwestern University; Shannon Odell, Southwestern University; Hannah Winkler, Southwestern University; Shannon Walsh, Southwestern University; Russ Minton, Gannon University; Romi L Burks, Southwestern University

Predicting East Texas freshwater mussel distributions using current and future climate data Kinza Iftikhar Ashraf, University of Texas at Tyler; Ashley D Walters, US Forrest Service Rocky Mountain Research Station; David Ford, EcoAnalysts; Marsha G Williams, University of Texas at Tyler; Neil B Ford, University of Texas at Tyler; Lance R Williams, University of Texas at Tyler; Joshua A Banta, University of Texas at Tyler

The effect of Independence Creek inflow on Pecos River water quality Susan Aina, Midland College

Tracking invasives in Texas: A comparison of spatial distribution of invasive fish over the last decade Kaylei Diane Chau, Environmental Institute of Houston - UHCL

**014-4. Geosciences Poster Session**

Geosciences  
Poster Session

Participant:

Structural Analysis of Barite Precipitation in Porous Media Bruce Nicholas Lomeli, Department of Physics, The University of Texas at El Paso; Jose Leo Banuelos, Department of Physics, The University of Texas at El Paso; Vitalii Starchenko, Geochemistry and Interfacial Sciences, Oak Ridge National Laboratory; Gernot Rother, Geochemistry and Interfacial Sciences, Oak Ridge Natinoal Laboratory

**014-5. Neuroscience Poster Session**

Neuroscience  
Poster Session

Participants:

Characterization of ferroptosis inductors in neuronal cells Elaine Michelle Hollibaugh, UTSA; George Perry, UTSA; German Plascencia-Villa, UTSA; Leslie Michelle Fuentes, University of Texas at San Antonio

Characterizing the role of autophagy gene product BEC-1 in neuronal longevity in the model organism *Caenorhabditis elegans* Nicholas Ashley, St. Edward's University; Andrea

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

*Holgado, St. Edward's University*

- Exercise precludes salt craving and fat consumption in satisfied female athlete *Gracia Sebastiao, Presenter*
- Initial studies examining bisphenol S effects on hippocampal neurons *Amber S Lancaster, Texas Lutheran University; Danielle D Grove, Texas Lutheran University*
- Salt addiction in male satisfied athlete possibly explained by preparation of home-made food less salty than restaurant and processed food. *Aaron white, Wayland Baptist University*
- Study of neuronal toxicity of amyloid-beta aggregates conjugated with copper ions *Leslie Michelle Fuentes, University of Texas at San Antonio; Elaine Michelle Hollibaugh, UTSA; German Plascencia-Villa, UTSA; George Perry, UTSA*
- Zebrafish as a model for nicotine cessation *Norma Perez-Garcia, The University of Texas at Tyler; Maria Alejandra Rivero, The University of Texas at Tyler; Amanda Solorza, The University of Texas at Tyler; Ayman K Hamouda, The University of Texas at Tyler; Brent Bill, University of Texas at Tyler*

**014-6. Physics and Engineering Poster Session**

Physics and Engineering  
Poster Session

Participant:

- Novel Analytical Technique for Dendritic Microstructures of Directionally Solidified Alloys and Synthesis of Alloy Fabrication Protocols to Optimize Physical Properties  
*Arman Sharma, The Academy of Science and Technology*

**014-7. Plant Biology Poster Session**

Plant Biology  
Poster Session

Participants:

- At the root of it: Investigating the effects of noise pollution on directional root growth *Shayna Marie Engdahl, St. Edward's University; Molly Williams, St. Edward's University*
- Bryophyte abundance on *Liquidambar styraciflua* *Teslin Chaney, Stephen F. Austin State University*
- Chlorophyll content and net photosynthesis in an intercropping and crop rotation system with *Zea mays* and *Medicago sativa* *Samuel Kenyon, St. Edward's University Student*
- Comparing mesh traps against standard traps to avoid the capture of *Tamarixia radiata*, a biological control organism of the ACP *Gisel Garza, The University of Texas-Rio Grande Valley; Genoveva Carriles, Co-Author; Teresa Feria Arroyo, Associate Professor*
- Dendrochronological suitability and climate sensitivity of *Quercus mohriana* in the Texas Panhandle *William R. Watkins III, Wayland Baptist University; Sarah A. Macha, Wayland Baptist University; Matthew S. Allen, Wayland Baptist University*
- Discovering microbial networks in plant microbiomes *Lauren Yancy, St. Edward's University; Dr. Charles Hauser, St. Edwards*
- Effect of nitrate supplementation and input frequency on lipid

production in *Chlorella vulgaris* *Cherokee Rivera Chatterton, Concordia University; Ashleigh Wostarek, Concordia University; Lauren Shuffield, Concordia University; Mary Kay Johnston, Concordia University Texas*

Range extension for the rare sedge *Schoenoplectiella erecta* *Mark Gustafson, Texas Lutheran University; Alan Lievens, Texas Lutheran University; George Yatskievych, Billie L. Turner Plant Resources Center, University of Texas at Austin*

Soil carbon amendments: Vireo Habitat Restoration approach *Serena Lynn Gibbs, St. Edward's University; Dr. Charles Hauser, St. Edwards*

The evolutionary origins of *Mentzelia bartonioides* (LOASACEAE) *Destiny J. Brokaw, Abilene Christian University; Joshua Michael Brokaw, Abilene Christian University*

**014-8. Terrestrial Ecology and Management Poster Session**

Terrestrial Ecology and Management  
Poster Session

Participants:

- Altered landscapes: how rapidly do soils change? *Megan Davis, University of the Incarnate Word; David Starkey, University of the Incarnate Word*
- Burrow Occupancy in Relation to Territoriality *Maclin Miller, Schreiner University; Dominique Nicole Muniz, Schreiner University; Abigail Rose Garcia, Schreiner University*
- Caudates as prey: Predator diversity and size-relationship patterns *Kasey L. Jobe, Department of Biology, Stephen F. Austin State University; Carmen G. Montaña, Department of Biological Science, Sam Houston State University; Christopher Schalk, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University*
- Comparison of tracking tubes and camera traps for assessment of relative abundance of small mammals *Madison Alexander, East Texas Baptist University; Ariana Lopez, East Texas Baptist University; Troy A. Ladine, East Texas Baptist University*
- Host plants of the Lepidoptera of the Coastal Bend, Texas *Richard Patrock, Dept. of Biological and Health Sciences, Texas A&M University-Kingsville*
- Prey composition of Barn Owl (*Tyto alba*) pellets from three different habitats in the Southern High Plains, Texas *Evelynn Simmons, Wayland Baptist University; Andrew Kasner, Wayland Baptist University*
- Response in activity patterns of white-tailed deer (*Odocoileus virginianus*) to lunar cycles and cloud cover *Lindsey Settles, East Texas Baptist University; Troy A. Ladine, East Texas Baptist University*
- Tardigrades in Texas: Fifth Graders add a New Record for the State *Hannah Catherine Cotten, Education; William R. Miller, Baker University*
- The effects of urbanization and habitat density on alarm call propagation in Carolina Wrens (*Thryothorus ludovicianus*) *Stephen Scribner, Sam Houston State University*
- Use of landscape shrubs by mammals *Hunter Barnes, East Texas Baptist University; Troy A. Ladine, East Texas*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

*Baptist University*

**014-9. Mathematics and Computer Science Poster**

**Session**

Mathematics and Computer Science

Poster Session

Participants:

Dynamic Fourier Technique Applied to Discriminate Between Seismic Signals from Natural Earthquakes and Mining Explosions *Md Al Masum Bhuiyan, The University of Texas at El Paso; Maria C. Mariani, The University of Texas at El Paso; Osei Kofi Tweneboah, The University of Texas at El Paso; Hector G. Huizar, The University of Texas at El Paso*

Estimating the volatility of geophysical time series by using stochastic volatility models *Osei Kofi Tweneboah, The University of Texas at El Paso; Md Al Masum Bhuiyan, The University of Texas at El Paso; Hector G. Huizar, The University of Texas at El Paso; Maria C. Mariani, The University of Texas at El Paso*

Optimal corrections to slam light shifts in human circadian rhythms using light and melatonin perturbations *Carrie Fulton, Schreiner University*

Optimizing performance using mathematical models for circadian rhythms *Tiara Hendricks, Schreiner University; Samuel Brice, Schreiner University*

**015. Biomedical Sciences Oral Session 2 and Section Meeting**

Biomedical Sciences

Paper Session

4:30 to 5:45 pm

*Winebrenner Science Building: Floor first - 121*

Participants:

4:30 Novel Therapeutic Organotin compound against *Leishmania major* *Itzel Amacalli Tejada, University of Texas at El Paso; Keith H Pannell, the university of texas at el paso; Rosa Maldonado, University of Texas at El Paso*

4:45 Pathobiology and Therapy of Acute Myeloid Leukemia with KLF4 Gene *Abraham Fausto Jornada Cooper, Howard Payne University*

4:30 Survey of Wild Turkeys for reticuloendotheliosis virus *Faith Josephine Cox, Tarleton State University1010*

4:45 Toxicity Profile and Localization of Virus Like Particles (VLPs) in *Danio rerio* *Bridget Fitzgerald, University of Texas at Tyler; Olivia Brandenburg, University of Texas at Tyler; Baylie Catrett, University of Texas at Tyler; J. Michael King, University of Texas at Tyler; Dustin Patterson, University of Texas at Tyler; Brent Bill, University of Texas at Tyler*

5:00 Biomedical Sciences Section Meeting *Joni H Ylostalo, University of Mary Hardin-Baylor*

**016. Terrestrial Ecology and Management Oral Session 2 and Section Meeting**

Terrestrial Ecology and Management

Paper Session

4:30 to 6:30 pm

*Winebrenner Science Building: Floor first - 123*

Participants:

4:30 Mosquito Ecology and Nectar Preferences *Ben Sloan, Austin College; Anusha Jacob, Austin College; Loriann Garcia, Austin College*

4:45 Novel ecosystems correlate with high biodiversity in urban areas *Damari Anderson, Alamo Colleges; Eric Nathan Madrid, Northwest Vista College*

5:00 Survey and life history of bee fly parasitoids (Diptera: Bombyliidae) of Hymenoptera within Brewster and Jeff Davis counties of Texas *Lauren G Garrett, Sul Ross State University; Chris M Ritzi, Dept of BGPS, SRSU*

5:15 Monitoring of Three Biocontrols for Salt Cedar in the Trans Pecos Texas and Southeastern New Mexico *Chris M Ritzi, Dept of BGPS, SRSU*

5:30 Section Meeting Terrestrial Ecology and Management *Richard Patrock, Dept. of Biological and Health Sciences, Texas A&M University-Kingsville*

**017. Systematics and Evolutionary Biology Oral Session and Section Meeting**

Systematics and Evolutionary Biology

Paper Session

4:30 to 5:00 pm

*Winebrenner Science Building: Floor second - 218*

Participants:

4:30 Visual communication in Gray Treefrog (*Hyla versicolor*): are yellow leg patches sexually selected? *Taylor Nicole Black, Stephen F. Austin State University; Jennifer Gumm, US Fish and Wildlife*

4:45 Systematics and Evolutionary Biology Section Meeting *Simon Scarpetta, University of Texas at Austin*

**018. Mathematics and Computer Science Oral Session and Section Meeting**

Mathematics and Computer Science

Paper Session

4:30 to 5:30 pm

*Winebrenner Science Building: Floor second - 219*

Participants:

4:30 A Toy Problem and it's Twisted Solution *Nicholas Alexander Petela, Tarleton State University; Randi Brianne Kelleher, Tarleton State University; Jaryd Stone Domine, Tarleton State University*

4:45 Math vs. Gerrymandering *Preston Ward, Tarleton State University*

5:00 Predicting the Evolution of the Spotted Owl Population *William Rommel Serrano, Sul Ross State University*

5:15 Mathematics and Computer Science Section Meeting *Scott R. Franklin, Wayland Baptist University*

**019. Geosciences Oral Session and Section Meeting**

Geosciences

Paper Session

4:30 to 6:30 pm

*Winebrenner Science Building: Floor second - 220*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

Participants:

- 4:30 Development of rill marks on washover fans, on Bryan Beach, Freeport, Texas *Russell LaRell Nielson, Stephen F. Austin State University*
- 4:45 Modeling high resolution soil organic matter profiles: insights into soil carbon stabilization *Lily Serach, The University of Texas at Austin*
- 5:00 Sedimentology analysis of the source of the Lanana Creek sediments in Nacogdoches, Texas *Jessica L. O'Neill, Stephen F. Austin State University; Russell LaRell Nielson, Stephen F. Austin State University*
- 5:15 The Pleistocene Capybaras of Texas *Pershing Darrow Gervais, Liva Nova PLC, Houston TX; Camille Gervais, League City Intermediate School; Jon Alan Baskin, Texas A&M-Kingsville*
- 5:30 The rise, fall and resurrection of Caplen, Texas: 10 years after Hurricane Ike *James Westgate, Lamar University*
- 5:45 Section Meeting Geoscience *Erin M Keenan Early, University of Texas at Austin*

**020. Freshwater Science Oral Session and Section**

**Meeting**

Freshwater Science

Paper Session

4:30 to 6:30 pm

FLC: Floor second - 221

Participants:

- 4:30 A snail out of water: Apple snail detection along Oyster Creek (Missouri City/Sugar Land, TX) *Lauren Elizabeth Muskara, Southwestern University; Shellsea Elizabeth Miller, Southwestern University; Matthew A. Barnes, Texas Tech University; Romi L Burks, Southwestern University*
- 4:45 Determining the specific status of an unusual, phreatic, Texas cavesnail (Mollusca; Gastropoda; Hydrobiidae) *Dominique Alvear, University of Texas Rio Grande Valley; Pete Diaz, U. S. Fish and Wildlife Service; Randy Gibson, U. S. Fish and Wildlife Service; Ben Hutchins, Texas Parks and Wildlife; Benjamin Schwartz, Texas State University; Kathryn Perez, University of Texas Rio Grande Valley*
- 5:00 The effect of cheliped function and color on male mating success in the red swamp crayfish, *Procambarus clarkii* *Hayden Hays, Sam Houston State University; Diane Neudorf, Sam Houston State University*
- 5:15 Unraveling the mystery: Genetic identification of non-native Asian Mysterysnails, *Cipangopaludina chinensis* and *C. japonica* *Hannah Winkler, Southwestern University; Nicole Kelly, Southwestern University; Shannon Odell, Southwestern University; Shannon Walsh, Southwestern University; Russ Minton, Gannon University; Romi L Burks, Southwestern University*
- 5:30 Use of diatom communities in aquatic biological assessments *Cynthia Hobson, Texas Parks and Wildlife Dept*
- 5:45 Section Meeting Freshwater Science *Matthew A. Barnes, Texas Tech University*

**021. STEM Education Oral Session 2 and Section**

**Meeting**

STEM Education

Paper Session

4:30 to 5:45 pm

FLC: 222

Participants:

- 4:30 Controversial Issues in Biology: a Senior-Level Assessment *Kathleen Wood, University of Mary Hardin-Baylor*
- 4:45 Design and implementation of activities to improve student performance on foundational concepts in biochemistry *Mary Kopecki-Fjetland, St. Edward's University*
- 5:00 Development of an engaging and rigorous microbiology online course *Joni H Ylostalo, University of Mary Hardin-Baylor*
- 5:15 Identifying Unknowns: Real Science for Middle-School Students *Steven Keith Mittwede, Covenant Classical School*
- 5:30 STEM Education Section Meeting *Phillip G Greco, Temple College*

**022. Marine Science Oral Session and Section Meeting**

Marine Science

Paper Session

4:30 to 6:30 pm

FLC: Floor first - Jackson A

Participants:

- 4:30 A longitudinal study of fish assemblages on the Mesoamerican Barrier Reef, in Roatán, Honduras *Scheila Rene Corujo, Texas Tech University*
- 4:45 Detection and Comparison of Bacterial Pathogens in the American Oyster in South Texas Waters *Mohammad Maruf Billah, The University of Texas Rio Grande Valley; MD Saydur Rahman, University of Texas Rio Grande Valley; Wendy Guerra, The University of Texas Rio Grande Valley; alehli silguero, The University of Texas Rio Grande Valley*
- 5:00 Determination of iron (II) and iron (III) concentrations in coral reef waters at roatan, honduras; august 18 – 25, 2018 *Patrick Edward Mileski, Midland College*
- 5:15 Impacts of Global Warming on Gonadal Functions, Heat Shock Protein Expression, and Cellular Apoptosis in Atlantic Sea Urchin *Jackson Brooks Johnstone, University of Texas Rio Grande Valley; MD Saydur Rahman, University of Texas Rio Grande Valley*
- 5:30 Lunar Reproductive Rhythms of Atlantic Sea Urchin in the Southern Gulf of Mexico *Eleazar Hernandez, University of Texas Rio Grande Valley; Omar A. Vázquez, University of Texas Rio Grande Valley; André Torruco, University of Texas Rio Grande Valley; MD Saydur Rahman, University of Texas Rio Grande Valley*
- 5:45 The Effects of Prozac on Feeding Behaviors and Reproductive Success in a Sex Role-Reversed Saltwater Fish *Dylan Joseph Wichman, Saint Edward's University; Samuel Alexander Cornelius, St. Edwards university; Raelynn Deaton Haynes, St. Edward's University; Sunny Scobell, St. Edward's University*
- 6:00 Effects of elevated carbon dioxide level on bioactive

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

metabolite accumulation in freshwater and marine cyanobacteria *I-Shuo Huang, Texas A&M Corpus Christi; Xinpeng Hu, Texas A&M Corpus Christi; Paul V. Zimba, Texas A&M Corpus Christi*

6:15 Section Meeting Marine Science *Stephanie Lockwood, Texas Tech University*

**023. Chemistry and Biochemistry Oral Session 3 and Section Meeting**

Chemistry and Biochemistry

Paper Session

4:30 to 6:30 pm

FLC: Floor first - Jackson B

Participants:

4:30 Assessing the Immunotoxicity of RNA Nanorings with Varied Functional Orientations *Yelixza Idalyss Avila, Sul Ross State University; Morgan Chandler, University of North Carolina at Charlotte; Kirill A. Afonin, University of North Carolina at Charlotte*

4:45 Designing a Simple Catalytic System for C-H Bond Oxidation *Roberto Napoleon Silva Villatoro, Stephen F. Austin State University; Randy J. Romero, Stephen F. Austin State University; John Brannon Gary, Stephen F. Austin State University*

5:00 Development of Synthetic Carbohydrate Biomimetics as Urinary Tract Infection (UTI) Prophylactics *Juan C. Mora, Sul Ross State University; David J Leaver, Sul Ross State University*

5:15 Implications of RecA in Tuberculosis Drug Resistance *Kyle Rickman, Wayland Baptist University; Robert Moore, Wayland Baptist University*

5:30 Investigating Programming of a Virus Like Particle for Cell Specific Chemotherapy *Savannah Marie Seely, The University of Texas at Tyler*

5:45 Molecular Analysis of *Eryngium Foetidum L.* *Paulo Bryant Flores, Howard Payne University*

6:00 Section Meeting Chemistry and Biochemistry *Brian Barngrover, Stephen F. Austin State University*

**SATURDAY, MARCH, 2**

**024. Past Presidents Breakfast**

Texas Academy of Science Annual Meeting

7:00 to 8:00 am

Mabee Center: Balcony

**025. Poster Presentation and Judging: Biomedical, Cell and Molecular Biology, Chemistry and Biochemistry, Marine Science, Systematics and Evolutionary Biology**

8:00 to 9:30 am

Winebrenner Science Building: Winebrenner Science Building, Corridor

**025-1. Poster Presentation and Judging: Biomedical, Cell and Molecular Biology, Chemistry and Biochemistry, Marine Science, Systematics and Evolutionary Biology**

Texas Academy of Science Annual Meeting

Poster Session

**025-2. Biomedical Sciences Poster Session**

Biomedical Sciences

Poster Session

Participants:

Antitrypanosomal activity of novel  $\alpha,\beta$ -unsaturated ketones and 15 N-aryl derivatives *Karsten Dieter Amezcua, UNIV OF TEXAS-EL PASO; Felipe Rodriguez, UNIV OF TEXAS-EL PASO; Jonathan Dimmock, University of Saskatchewan; Rosa Maldonado, University of Texas at El Paso*

Delivery of Virus Like Particles (VLPs) in *Danio rerio* *Baylie Catrett, University of Texas at Tyler; Bridget Fitzgerald, University of Texas at Tyler; Olivia Brandenburg, University of Texas at Tyler; J. Michael King, University of Texas at Tyler; Dustin Patterson, University of Texas at Tyler; Brent Bill, University of Texas at Tyler*

Finding cytotoxic activity of thiadiazole a potential anti-cancer compound on leukemia cell lines *Karla Gabriela Cano Hernandez, The University of Texas at El Paso; Austre Schiaffino, UTEP; Armando Varela, UTEP; Renato Aguilera, UTEP*

*Streptococcus mutans* genotyping from a predominantly Hispanic population in South Texas *Lazaro Tobias, University of Texas Rio Grande Valley; Thomas Eubanks, University of Texas Rio Grande Valley; Kristine Lowe, University of Texas Rio Grande Valley*

NKT cell subsets regulate the cytokine storm during *Francisella tularensis* infection *Leslie Rodriguez, University of Texas at El Paso; Nicole Setzu, University of Texas at El Paso*

Potency and efficacy of peppermint and Thieves® essential oil on *Escherichia coli* and *Staphylococcus aureus* compared to commercial cleaners *Hannah Justice, Howard Payne University*

Potential Impact of Climate Change on the Geographic Distribution of *Aedes albopictus* in Southern Texas *Wendy Westerheide, The University of Texas Rio Grande Valley; Jonathan Kasofsky, Student; Marcos Valdez, Student; Hamaad Gohar, Student; Teresa Feria Arroyo, Associate Professor*

**025-3. Cell and Molecular Biology Poster Session**

Cell and Molecular Biology

Poster Session

Participants:

Components of *Cinnamomum verum* (Cinnamon) and *Salvia officinalis* (Sage) are Cytotoxic to Murine 4T1 Breast Cancer Cells *Makayla Nicholson, Wayland Baptist University; Jai'Cee Tudman, Wayland Baptist University; Adam Reinhart, Wayland Baptist University; Gary Gray, Wayland Baptist University*

Cytotoxic and apoptotic effects of gingerols and shogaols on 4T1 breast cancer and EpH4-ev non-tumorigenic



Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

- epithelial cell lines *Jai'Cee Tudman, Wayland Baptist University; Makayla Nicholson, Wayland Baptist University; Alana Quackenbush, Wayland Baptist University; Parvin Mirzaei, Center for Biotechnology and Genomics, Texas Tech University; Masoud Zabet-Moghaddam, Center for Biotechnology and Genomics, Texas Tech University; Gary Gray, Wayland Baptist University; Adam Reinhart, Wayland Baptist University*
- Detection of Parasite DNA in a Metagenome Sample *Chloe Herman, St. Edwards University; Dr. Charles Hauser, St. Edwards*
- Estradiol May Not be Anorexigenic in Hibernators *Lisha Susan Jacob, Austin College; Taqwa Armstrong, Austin College; Monica Martinez, Austin College*
- Looking for genetic superheroes: Genetic background affects mutant phenotypes in *Drosophila melanogaster* *Maria Jose Cardenas Muedano, St. Edward's University; Lisa M. Goering, St. Edward's University*
- Screening of students' noses for *Staphylococcus* *Loan Yen Yu, Ms.*
- The Effect of Dietary Protein on Parkinson's Disease Symptoms in *Drosophila melanogaster* *Kaitlyn Matthey, St. Edward's University; Maria Jose Cardenas Muedano, St. Edward's University; Lisa M. Goering, St. Edward's University*
- Using bioinformatics approaches to identify differentially expressed genes in Alzheimer's disease *Adriana Calderone, University of Mary Hardin-Baylor; Joni H Ylostalo, University of Mary Hardin-Baylor*

**025-4. Chemistry and Biochemistry Poster Session**

Chemistry and Biochemistry

Poster Session

Participants:

- Acetaldehyde Determination in Home Distilled Liquors and Commercial Liquors *Rena Elizabeth Gosnell, Texas A&M University - Central Texas; Andrew Rhiner, Texas A&M University- Central Texas; Randy Stoneroad, Texas A&M University- Central Texas; Linh Pham, Texas A&M University- Central Texas; Coady Lapierre, Texas A&M University- Central Texas*
- Analysis of the Amino Acid Content in Beef, Chicken and Turkey Bone Broth *Max Shaw, West Texas A&M University; Nick Flynn, West Texas A&M University*
- Assessment of drinking water quality for metals in the eight natural springs of Manitou Springs, Colorado, using inductively coupled plasma-mass spectroscopy *Elijah Edward Miranda, University of the Incarnate Word; Yesenia L Bass, University of the Incarnate Word; Jason Gerding, University of the Incarnate Word; Alakananda Ray Chaudhuri, University of the Incarnate Word; Edward E Gonzalez, University of the Incarnate Word*
- Computational Analysis of Silver (II) NHC Complex *Allison Marie McKee, University of Houston-Downtown*
- Construction and Evaluation of Low-Volume Flow through Asymmetric Membranes Devices for Gas Exchange *Payton Alexia Wasemiller, University of Texas at Arlington; C. Phillip Shelor, Research Assistant Professor; Purnendu K Dasgupta, University of Texas at Arlington*

- Developing a Multifunctional Treatment Solution of TMPyP/DHN for the Treatment of Alzheimer's Disease. *Matibur Rahaman Zamadar, Stephen F. Austin State University; Jacob Herschmann, Stephen F. Austin State University*
- Effect of Metal Ions on Photosensitized Singlet Oxygen Generation for Photodegradation of Polyaromatic Hydrocarbon Derivatives and Photoinactivation of *Escherichia coli* *Aqeeb Ali, SFASU Chemistry and Biochemistry Department; Matibur Rahaman Zamadar, Stephen F. Austin State University*
- Electrochemical Determination of A Silver Intermediate *Milka O Montes, UT Permian Basin; Michael Hayes, UT Permian Basin*
- Encapsulation of Proteins inside the HK97 VLP *Bubacarr Ceessay, University of Texas at Tyler; Dustin Patterson, University of Texas at Tyler*
- Functional Significance of Point Mutations in Hsp27 that Lead to Neurodegenerative Disease *Maria Iziar Grajeda, University of Texas at EL Paso*
- Genomic Analysis of *C. acetobutylicum* for its Potential as a Biofuel Source *Sarah Reeder, University of Texas at Tyler*
- Influence of Composted Wastewater Sludge (CWS) on Cadmium and Manganese Uptake by Radish (*Raphanus sativus* L.) *OLUWADAMILOLA OLASUMBO FATERU, Stephen F. Austin State University; Kefa K Onchoke, Stephen F. Austin State University*
- Multidimensional Analysis of Texas Home Distilled Liquors *Andrew Rhiner, Texas A&M University- Central Texas; Randy Stoneroad, Texas A&M University- Central Texas; Coady Lapierre, Texas A&M University- Central Texas; Linh Pham, Texas A&M University- Central Texas*
- Quantification of Hydrolyzable Tannins in Acorns from Different Species of Oak Trees (*Quercus* sp.) in East Texas *Russell J. Franks, Stephen F. Austin State University; Sarah E. Browning, Stephen F. Austin State University*
- Strain Management in an Extended Series of Lanthanide 2-Sulfonatoterephthalates,  $[Ln(tpso3)(h2o)2]n$ , with Ln = ce - lu, except pm *Harry Maslen, Angelo State University*
- Synthesis and Structural Study of (3-Chloropropyl)Triphenyltin  $[Ph_3Sn(CH_2)_3Cl]$  and (3-Chloropropyl)Diphenyltin Chloride  $[Ph_2ClSn(CH_2)_3Cl]$  *Henk Steven van den Bogaard, The University of Texas at El Paso*
- The Design of Irreversible Inhibitors of Sterol C24-Methyltransferase (24-SMT) as Potential Therapeutics to Treat Parasitic Protozoan Infections *Luis Payan, Sul Ross State University; David J Leaver, Sul Ross State University*
- Toward the Synthesis of a Macroinitiator and its use in the Preparation of Poly(styrene-*b*-methacrylonitrile): An Undergraduate Laboratory Project in Polymer Chemistry *Aaron Scoggins, The University of Texas at Tyler; Whitney Romero, The University of Texas at Tyler; Neil Gray, The University of Texas at Tyler; Sean Butler, The University of Texas at Tyler*
- Using Virtual Screening to Identify Possible Inhibitors of S-adenosylmethionine in *Burkholderia pseudomallei* *Marie Pearce, University of Texas at Austin*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**025-5. Marine Science Poster Session**

Marine Science  
Poster Session

Participants:

Abundance and frequency of disease and bleaching in *Xestospongia muta* in Roatán, Honduras *Matthew Wayne Krueger, T.I.D.E.S*

A Methodological Comparison of the Belt Transect and Randell-Robertson Marine Survey Technique for Assessing Coral Health in Roatán, Honduras *Brittlinn O'Quinn, McLennan Community College; Madison Knight, McLennan Community College*

A one day continuous water quality record along the Lower Laguna Madre between the Brazos-Santiago Pass and the Arroyo Colorado *Estefania Andrade, The International Baccalaureate Program at Lamar Academy; Fathima Elizondo, The International Baccalaureate Program at Lamar Academy; Alexa Dezena, The International Baccalaureate Program at Lamar Academy; Josiah Cabeza, Classical Conversations of Edinburg, TX; Itzel Salas, Classical Conversations of Edinburg, TX; Alfredo Salas, Classical Conversations of Edinburg, TX; Destiny Garcia, The International Baccalaureate Program at Lamar Academy; Julian Cabeza, Classical Conversations of Edinburg, TX; Daniel Santos, The International Baccalaureate Program at Lamar Academy; Sara Maldonado, The International Baccalaureate Program at Lamar Academy; Joseph Kowalski, The University of Texas Rio Grande Valley*

Faunal diversity along a salinity gradient, Lower Laguna Madre, Texas *Fathima Elizondo, The International Baccalaureate Program at Lamar Academy; Daniel Santos, The International Baccalaureate Program at Lamar Academy; Julian Cabeza, Classical Conversations of Edinburg, TX; Alfredo Salas, Classical Conversations of Edinburg, TX; Itzel Salas, Classical Conversations of Edinburg, TX; Josiah Cabeza, Classical Conversations of Edinburg, TX; Estefania Andrade, The International Baccalaureate Program at Lamar Academy; Sara Maldonado, The International Baccalaureate Program at Lamar Academy; Alexa Dezena, The International Baccalaureate Program at Lamar Academy; Destiny Garcia, The International Baccalaureate Program at Lamar Academy; Joseph Kowalski, The University of Texas Rio Grande Valley*

Frequency and Disease Prevalence in Boulder Corals in Association with Burrowing Annelids in Roatan, Honduras. *Terri Cox, Texas Tech University Waco*

Genetic and morphological characterization of internal parasites of the Gulf pipefish, *Syngnathus scovelli* *Samuel Alexander Cornelius, St. Edwards university; Daniel A Gold, St. Edwards university; Sunny Scobell, St. Edward's University*

Prevalence and Frequency of Encrusting Millepora on Octocorals on the Mesoamerican Barrier Reef in Roatán, Honduras *Shirley Rose Stewart, McLennan Community College*

Territoriality and aggressive behavior of dusky damselfish, *Stegastes adustus*, in Roatán, Honduras *Maria Lozada, McLennan Community College*

The use of optical brighteners to track water quality in the Arroyo Colorado (Texas) drain *Sara Maldonado, The International Baccalaureate Program at Lamar Academy; Alexa Dezena, The International Baccalaureate Program at Lamar Academy; Alfredo Salas, Classical Conversations of Edinburg, TX; Itzel Salas, Classical Conversations of Edinburg, TX; Fathima Elizondo, The International Baccalaureate Program at Lamar Academy; Daniel Santos, The International Baccalaureate Program at Lamar Academy; Estefania Andrade, The International Baccalaureate Program at Lamar Academy; Josiah Cabeza, Classical Conversations of Edinburg, TX; Julian Cabeza, Classical Conversations of Edinburg, TX; Destiny Garcia, The International Baccalaureate Program at Lamar Academy; Joseph Kowalski, The University of Texas Rio Grande Valley*

Community respiration and primary productivity patterns along a salinity and nutrient gradient in the Lower Laguna Madre of Texas *Fathima Elizondo, The International Baccalaureate Program at Lamar Academy*

**025-6. Systematics and Evolutionary Biology Poster Session**

Systematics and Evolutionary Biology  
Poster Session

Participants:

Codon Bias: Do turtles show a preference? *Vivian Nguyen, University of the Incarnate Word; Brittany Muller, University of the Incarnate Word; David Starkey, University of the Incarnate Word*

Cytochrome B Sequences to Determine Clade Assemblages of *Lonchophylla* Species (Phyllostomidae: Lonchophyllinae). *Austin Bidy, Texas Tech University*  
*Estigmene acraea* Crossing Dunes with "Island Hopping" Technique *Alexander G Martinez, Sul Ross State University*

Range extension of *Ashmunella carlsbadensis*, the Guadalupe Woodlandsnail, and its relationship with other *Ashmunella*. *Alison Schofield, University of Texas Rio Grande Valley; Ben Hutchins, Texas Parks and Wildlife; Jeff Nekola, University of New Mexico; Kathryn Perez, University of Texas Rio Grande Valley*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

Plenary Session  
3:00 to 3:30 pm  
*Mims Theater Hall: Mims Theater Hall*

**026. Graduate Competition Oral Session**

Graduate Student Paper Competition  
Paper Session  
10:00 to 11:40 am  
*Mims Theater Hall: Mims Theater Hall*

Participants:

- 10:00 Assessing species-specific responses to forest restoration interventions in the Lower Rio Grande Valley *Faeqa Mohsin, The University of Texas Rio Grande Valley; Kimberly Wahl-Villarreal, US Fish and Wildlife Services; Willemijn Stoffels, Land Life Company; Gautham Ramachandra, Land Life Company; Tom Janmaat, Land Life Company; Bradley Christoffersen, The University of Texas Rio Grande Valley*
- 10:20 Comparison of snail communities of the lower Rio Grande Valley of Texas in urban and wild areas *Briante Najev, University of Texas Rio Grande Valley; Alison Schofield, University of Texas Rio Grande Valley; Jeff Nekola, University of New Mexico; Ben Hutchins, Texas Parks and Wildlife; Kathryn Perez, University of Texas Rio Grande Valley*
- 10:40 Data collection methods and species traits influence species distribution model predictions *Elizabeth Roesler, Texas Tech University; Timothy B. Grabowski, University of Hawai'i at Hilo; Matthew A. Barnes, Texas Tech University*
- 11:00 Miocene modernization of North American lizard fauna *Simon Scarpetta, University of Texas at Austin*
- 11:20 Using diceCT as a novel approach to the comparative anatomy of degenerate neural structures *Ruben Tovar, The University of Texas; Paul Gignac, Oklahoma State University Center for Health Sciences*

**027. Lunch**

Texas Academy of Science Annual Meeting  
12:00 to 1:30 pm  
*Mabee Center: Cafeteria Area*

**028. Section Chairs post Session Meeting**

Texas Academy of Science Annual Meeting  
1:30 to 2:00 pm  
*Winebrenner Science Building: Floor first - 121*

**029. Science Jeopardy**

Texas Academy of Science Annual Meeting  
1:30 to 2:30 pm  
*Mims Theater Hall: Mims Theater Hall*

**030. TAS Business Meeting**

Texas Academy of Science Annual Meeting  
Business Meeting  
2:30 to 3:00 pm  
*Mims Theater Hall: Mims Theater Hall*

**031. Texas Outstanding Educator Award and Lecture**

Texas Academy of Science Annual Meeting

**032. Distinguished Texas Scientist Award and Lecture**

Texas Academy of Science Annual Meeting  
Plenary Session  
3:30 to 4:00 pm

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**FRIDAY, MARCH, 1**

**001. TAS Board Meeting**

Texas Academy of Science Annual Meeting  
Special Event  
8:00 to 11:30 am  
Mabee Center: Balcony

**002. Section Chairs Pre-Session Lunch Meeting**

Texas Academy of Science Annual Meeting  
Special Event  
11:30 to 12:30 pm  
Mabee Center: Balcony

**003. Biomedical Sciences Oral Session 1**

Biomedical Sciences  
Paper Session  
1:00 to 2:00 pm  
Winebrenner Science Building: Floor first - 121  
Participants:

**1:00 Alterations of cellular metabolic pathways in 4T1 breast cancer cells in response to 8-shogaol** Luke Brown, Wayland Baptist University; Jai'Cee Tudman, Wayland Baptist University; Parvin Mirzaei, Center for Biotechnology and Genomics, Texas Tech University; Masoud Zabet-Moghaddam, Center for Biotechnology and Genomics, Texas Tech University; Gary Gray, Wayland Baptist University; Adam Reinhart, Wayland Baptist University

The metabolic pathways necessary for survival become significantly altered in cancer. Primarily, they have a higher rate of glucose utilization and lactate production. Cancer cells rely heavily on glucose for cell maintenance and proliferation, allowing them to have a growth advantage in hypoxic conditions. This phenomenon known as the Warburg effect has been studied since the 1920's. This altered metabolic state has been studied as a potential target for chemotherapy treatments. If enzymes involved in glucose metabolism could be attenuated, cancer cells may be unable to survive in oxygen-poor environments, typically found in rapidly growing tumors. Previous research has shown that ginger is cytotoxic to the 4T1 murine breast cancer cell line; but, not as cytotoxic to the non-tumorigenic Eph4-ev murine breast epithelial cell line. Previous studies have also found that all of the major components from ginger, 8-shogaol was most cytotoxic to 4T1 cells, and triggered apoptosis. In this study we sought to explore the effect of 8-shogaol on major metabolic pathways. 4T1 cells were treated with 10ug/ml 8-shogaol (ethanol control) and proteins were extracted. Proteomic studies were done via (LC-MS/MS) and protein levels were identified using MaxQuant software. We report that some enzymes involved in fat metabolism and ketosis [mitochondrial acyl-CoA dehydrogenase family member 9, and hydroxymethylglutaryl-CoA synthase] have increased significantly. Enzymes involved in glycolysis and pentose phosphate pathways [hexokinase-II, and 6-phosphogluconate dehydrogenase] have significantly decreased. Taken together, these data suggest 8-shogaol, may be involved in reprogramming metabolic pathways which are abnormal in highly glycolytic tumors

**1:15 Determining lipid composition of carotid artery plaques using multimodal imaging: Predictive analysis to enhance risk factor assessment of carotid atherosclerosis** Divya Nagaraj, William P. Clements High School

The composition of atherosclerotic plaques is an indicator of plaque stability, and therefore of importance for clinical risk assessment of atherosclerotic cardiovascular disease (ACVD). The goal of this study was to design and implement a multimodal image fusion program to understand lipid morphology in human carotid endarterectomy (CEA) samples. Thus, 66 sections of 13 CEA specimens were cut after a carotid endarterectomy and stained with the Oil Red O reagent to mark the location of lipid droplets and were layered on top of micro-CT scans using the developed program. Dice-Sorensen coefficients for tissue, lipid, and image overlap were calculated and used as an index to study the accuracy of image fusion. The algorithm was implemented in MATLAB and produced a  $80.6\% \pm 8.5\%$  similarity between the micro-CT scans and Oil Red O stained histology images. A  $68.8\% \pm 19.8\%$  overlap in lipid similarity was established, along with a statistically significant correlation between lipid and tissue similarity. The study's results show that composition of atherosclerotic plaques, specifically the composition and locations of lipids in these plaques, can be determined by computed tomography scans to a large degree. This study also determines that image fusion with the ultrasound and MRI modalities could provide even more targeted and specific information about the composition of the plaque. Future studies that improve the overlay further will enhance the fusion's predictive accuracy and will increase the functionality of this algorithm to aid in the clinical decision process for ACVD.

**1:30 Histological analysis of muscular atrophy in *Nauphoeta cinerea*** Megan Alexander, Grant Winner

In this study, the walking muscles of *Nauphoeta cinerea*, or the speckled cockroach, were examined for age-related muscular atrophy. The species chosen was carefully selected due to their inability to lift off the ground and take flight, which draws a parallel to mammalian age-related muscle degeneration making this species more relatable to humans than the standard model organism *Drosophila melanogaster*, or the fruit fly. Specifically, the muscle tissue of the left metathoracic femur between the trochanteral-femoral joint and the femoral-tibial joint was examined in 20 different speckled cockroaches of both sexes. Using Hematoxylin and Eosin staining, differences in the diameter of individual muscle fibers among age groups were used as an indicator of atrophy. The results gathered in this study could pave the way for interventional strategies to delay and/or slow the progression of age-related atrophy in mammals, including humans.

**1:45 In vivo selection of human breast cancer cells that endogenously overexpress Her-2** Valerie Gallegos, UTEP; Paloma Valenzuela, UTEP; Karla Parra, UTEP; Karen Chavez, UTEP; Natzielly Lerma, UTEP; Shan Man, Sunnybrook Research Institute; Ping Xu, Sunnybrook Research Institute; Guido Bocci, University of Pisa; Urban Emmenegger, Sunnybrook Research Institute; Robert Kirken, UTEP; Robert Kerbel, Sunnybrook Research Institute; Giulio Francia, UTEP

Targeting the Her-2 oncogene is an effective strategy for the treatment of Her-2 overexpressing breast cancers. However, new strategies against Her-2 are needed to combat the emergence of drug resistance. It is important to develop new models of Her-2 positive breast cancer which can be used to evaluate optimal strategies for targeting the disease. Here, we report the in vivo selection of variants of the human Her-2 positive breast cancer cell

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

lines BT474 and MDA-MB-361. Serial passaging in SCID mice resulted in more aggressive variants, which readily grew in mice after orthotopic implantation. The selected variants responded to trastuzumab (20mg/kg every 3 days) monotherapy. MDA-MB-361 variants implanted orthotopically produced tumors with a doubling rate of 40 days which responded to metronomic cyclophosphamide (20mg/kg/day); in this model the combination of trastuzumab plus metronomic cyclophosphamide did not significantly improve tumor inhibition compared to either monotherapy. These variants provide additional models for the study of Her-2 positive breast cancer, and our results suggest that models of Her-2 positive breast cancer generated by transduction of Her-2 into Her-2 negative cells may exaggerate the therapeutic benefit of anti-Her-2 based therapies. Future studies that target important processes in cancer progression, such as VEGF, using anti-bodies from hybridomas will allow us to identify possible treatment regimens for Her-2 overexpressing breast cancers.

**004. Terrestrial Ecology & Management Oral Session 1**

Terrestrial Ecology and Management

Paper Session

1:00 to 2:00 pm

Winebrenner Science Building: Floor first - 123

Participants:

**1:00 Chronic Sloughing Shell Disease in the Chihuahuan Mud Turtle, *Kinosternon hirtipes murrayi* and other Subtropical and Tropical Mud Turtles** James Learned Christiansen, University of Texas, Austin; D R Davis, University of Texas Rio Grande Valley; Travis LaDuc, University of Texas at Austin

The authors have described a new mechanism for a sloughing disease of the dorsal scutes of the shell of the Yellow Mud Turtle, *Kinosternon flavescens* whereby an organism such as the common filamentous alga *Arnoldiella chelonum*, invaded natural pores in the growing shell producing lesions easily recognizable in four stages. In the last year we examined over 1000 specimens of tropical and subtropical kinosternid turtles across four research collections to determine whether these disease stages were present, thus providing evidence that this mechanism of invasion functions in these more southern, mostly aquatic species. Of particular interest was the Chihuahuan Mud Turtle, *Kinosternon hirtipes murrayi*, a species listed as threatened in Texas. In this paper we illustrate the presence of all four stages of this disease process in this listed species and show variation in the defense of *K. f. murrayi* against this disease with possible differences in late stage 2, stage 3, and the most severe, stage 4. We also provide evidence that this disease mechanism functions in the Mexican Mud Turtle, *K. integrum*, the White Lipped Mud Turtle, *K. leucostomum*, and the Scorpion Mud Turtle, *K. scorpioides*.

**1:15 Grassland bird diversity and habitat associations in the Southern High Plains, Texas** Sharon Leigh Ann DeMerritt, Wayland Baptist University; Andrew Kasner, Wayland Baptist University

Birds were surveyed in winter (Dec 2017-Feb 2018; Floyd County, Texas) and summer (May-June 2018; Cochran, Terry, Yoakum counties, Texas) to determine diversity, abundance and habitat associations in farmland and grassland and mist-net capture in brushy canyonlands. Summer surveys utilized 100-m transects established in 4 habitats (mesquite, sand-sage, treated shin-oak, and untreated shin-oak) in Yoakum Dunes Wildlife Management Area (YDWMA). Three species totaling 124 birds were detected during winter point-counts in Floyd Co., and

number of sparrows at points was negatively correlated ( $P=0.01$ ) with distance from points to the nearest playa bottom (most were dry). Ten species were captured in the canyonland site, increasing observed winter sparrow richness to 11 species. In summer at YDWMA, 31 species totaling 310 birds were detected. Average number of birds was similar between mesquite and sand-sage and between untreated and treated shin-oak; however, average number of birds was higher in mesquite and sand-sage than in either of the shin-oak habitats ( $P<0.001$ ). Species richness varied among habitats (mesquite=23, sand-sage=16, untreated shin-oak=8, treated shin-oak=6). Shannon's Index of Diversity was highest in mesquite (2.73) and lowest in treated shin-oak (1.2). Mesquite bird community was least similar to the other three habitats (Jaccard's Coefficient of Similarity CCj: sand-sage=0.39, untreated shin-oak=0.15, treated shin-oak=0.12), while the shin-oak habitats were most similar (CCj=0.56). Although treated shin-oak had low species richness, Lesser Prairie-Chicken was present in this habitat, which is the management objective for shin-oak reduction.

**1:30 Habitat associations and population estimates for the Texas horned lizard (*Phrynosoma cornutum*) in the Southern High Plains of Texas**

Sara Andea van der Leek, Wayland Baptist University; Andrew Kasner, Wayland Baptist University

This study was conducted from May-Sept. 2016, July-Oct. 2017, and April-Sept. 2018 using transects and area searches to locate Texas horned lizards in Hale and Floyd counties, Texas. Lizards were captured, and morphological and habitat measurements were taken. In 2017 and 2018, PIT tags were inserted subcutaneously in lizards with SVL>40mm. The Schnabel Index indicated that the population estimate for adult and juvenile lizards at the Hale County site in 2018 was 135 markable (SVL>40mm) individuals. Including hatchlings (that could be identified as individuals), the population estimate is 178. Using the Schnabel Index result there is a density of 36 (SVL>40mm) lizards per hectare at the Hale County site. Habitat at male and female lizard locations was not different. Habitat at hatchling, juvenile, and adult locations was not different. Lizard locations had a lower percent grass ( $P=0.0472$ ), lower percent forb ( $P=0.0004$ ), higher percent bare ground ( $P<0.0001$ ), and a lower vegetation height ( $P<0.0001$ ) than did transect sample points without lizards. At the Floyd County site, disturbance from heavy, short-term grazing had an impact on horned lizard numbers (2016, pre-grazing=21; 2017, during grazing=6; 2018, post-grazing=5). However, there were no significant differences in horned lizard location habitat between years at this site.

**1:45 Historic Land Use Effects on Ecosystem Health: Use of Aerial and Satellite Imagery**

Julianna Kurpis, UTRGV

Historic and current land-use activities result in significant, patterned changes to ecosystem health. In the Lower Rio Grande Valley (LRGV), Texas, the clearing of native Tamaulipan scrub, mesquite, and riparian forests for agricultural use and rapid urban expansion followed by population growth continue to have profound ecological impacts. This study uses a historical ecology framework and approach to, 1) use historic and contemporary satellite imagery in documenting patterns of land use change (agriculture, residential, and commercial) over time and, 2) assess the effects of temporal and spatial land use change to regional vegetation and ecosystem health. Contemporary and historic images from remote sensing data were obtained from Landsat satellites, and historic aerial images were obtained from the Texas Natural Resources Information

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

System. Imagery and measures of biomass density and vegetative cover change were analyzed using the normalized difference vegetation index (NDVI) tool in ArcGIS 10.6. Additionally, field collected data from exemplary sites representing different LRGV land use were entered into the Ecosystem Services Identification & Inventory (ESII) Tool to determine proportioned measures of ecosystem functions and services. The results of this study are important to assessing the effects of LRGV land use, understanding how these effects affect vegetation change and ecosystem health, and identifying patterns useful to conservation planning and management.

**005. Anthropology Oral Session and Section Meeting**

Anthropology

Paper Session

1:00 to 2:15 pm

Winebrenner Science Building: Floor second - 218

Participants:

1:00 **Balancing climatic and energetic demands within the human nose** *ALEXA PENNAVARIA KELLY, University of North Texas Health Science Center; Scott D. Maddux, University of North Texas Health Science Center*

Comparatively, cold-dry environments are more metabolically expensive for the human body than tropical environments. Accordingly, as metabolic demand increases, volumetric oxygen intake must increase to meet the energetic demands. The mechanism for how these strong physiological forces are balanced within the human nose is not completely understood at present. To test this, we employed 17 linear measurements from the nasal skeleton of modern humans from 10 climatically diverse geographic areas (Arctic Circle, Europe, Iran, Australia, North Africa, Khoisan, South African Bantu, East Africa, West Africa, Papua New Guinea). Femoral head diameter (FHD) and stature estimations were further employed as a proxy for body size and metabolic requirements. In conjunction with climatic data, these morphological data were employed in multivariate analyses to examine the relationship between nasal dimensions, climate, and metabolic demand. Our results indicate that most breadth measurements of the nasal aperture and internal cavity are significantly correlated with climate (all  $r$ -values=0.64–0.81,  $p$ -values<0.045), but not FHD. Conversely, nasal size measurements were found to be more strongly correlated with FHD ( $r$ -values=0.53–0.68,  $p$ -values<0.047) compared to climate. Further, overall nasal passage area was found to be positively associated with FHD ( $r=0.54$ ,  $p=0.039$ ), while nasal passage shape retained a significant relationship with climate ( $r=0.76$ ,  $p=0.001$ ) with relatively tall/narrow airways associated with colder-drier environments. Collectively, these results support the assertion that airway size represents a compensatory mechanism for ensuring a metabolically sufficient intake of oxygen, while nasal shape is more dependent on climatic factors. Additional studies employing more direct measures of metabolic demands are needed.

1:15 **Early Onset Anthropocene. Control of the Landscape by the ancient Maya in Northwestern Belize.** *Thomas Guderjan, University of Texas at Tyler*

Using LiDAR, terrestrial survey and archaeological excavations, we have identified large-scale and multi-purpose landscape modifications by the Classic period Maya, generally AD 100-800, in northwest Belize. Not surprisingly, these include construction of kawks, or central places with pyramids, plazas, and images of power. Additionally, these modifications include large numbers of residential building exhibiting evidence of multiple social

strata and spatially demarcated by linear piles of stones bounding individual houselots. This discovery causes us to rethink the scale and complexity of Maya settlement systems and land tenure. Additionally, terracing and other cross-channel constructions are found on hill-slopes and platforms and ditched agricultural fields are found on the bases of hills. Taken together, these features show that ancient Maya completely transformed their natural environment into a built landscape over which, they had complete control.

1:30 **Preliminary Analysis of Fossil Avifaunal Humeri from Swartkrans** *Reagan Van Couteren, Department of Anthropology, Baylor University; Thomas A. Stidham, Key Laboratory of Vertebrate Evolution and Human Origins, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences; Timothy L Campbell, Department of Anthropology, Baylor University*

In this study, we present preliminary results from an analysis of avifaunal remains recovered from the hominin-bearing site of Swartkrans, South Africa. The specimens represent part of the SKX microfaunal assemblage, a collection of fossils excavated between 1979-1986 from Members 1-3 of the cave site. These deposits are Early to Middle Pleistocene in age and date to ~2.0, 1.65-1.07, and 1.04-0.62 Ma respectively. To date, relatively little has been published on the birds from Swartkrans, although seven orders and 11 families have previously been identified from these deposits. In this preliminary analysis, we examined 71 nearly complete to complete bird humeri from the SKX collection. Identifications are based on overall gross morphology and the presence of synapomorphies indicating phylogenetic placement. In total, specimens from six orders and four families have been identified with the majority of specimens ( $n=54$ ) attributed to the most diverse avian clade, Passeriformes (song birds). Nineteen specimens from three families, however, represent new records for the site. Newly identified families include the Psittacidae (parrots, NISP=10), Hirundinidae (swallows and martins, NISP=8), and Turnicidae (buttonquails, NISP=1). These preliminary results demonstrate that a greater diversity of birds was present at Swartkrans than has previously been recognized. Moreover, these birds point to a past diversity of habitats around the cave including wet grasses and forests or woodlands.

1:45 **Stable isotope signals as proxy for mobility amongst ancient Canary aboriginals: creating a strontium and oxygen baseline for Gran Canaria** *Paloma Cuello, Texas A&M University*

The discipline of archaeology has become increasingly interdisciplinary with continuous technological advancements. Within the last few decades, methods applied in the realm of geochemistry have been established in anthropological fields, a collaboration that has allowed quantitative analysis to shed light on anthropological questions such as past human migratory patterns. This presentation focuses on the use of stable isotope analyses to understand ancient aboriginal movement within the Canary Islands (Spain), emphasizing the technique's ability to detect foreign versus local populations. This project is interested on the values from stable isotopes of oxygen ( $d18O$ ) and bioavailability of strontium ( $87Sr/86Sr$ ) obtained from modern faunal and floral remains across Gran Canaria Island. Because the two isotopes do not undergo radiogenic alteration, archaeological applications use the more abundant and accessible modern organic specimens to represent local geochemical signatures. Thus, the goal of this project has been to develop an isoscape of Gran Canaria using local vegetation, road-kill rabbits and lizards, as well as dental

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

remains from sheep/goats. Values of  $\delta^{18}O$  from fresh water have also been obtained. Such exploration was already conducted in Lanzarote Island as a Master thesis, ergo the project has continued with Gran Canaria in order to keep developing a Canary Island oxygen and strontium baseline. The information gathered will be used as a proxy to infer movement amongst ancient Canary aboriginals in the form of a Ph.D. dissertation. Therefore, this research considers that obtaining a solid understanding of baseline levels in the archipelago takes precedence to its application in humans.

### **2:00 Taxonomic Assessment of Modern and Fossil African Rodent Femora** *Timothy L Campbell, Department of Anthropology, Baylor University*

In this study I test the taxonomic signal present in African rodent femora using modern museum specimens and apply the results to fossil specimens from Swartkrans Members 1-3 (~2 – 0.62 Ma), South Africa. Rodents are found in many African Plio-Pleistocene fossil-bearing localities and their fossilized remains are commonly used to reconstruct past environments. Paleoenvironmental reconstructions utilizing rodents are typically conducted within a taxonomic framework by examining paleocommunity structure and rely on actualistic principles where the environmental and habitat requirements of living taxa are considered to be suitable analogs for the fossil taxa they morphologically resemble. As these types of paleoenvironmental reconstructions have relied almost exclusively on the analysis of relatively complete cranio-dental remains, the degree to which rodent postcrania can be used to inform on rodent paleocommunities is still unknown. To address this question data were collected from modern specimens (N=270) representing seven families, 11 subfamilies and 32 genera using two dimensional geometric morphometric - Elliptic Fourier Analysis, and analyzed using MANOVA and Canonical Variates Analysis (CVA). Results from the analysis of modern specimens showed significant differences at all three taxonomic levels while those from the CVA showed increased misclassifications at lower taxonomic levels. In particular, misclassifications were highest for members of the subfamily Murinae (rats and mice). Results from the analysis of modern specimens were then used as a training dataset in order to classify the unknown fossil specimens in the first ever analysis of rodent postcrania from Swartkrans.

**2:15 Anthropology Section Meeting** *Timothy L Campbell, Department of Anthropology, Baylor University*

### **006. Physics and Engineering Oral Session and Section Meeting**

Physics and Engineering

Paper Session

1:00 to 2:15 pm

*Winebrenner Science Building: Floor second - 219*

Participants:

### **1:00 Analysis of free and underdamped oscillation of metallic cantilever beams** *Hendra Jaya Tarigan, Howard Payne University*

The oscillating frequency of metallic cantilever beams are investigated using three different experiment techniques: bending stress/strain, sound wave propagation, and the reflection of linearly polarized He-Ne laser light. The frequencies are measured for beam lengths of 23 cm, 26 cm, 30 cm and 35 cm, respectively, where the beam width and height are held fixed at 38 mm and 3 mm. The three experiment techniques show a good agreement in terms of oscillating frequencies. Aluminum and steel alloy based cantilever beams were utilized. The steel alloy shows a

slightly lower oscillating frequency in comparison with that of its aluminum alloy counterpart. The rates of decay of underdamped oscillation based on the bending stress/strain experiment technique were compared among air, water, vegetable oil and engine oil (SAE 5W-20) where an extended arm of the cantilever is immersed in the respective fluids. The engine oil shows the highest decay rate while air has the lowest. The sound wave propagation based experiment technique is viewed important as it has never been used before to the best of the author's knowledge.

### **1:15 Creating a Heliocentric Lunar Forming Impact Model** *Bryant Wyatt, Tarleton State University*

To date, researchers investigating lunar forming impacts only considered the impactor and proto-Earth in their simulations. In this research we incorporated the effects of the Sun on lunar forming impacts. The Sun, making up 99.8 percent of the Solar System's mass, must be included in any valid lunar forming model. We have incorporated data from NASA's "Horizons" system at JPL to produce the correct initial conditions for the impactor and proto-Earth—relative to the Sun. Using this data along with the gravitational effects of the Sun we created a heliocentric model. This model has shown: that the impactor and proto-earth could have originated well within the asteroid belt and the post impact earth could have a low orbital eccentricity.

### **1:30 Evolutionary Algorithm Optimization of Lattice Towers** *Wyatt Beck Young, Tarleton State University*

We will develop an evolutionary algorithm for the structural changes of galvanized steel beams over time under external forces. These beams will be used to construct lattice tower models. These models will treat the galvanized steel beams as ideal springs with limits in both tensile and compressive forces. We will apply an evolutionary algorithm to optimize the tensile and compressive strengths of the beams. By modeling structures in this way, we can create a stable collection of beams that are optimized to withstand specified external forces, without the cost of over-engineering. Because of the large number of calculations and the need for multiple trials to determine success, we plan to use parallel processing on high end graphics cards to execute these simulations. This method will allow us to rapidly design more efficient structures.

### **1:45 Stabilized Adobe Brick – Physical and Optical Properties** *Gerald J. Mulvey, Univer of the Incarnate Word; Sreedev J. Ande, Univer of the Incarnate Word*

The mechanical and thermal properties of stabilized adobe brick are poorly understood. Adobe brick used commercially in San Antonio is one example of such a brick. This presentation describes the research conducted to establish the physical and optical properties of the brick towards the goal of creating a properties data base for thermal mathematical modeling of adobe brick structure's energy performance. The samples can be described as stabilized rectangular solid bricks composed of silt, clay, sharp red sand, lime, and concrete mixture. The ingredients are mixed at the construction site to provide masonry for commercial construction. The rough brick dimensions were relatively uniform, with width, length, and depth of 30.46 centimeters, 15.33 centimeters, 8.85 centimeters, respectively, while the brick average volume was 4132.1 cubic centimeters. Brick dimensions and volumes are greater than standard US clay bricks. Thirty-five brick samples off of the production line were examined to determine their characteristic size, density, water absorption, surface reflectivity (albedo), thermal expansion, and thermal conductivity. The total sample was subsetted for the individual tests. The brick morphology was characterized using a Scanning Electron Microscope. The results show that the density of the adobe brick is

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

comparable to the density of clay fired brick. Water absorption, surface reflectivity measurements along with thermal expansion, and thermal conductivity will also be presented. The results obtained will be compared with the recommended values for commercial fired clay bricks, Engineering A and B classes.

2:00 **Physics and Engineering Section Meeting** Kim Arvidsson, Schreiner University

**007. Plant Biology Oral Session and Section Meeting**

Plant Biology

Paper Session

1:00 to 3:00 pm

Winebrenner Science Building: Floor second - 220

Participants:

1:00 **A new species in *Mentzelia* section *Bicuspidaria* (Loasaceae) from Baja California Sur and Cedros Island.** Destiny J. Brokaw, Abilene Christian University; Joshua Michael Brokaw, Abilene Christian University

*Mentzelia* section *Bicuspidaria* is a group of desert annuals containing five recognized taxa distributed in northwestern Mexico and the southwestern United States. Based on recent phylogenetic reconstructions of *Bicuspidaria* using plastid and nuclear ribosomal DNA sequences, *M. hirsutissima* sensu lato has been found to consist of two clades that are paraphyletic with respect to *M. involucrata*. These two clades of *M. hirsutissima* consist of populations that are distinguished most reliably by geography. The 'northern *M. hirsutissima* clade' sister to *M. involucrata* includes the type specimen of *M. hirsutissima* and occurs in southern California and Baja California. The 'southern *M. hirsutissima* clade' has been found only in Baja California Sur and Cedros Island at the southwestern tip of Baja California. In order to determine whether morphological characters can be identified to distinguish these lineages, we have sampled 20 floral and vegetative characters from 40 voucher specimens of *M. hirsutissima*. Although no discrete morphological characters could be found to perfectly distinguish the northern and southern clades, discriminant analysis suggests that leaf length and rachis width most reliably indicate the phylogenetic origins of these populations. Further work is needed to describe the 'southern *M. hirsutissima* clade' as a previously unrecognized species.

1:15 **An updated vascular flora of the Runningwater Conservancy, Hale County, TX with comparisons to regional floristic records** Krista S. Epley, Wayland Baptist University; Matthew S. Allen, Wayland Baptist University

Located within the high plains of West Texas, the Runningwater Conservancy in Hale County is a grassland remnant with native, unplowed upland prairie and a playa lake. It is a 29 ha site approximately 25 kilometers west-northwest of Plainview, TX. It is currently enrolled in the Wetland Reserve Program. Inventories of the vascular plant flora in the high plains region are limited with few surveys completed recently. The goal of this project is to catalog all vascular plants occurring in the study area. This project was initiated in the fall of 2017 with walking surveys. Surveys will continue during the growing seasons at least through the fall of 2020. Voucher specimens for all identified taxa will be deposited in the E. L. Reed Herbarium at Texas Tech University. To date, we have identified over 50 plant species in more than 45 genera in 19 families. Additionally, we seek to compare the floristic diversity of this location with other floristic records of the region. This study will improve our floristic knowledge in an understudied region.

1:30 **Comparison of plant communities from two rivers in the West Cross Timbers ecoregion of Texas** Allan Nelson, Tarleton State University; Randall Rosiere, Tarleton State University; Kim Gamez, Tarleton State University; Turner Cotton, Tarleton State University; Sarah Brown, Tarleton State University; Keagan Lowey, Tarleton State University

We are investigating hardwood bottomland forests and describing species composition and structure of vegetation. Our analysis is being conducted to provide baseline knowledge on this natural vegetation and the first quantitative knowledge for hardwood bottomland forests in the ecotonal West Cross Timbers (WCT) ecoregion. Our quantitative analyses of the herbaceous vegetation in bottomlands are the only ones for the state. Currently there is a need for quantitative data of this forest vegetation, which is lacking for much of Texas and because of ongoing classification and mapping of natural plant communities. The bottomland forest along the Colorado River in the WCT was comprised of three vegetational layers: 1) upper canopy of trees, 2) under canopy of heavily browsed shorter trees and shrubs, and 3) herbaceous zone of Canada wild rye (*Elymus canadensis*), sedges, and forbs. Green ash (*Fraxinus pennsylvanica*) and cedar elm (*Ulmus crassifolia*) were dominant trees but had little regeneration due to high herbivory. This investigation will be compared to the Bosque River of the WCT and other investigations of woody vegetation reported from Texas.

1:45 **Exploring the potential for communication of learned behavior in populations of the sensitive plant (*Mimosa pudica*)** Nickolas G. Robinson, Northwest Vista College, CIMA-LSAMP

The sensitive plant—*Mimosa pudica*—exhibits a defensive leaf-folding response to physical stimulation, thereby reducing its leaves' exposure to potential threats in the surrounding environment. Recent research indicates that individual *Mimosa* plants eventually habituate—or reduce their leaf-folding response—to a reliably unharmed, repeated, physical stimulus. In this study, our aim was to find whether or not *Mimosa* plants in a population, which have been habituated to a particular physical stimulus, somehow influence unhabituated plants in the same population to reduce leaf-folding behavior when exposed to the same physical stimulus. Two populations of *Mimosa pudica* were established in a nursery setting. Plants located near the outer edge of one population were exposed to a repeated physical stimulus over a habituation training period of several days. Plants at the center of this population were not exposed to the physical stimulus. Following the period of habituation training, plants at the center were finally exposed to the physical stimulus, and their reactions were compared to those of a second, control population, which was also left unexposed to the stimulus throughout the course of the habituation training period. Ultimately, the particular physical stimulus employed in this study damaged the *Mimosa* plants, rendering unexpected results. Nevertheless, we present useful insights for future behavioral studies in populations of *Mimosa pudica*.

2:00 **Investigations of the mycoflora inhabiting the bark of *Juniperus ashei* (Cupressaceae) in central Texas** Jessica Bernardin, Texas State University; Trina Guerra, Texas State University; David Rodriguez, Texas State University; Dittmar Hahn, Texas State University; David E Lemke, Texas State University

*Juniperus ashei* (Cupressaceae) is a common evergreen tree in central Texas with a range extending from Arkansas to northern Mexico. A notable feature of these trees are



## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

conspicuous white patches that occur on the bark of the trunk and branches that have been identified as a parasitic fungus, *Robergea albicedrae* (Ascomycota). This fungus, along with others that inhabit the bark of *J. ashei*, remains understudied and ambiguous in terms of the overall mycoflora occurring on juniper bark. The purpose of this study is to (1) identify culturing techniques and media types suitable to grow *R. albicedrae* in vitro, (2) isolate and culture other fungal species that grow on the bark of *J. ashei*, and (3) sequence *R. albicedrae* and the other mycoflora constituents.

**2:00 Vegetation survey of the Yegua Knobs Preserve, Bastrop and Lee Counties, Texas** *Diana K. Digges, Texas State university; David E Lemke, Texas State University*

The Yegua Knobs Preserve (YKP) is a private, 122-hectare tract owned and managed by the Pines and Prairies Land Trust and is situated on the Bastrop-Lee County line in the Oak Woods and Prairies ecoregion of east-central Texas. The purpose of this study was to (1) catalog the flora during an entire growing season, (2) collect quantitative data on the composition of the woody and herbaceous communities (3) classify the plant communities that occur at YKP. Three major plant community types have been documented on the site: a post oak-blackjack oak association, a loblolly pine-oak association, and a little bluestem-paspalum association. Botanically, the site is particularly interesting in that it seems to represent the westernmost distribution limit for a number of east Texas species.

**2:15 Plant Biology Section Meeting** *Kathleen Wood, University of Mary Hardin-Baylor*

### 008. Conservation Ecology Oral Session and Section Meeting

Conservation Ecology

Paper Session

1:00 to 3:00 pm

FLC: Floor second - 221

Participants:

**1:00 Body Condition in Natural Populations of the Georgetown Salamander (*Eurycea naufragia*)**

*Benjamin Allen Pierce, Southwestern University*

Assessment of body condition is a potentially important tool for evaluating population health and identifying periods of vulnerability in threatened and endangered species. I studied body condition in two populations of the Georgetown salamander, *Eurycea naufragia*, a spring- and cave-dwelling salamander endemic to the San Gabriel River watershed in Williamson County, Texas. The species is known from only about 15 sites, and urbanization throughout its range threatens all known populations. Monthly surveys of salamanders were conducted at two spring sites (Swinbank Spring and Twin Springs) from 2012 to 2015. Each salamander captured was examined for the presence of eggs and photographed. Tail width and head-trunk length were measured from digital images of salamanders. I assessed body condition of salamanders using size-adjusted tail widths (residuals of regression of tail width with head-trunk length), because salamanders store lipids in their tails and previous studies of salamanders have used tail width as a measure of body condition. Salamanders at Swinbank Spring had significantly greater body condition than salamanders from Twin Springs. Gravid salamanders had lower body condition than nongravid salamanders, and body condition varied by capture location within the spring. Average body condition was lowest during winter months, increased in spring and summer, and reached its maximum in the fall. These observations suggest that body condition of

Georgetown salamanders varies over time and space and is affected by environmental and biological factors.

**1:15 Correlates of Snake Entanglement in Erosion Control Blankets** *Sarah Elizabeth Ebert, Department of Biology, Stephen F. Austin State University; Kasey L. Jobe, Department of Biology, Stephen F. Austin State University; Christopher Schalk, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University; Daniel Saenz, Southern Research Station, USDA Forest Service; Cory Adams, Southern Research Station, USDA Forest Service; Christopher Comer, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University*

In road construction projects across the United States, erosion control methods (e.g., erosion control blankets [ECBs]), are mandated to stimulate seedbed regeneration and prevent soil loss. Anecdotal reports have suggested that snakes are vulnerable to entanglement in ECBs. We conducted a literature review, field surveys, and an entanglement experiment to examine what factors increase a snake's risk of ECB entanglement. Our literature review produced reports of 175 reptiles entangled in mesh products, 89.1% of which were snakes, with 43.6% of snake entanglements occurring in erosion control products. During our field surveys, we found ten entangled snakes (n = 2 alive; n = 8 dead). From our experiment, we found that ECBs that contain fixed-intersection, small-diameter mesh comprised of polypropylene were significantly more likely to entangle snakes compared to ECBs with larger diameter polypropylene mesh or ECBs that have woven mesh made of natural fibers. Snake body size was also associated with entanglement; for every 1 mm increase in body circumference, the probability of entanglement increased 4%. These results can help construct a predictive framework to determine those species and individuals that are most vulnerable to entanglement.

**1:30 Updating the conservation status ranks for Texas land snails (Mollusca: Gastropoda)** *Jeff Nekola, University of New Mexico; Briante Najev, University of Texas Rio Grande Valley; Alison Schofield, University of Texas Rio Grande Valley; Ben Hutchins, Texas Parks and Wildlife; Kathryn Perez, University of Texas Rio Grande Valley*

Our knowledge of the conservation status of the Texas terrestrial gastropod fauna is inadequate. We possess little replicable, empirical data on the majority of the fauna from across most of the state. As a consequence, the Texas Parks & Wildlife list of Species of Greatest Conservation Need (SGCN) includes taxa which are more common than currently recognized or have secure populations while other species which should demand higher concern are not listed. We conducted a systematic, empirical analysis of the Southern, Central, and Western Texas terrestrial gastropod fauna both in museum collections (n=4023 lots) and from de novo field research (n=140 sites; >100,000 snails). We found 199 total land snail species and subspecies in Texas that were rankable using the NatureServe Rank Calculator. The previous SGCN list of 30 species (G1-G2/S1-S2) should be increased to 67 species with 18 species removed from the list and 55 added. This work substantially revises the conservation status rankings for all Texas land snails to reflect only those species that warrant conservation attention.

**1:45 Updating the known ranges of Texas's endemic, freshwater cavesnails (Mollusca; Gastropoda; "Hydrobiidae")** *Dominique Alvear, University of Texas Rio Grande Valley; Pete Diaz, U. S. Fish and Wildlife*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

*Service; Randy Gibson, U. S. Fish and Wildlife Service; Ben Hutchins, Texas Parks and Wildlife; Benjamin Schwartz, Texas State University; Kathryn Perez, University of Texas Rio Grande Valley*

Endemic to the world's most ecologically-diverse underground system, the Edwards Aquifer of Texas, are 13 species (across 5 genera) of snail that are extremely poorly known due to the historic lack of study. Their underground habit and microscopic size make them difficult to study and identify. Most of the published records are from the original species descriptions and some have not been seen since they were described more than 100 years ago. Here we use ~150 new collections from across the Southern Edwards Plateau to update the ranges of 11 of these species. Two described species, *Pyrgophorus spinosus* and *Phreatodrobia imitata*, were not re-collected in these samples and four morphological types were encountered that are not assignable to named species. Other notable findings include re-discovery and greatly expanded range of *Stygopyrgus bartonensis*, the Barton Cavesnail, and range extensions of 100+ km for several species.

**2:00 Use of Biodiversity Collections in Conservation of Species of Greatest Conservation Need** *Gary Pace Garrett, University of Texas; Adam Cohen, University of Texas; Dean Hendrickson, University of Texas*

Data held in natural history collections are critically important for modern ecological, evolutionary, and biogeographical studies and are increasingly aiding conservation decision-making. The information collections contain in the form of specimen-backed occurrences, field notes, and images can provide insights and guidance for researchers and resource managers, and serve as a verifiable baseline representing historical communities. The Fishes of Texas Project is a regional, quality-controlled, database of museum specimens compiled from many collections, and an online user interface allowing users to view, map, and download data. It has enhanced conservation decision-making for aquatic species in Texas and has played an integral role in the development of the Native Fish Conservation Areas Network.

**2:15 Variation in Arthropod Community on a Prairie-Style Green Roof Relative to vegetation and slope position** *Sydney Jackson, Austin College; Loriann Garcia, Austin College; Brooke Byerley Best, Botanical Research Institute of Texas*

Prairie-style green roofs designed to be low maintenance require the development of a healthy arthropod community to provide important ecological services. Green roofs with greater habitat variability typically exhibit greater plant biodiversity. Is the same true for arthropods? We used pitfall traps to sample ground-dwelling arthropods across a 2-year-old green roof in order to (1) determine the overall status of the developing arthropod community and (2) determine whether that community differs relative to two slope positions and three plant assemblages. We predict arthropod diversity to be highest in grass-dominated foot slope areas because of combined effects of higher vegetation coverage and higher soil moisture. We found an abundance of Collembolans (springtails) and Acarids (mites) which indicate early successional soils. We also found a high proportion of Hymenoptera, Hemiptera, and Coleoptera, which could indicate a diverse array of higher trophic level predators.

**2:30 Section Meeting Conservation Ecology** *Chris Distel, Schreiner University*

**009. STEM Education Oral Session 1**

STEM Education

Paper Session

1:00 to 2:15 pm

FLC: 222

Participants:

**1:00 A Guide to Improve the Mathematical Skills of Students in General Chemistry** *Elizabeth Antohi, University of Texas at El Paso; Ryan Floresca, University of Texas at El Paso; Geoffrey B. Saupe, University of Texas at El Paso; James El Becvar, University of Texas at El Paso*

When students enroll in a general chemistry course, it is assumed that they have achieved a mastery of basic mathematics. The concepts in almost every science course involve an application of mathematical skills. Unfortunately, many students begin general chemistry with a severe deficit in their knowledge of mathematics. Students go to class with the intention of learning chemistry only to find themselves confused by the involved mathematics before they can even attempt to grasp the fundamental chemistry concepts. In order for more students to succeed, we have to ensure their awareness of the significance of mathematical proficiency in chemistry. The creation of a mathematics workbook will help students develop and hone the skills that they need to succeed in introductory science courses. The mathematics workbook will be a study guide dedicated only to mathematics as it pertains to general chemistry. It will include summaries, practice problems, and mnemonics that will help students review concepts from middle and high school. At the University of Texas at El Paso, this workbook will be utilized in Peer-Led Team Learning workshops for first and second semester general chemistry to improve the mathematical proficiency of students in course.

**1:15 Improving Networking Skills by Implementing Study Pages into the Chemistry Workshop**

*Workbooks Anthony Ramirez, University of Texas at El Paso; Elizabeth Antohi, University of Texas at El Paso; Juan C. Noveron, University of Texas at El Paso; Geoffrey B. Saupe, University of Texas at El Paso; James El Becvar, University of Texas at El Paso*

The Peer-Led Team Learning (PLTL) program at the University of Texas at El Paso helps students succeed in general chemistry. PLTL develops effective study methods by implementing small learning community workshops led by Peer Leaders. The PLTL experience develops habits that a student can apply to any course, thus it should introduce students to the universal skill of networking. The program currently uses leader-authored workbooks to facilitate learning in workshop. Introducing Study Pages to the chemistry workbooks will organize student notetaking and facilitate networking. Study Pages will help further align lecture and workshop and allow students from different lectures and different workshops to be in sync. Study Pages will encourage students to learn more effectively individually and in groups. The first Study Page will be a Networking Page to allow the student to enter basic information: the name of their professor, lecture times, the name of their peer leader, the workshop meeting time, the professor's and peer leader's contact information, and – most importantly – the names of their peers in workshop with their contact information (ex. emails). Workshop is designed to be more personal than lecture, and the Study Pages will encourage students to take advantage of the workshop's individualized and interactive nature. Incorporation of Study Pages to the workbook will direct students to recognize the tactics that they must implement in

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

order to succeed in every course.

**1:30 Peer leaders facilitate teachable moments in interactive workshops dedicated for students acquiring general chemistry** *Cassandra Lissett Orozco, University of Texas at El Paso; Mary Adu-Gyamfi, University of Texas at El Paso; Andrea McWilliams, University of Texas at El Paso; Ryan Floresca, University of Texas at El Paso; Mahesh Narayan, University of Texas at El Paso; James El Becvar, University of Texas at El Paso*

This presentation will illustrate how Peer Leaders practiced in the subject of general chemistry, create teachable moments in small learning community workshops. Every workshop is overseen by a single undergraduate Peer Leader. An objective for PLTL workshop is to promote peer-to-peer interaction and connect text to real life via hands-on activities. As opposed to workshop, information in lecture is not absorbed efficiently as students take notes at the same time while listening. Many times, students are consumed in the mentality that their studying time does not take place outside of lecture, lab, and workshop. Lecture is an example of passive learning; lab is designed to have students perform experiments related to what is given in lecture. In workshop, a Peer Leader facilitates learning through group activities, games, and explorations that illustrate chemistry in real life. Peer Leaders inspire curiosity in growing minds by asking lots of questions during group work. Students often pressure the Leaders to lecture, but that is the job of the professor. Peer Leaders are not hired to do the same job as a professor. Peer Leaders are not expected to know the content by heart like a professor with years of experience but understand content to the best of their ability. A Peer Leader is a peer of their students and the relationship in workshop should not be student to professor but peer to peer. This is facilitation. This workshop will demonstrate PLTL in a topic taught in the second semester of general chemistry: organic nomenclature.

**1:45 PLTL: Science for the Artsy** *Ajuma Michelle Alfred, University of Texas at El Paso; Juan C. Noveron, University of Texas at El Paso; Geoffrey B. Saupe, University of Texas at El Paso; James El Becvar, University of Texas at El Paso*

The Peer-Led Team Learning (PLTL) Program in first and second semester general chemistry at the University of Texas at El Paso uses undergraduate student authored workbooks to facilitate understanding in these two courses. PLTL recognizes that the arts and sciences are more alike than most people think. We want to integrate art into science to make it easier for the artistic students to understand not just chemistry but the other sciences. The fact that a student is artistically inclined doesn't mean that they can't also be a great student in the field of science. The peer leading program concentrates on making it easier for students to understand content and to apply acquired knowledge in ways that have not yet been discovered. One of the many ways that we have achieved this is by creating different kinds of games and activities for chemistry to enhance cognitive and problem-solving skills. This is another way we wish to achieve our goal. Using music, art, history and even dance we can make the many science courses just a little easier for the next student.

**2:00 Understanding Conflicts over Evolution Through a Historical Lens: A Historiography of the Major Trends in Evolution Education in the United States** *Sarah Jenevein, The University of Texas at Austin*

According to large-scale surveys of public understanding and opinion, the United States ranks close to last among

developed nations in terms of acceptance of evolutionary theory. Evolution education in the United States continues to be marked by controversy, with science teachers reportedly downplaying or altogether avoiding the topic of evolution (the "E-word"). The current state of evolution education is perhaps best understood by examining its history. To that end, this paper outlines five distinct historical phases: 1) early legal tests, such as the infamous "Scopes Monkey Trial," as the proving grounds for proponents and opponents of evolution; 2) an era of heightened conflict over state science standards and textbooks following post-Sputnik science reforms; 3) incendiary public debates and polemics between evolutionists and creationists at the turn of the 21st century; 4) a critical examination of the learning science of evolution and common misconceptions; and 5) a shift toward work on student and teacher beliefs about evolution. This paper moves beyond militaristic characterizations of the "clashes" and "culture wars" between evolution and creationism. Instead, it provides a broad, historiographical account to contextualize the trends and future challenges in evolution education.

### 010. Chemistry and Biochemistry Oral Session 1

Chemistry and Biochemistry

Paper Session

1:00 to 3:00 pm

FLC: Floor first - Jackson A

Participants:

**1:00 2019: The United Nations designated International Year of the Periodic Table of the Chemical Elements: A personal assessment and exploration** *Keith H. Pannell, the university of texas at el paso*

One hundred and fifty years ago, 1869, the Russian scientist Dimitri Mendeleev decided to forgo a planned trip to a cheese factory and jotted down his blossoming ideas on organizing the known chemical elements by relating atomic weights and properties. The result initiated what would transform into the icon we know as the Periodic Table (PT). In recognition of this event, the United Nations has designated 2019 as the International Year of the PT. As in any field of science, Mendeleev had knowledge of prior insights demonstrating periodicity involving groups of elements, and even though his name is synonymous with his creation, many others predating 1869 must be acknowledged and celebrated. It can be said to start with John Dalton, who, starting in 1803, introduced the concept of the indivisibility of the atom and who also (with later pioneers such as Avogadro, Berzelius, Dulong and Petit) facilitated the determination of atomic weights of the elements. With the standardization of the then known atomic weights by Cannizzaro, who selected hydrogen as the standard with an atomic weight of 2, the scientific community was provided a numerical handle on the elements. By selectively combining these numerics with chemical properties, periodicity became apparent: Dobereiner's triads, Newland's law of Octaves, and Chancourtois' brilliant Telluric screw. Two questions will be addressed: (1) Why do we not remember their names to the same extent as Mendeleev's: what was his genius? (2) Can you synthesize a Group?

**1:15 A Comparative Metagenomic and Spectroscopic Analysis of Soils from an International Point of Entry between the US and Mexico** *Abdiel Keni Cota-Ruiz, UTEP; Yosef López de los Santos, dINRS-Institut Armand-Frappier, Université du Québec; José Ángel Hernández-Viezcas, UTEP; Marcos Delgado-Rios, Universidad Autónoma de Ciudad Juárez; José Ramón Peralta, UTEP; Jorge Luis Gardea-Torresdey, UTEP*

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

In this study, we analyzed the soils taken from urban [domestic workshops (DW)] and agricultural-intended (AI) points in Ciudad Juárez and evaluated their element content, fertility, and microbial diversity. Predictably, the AI soils showed better fertility parameters. The metal(oid)s Cr, Se, As, Pb, Ni, and Cd were examined in AI soils but not detected. The heavy metal Pb was detected in DW soils. The Proteobacteria phylum was the most predominant group among all soils, with an average relative abundance of 67% ( $P < 0.05$ ). In AI soils, *Paracoccus denitrificans* was diminished ( $p \leq 0.05$ ), concurring with an increase in nitrates; meanwhile, the content of nitrogen was negatively correlated with rhizobium ( $r^2 = -0.65$ ,  $p \leq 0.05$ ). DW soils showed the greatest content of Cu, which strongly correlated with the relative abundance of Proteobacteria ( $r^2 = 0.99$ ,  $P < 0.0001$ ). The Firmicutes phylum represented up to ~25% in the DW locations, which suggest the possible role of these microorganisms in heavy metal hyper-accumulation. Particularly, only the oil-contaminated soil showed the presence of the genus *Sulfuricurvum*, a microorganism that can grow in crude oil and can oxidize sulfur, sulfide, and thiosulfate. The recent created *Candidatus saccharibacteria* was found in all environments tested. This latter finding becomes relevant as they have the cellular machinery to degrade organic compounds. Taken together, these results describe the productivity parameters of soils and its correlation to the microbial diversity. Also, the presence, abundance, and the potential participation of microorganisms to alleviate contaminated sites is presented.

### 1:30 Contact Conductivity Detection in On-column Suppressed Open Tubular Ion Chromatography Bikash Chouhan, University of Texas at Arlington; Purnendu K Dasgupta, University of Texas at Arlington

We describe a solution contact conductivity detector for use with open tubular capillaries. The first choice as detector for such a capillary is the Capacitively Coupled Contactless Conductivity (Admittance) Detector. Admittance detection allows on-column measurement of admittance of the flowing liquid. We are interested in suppressed open tubular ion chromatography (OTIC) because of the low background noise and enhancement of signal compared to non-suppressed OTIC. In suppressed OTIC with small bore capillaries where the solution conductivity is very low, the admittance signal is nonlinear to the analyte concentration. While contact conductance measurement has been successfully performed in small microfluidic channels, this has been elusive with capillaries. We designed a simple end-column scheme to measure solution conductivity. The proposed contact conductivity detector consists of two parallel planar 25  $\mu\text{m}$  thick stainless steel foils with a polyimide tape (50  $\mu\text{m}$ ) in between. The liquid flows through an IR laser drilled hole (~40  $\mu\text{m}$ ). The effective thickness of the electrode assembly is 100  $\mu\text{m}$ , thus the dispersion is minimum. The conductivity response is linear with the concentration of the electrolyte and single digit  $\mu\text{M}$  LODs for anions like F<sup>-</sup> and Cl<sup>-</sup> are attained.

### 1:45 Hierarchical Porous Carbon Fabric Membrane Derived from ZIF-8/PAN: Electrospinning Synthesis and Application as Anode for Sodium-Ion Battery Yanfeng Yue, Sul Ross State University; Monica Argueta, Sul Ross State University; Hong-Yu Guan, Gouangzhou University

Carbon-based anode materials have raised a great deal of interests due to their low-cost and light-weight (i.e. high energy density). Among these carbonaceous materials, carbon nanofiber is a potential anode material for sodium-ion batteries (SIBs) with the advantages of high specific strength, high temperature resistance, and high conductivity. In this work, N-doped hierarchical porous structured carbon

fibers (CZIF-8/PAN) were prepared from carbonization of zeolitic imidazolate framework (ZIF) on polyacrylonitrile (PAN) composite fabricated by electrospinning technique. As anode for SIBs, the CZIF-8/PAN fibers showed superior reversible capacities of 186.2 mAh g<sup>-1</sup> at the current density of 1 A g<sup>-1</sup> with an excellent cyclic stability. Remarkably, compared to other similar reported carbonaceous anodes materials for SIBs, CZIF-8/PAN fibers as anode for SIBs shows a high reversible capacity at high current densities and an excellent cyclic stability, i.e., the capacities can be kept 93.5% at a current density of 1.0 A g<sup>-1</sup> after 600 cycles. The improved electrochemical performance of CZIF-8/PAN fibers is mainly attributed to the hierarchical porous structures, which greatly promotes the ion and electron transfer rates due to the increased contact area between electrode and electrolyte. In addition, the increased electrochemical performance of CZIF-8/PAN fabric anode also benefit from the doping of nitrogen atoms which enhance the conductivity and increase the active sites.

### 2:00 Time-of-Flight Nano Flow Sensor for Instrumentation Development and Troubleshooting Chuchu Qin, UT Arlington; Purnendu K Dasgupta, University of Texas at Arlington

An increasing number of devices operate today under ultra-low flow rates. Such systems are generally blessed with higher efficiency, greater sensitivity, smaller sample size and less solvent consumption. An accurate flow rate assessment is crucial for measurement reproducibility and is sometimes mandatory in certain applications. While technologies are constantly advancing towards the nano-scale, conventional methods and commercial sensors for flow measurement do not meet current needs. We report a time-of-flight (TOF) flow sensor that can measure liquid flow rates at single digit nL/min level. One or more flow markers are pre-introduced into a flow cell consisting of a precision capillary. A 4-port valve switches flow direction in a way that the flow marker(s) pass(es) through the sensor back and forth. Flow rates are determined on the time between flow marker's leading edge and trailing edge passing the detector. Sensitive optical and admittance detectors are developed which can trace flow marker in very narrow bore capillary (5 - 11  $\mu\text{m}$  i.d.). This device is independent of fluid properties, thus it is widely applicable in liquid chromatography. The flow sensor has been experimentally proven to measure flow rate as low as 3 nL/min; the performance indicates the sensor should be able to measure flow in the pL/min regime.

### 2:15 TiS<sub>2</sub>-based Electrocatalysts for Hydrogen Evolution Reaction: Synthesis, Fundamental Understanding, Engineering, and Optimization Aruna Narayanan Nair, University of Texas at El Paso; Saptasree Bose, UTEP; Sreerprasad Sreenivasan, UTEP

The constantly diminishing fossil fuels reserves coupled with acute environmental effects of their operation has driven the research to find alternative renewable clean fuel platforms. Hydrogen, a clean fuel (with near zero CO<sub>2</sub> emission during its use), and its renewable production through electrocatalytic water splitting process is getting tremendous attention as a potential energy resource. While different catalysts including metals and their nitrides, carbides and chalcogenides are proposed for hydrogen evolution reaction (HER), Pt group metals demonstrated the best catalytic activity. However, the expensive nature and low abundance of Pt- group metals forced researchers to discover cost-effective and earth abundant catalyst-substitutes. Though two-dimensional (2D) transition metal chalcogenides (TMCs) exhibited great promise, the comparatively low number of available active sites and dull electrical conductivity lead them to have substantially lower

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

catalytic activity. Unlike few of its more illustrious counterparts, Titanium disulphide (TiS<sub>2</sub>) is less explored for HER. With quasi-metallic conductivity, TiS<sub>2</sub> nanosheets, when engineered intelligently could demonstrate high catalytic efficiency towards HER. Hence, in this work, taking TiS<sub>2</sub> as a model system, we investigate the fundamental mechanisms that govern the catalytic activity of the TMCs for electrocatalytic fuel production and develop feasible pathways to engineer the microstructure of the catalyst to derive superior activity, selectivity, and efficiency.

### 2:30 **Vibrational and Electronic Spectra of 2-Nitrobenzanthrone: An Experimental and Computational Study** *Kefa K Onchoke, Stephen F. Austin State University*

The environmental pollutant 2-nitrobenzanthrone (2-NBA) poses human health hazards, and is formed by atmospheric reactions of NO<sub>x</sub> gases with atmospheric particulates. Though its mutagenic effects have been studied in biological systems, its comprehensive spectroscopic experimental data are scarce. Thus, vibrational and optical spectroscopic analysis (UV-Vis, and fluorescence) of 2-NBA was studied using experimental and density functional theory employing B3LYP method with 6-311+G(d,p) basis set. The scaled theoretical vibrational frequencies show good agreement to experiment to within ~ 5 cm<sup>-1</sup> and < 20 cm<sup>-1</sup> for frequencies < 1800 cm<sup>-1</sup> and 2700 -3200 cm<sup>-1</sup>, respectively. In addition, predictions of the DFT frequencies below 1800 cm<sup>-1</sup> yield an overall root mean square (RMS) of ± 20.1 and ± 20.6 cm<sup>-1</sup> for benzanthrone and 2-NBA, respectively. On the basis of normal coordinate analysis complete assignments of harmonic experimental infrared and Raman bands are made. The influence of the nitro group substitution upon the benzanthrone structure and symmetric CH vibrations, and electronic spectra is noted. This study is useful for the development of spectroscopy-mutagenicity relationships in nitrated polycyclic aromatic hydrocarbons.

## 011. Chemistry and Biochemistry Oral Session 2

Chemistry and Biochemistry

Paper Session

1:00 to 3:00 pm

FLC: Floor first - Jackson B

Participants:

### 1:00 **A Field-Ready Colorimetric Assay for the Determination of Arsenic Concentrations in Freshwater Samples Containing Mixed Metal Contaminants** *Hannah Gloden, Midland College*

Arsenic is a toxic material of concern in potable water supplies. The U.S. Environmental Protection Agency (EPA) maximum contaminant level is 0.010 ppm. Total arsenic concentrations can reliably be measured to the sub-ppm level using inductively coupled plasma spectroscopy (ICP) or atomic absorption spectroscopy (AAS), but these techniques require expensive, non-mobile instrumentation. An inexpensive, convenient, and mobile colorimetric assay has been developed based on modifications of prior art involving alizarin red S dye, which allows for the determination of arsenic concentrations to the sub-ppm level using common, low cost spectrophotometers. Importantly, this assay allows for analysis in samples containing mixed metal contamination of Pb<sup>2+</sup>, Sr<sup>3+</sup>, Fe<sup>2+</sup>, Fe<sup>3+</sup>, Cu<sup>2+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>, and K<sup>+</sup> avoiding interferences of these ions via a simple sample preparation. This work has implications for the analysis of water supplies in third-world countries.

1:15 **Applications of STA** *Courtney Harris, Stephen F. Austin State University; Alyx Frantzen, Stephen F. Austin State University*

The Perkin Elmer Simultaneous Thermal Analyzer 6000 (STA) instrument utilizes a method that simultaneously computes weight loss and heat flow of a sample upon heating. Sample conditions can be manipulated by changing the flow of gas or heating rate. The STA was used to analyze electronic cigarette fluid mixtures, commonly known as E liquids. The samples include the major components of propylene glycol (PG), vegetable glycerine (VG), and nicotine. Through STA application, the optimal temperature at which E liquids are heated to be inhaled was identified. Furthermore, STA applications were utilized to identify the optimal temperature of roasting coffee beans. A local coffee shop provided fresh coffee beans from various location for analysis. Varying STA conditions were manipulated to relate the amount of mass loss from the bean to the optimal roasting temperature. The flow and heat rate were manipulated, allowing for the comparison of mass loss with varying time.

### 1:30 **Fundamental Growth Mechanism of Thiolate Protected Platinum Nanoparticles** *Alexandria Cook, Stephen F. Austin State University; Brian Barngrover, Stephen F. Austin State University*

Utilizing Density Functional Theory (DFT) with a Becke Perdew (BP86) functional and triple zeta polarized (TZP) basis set in methanol solvent; the fundamental growth mechanism of thiolate protected platinum nanoparticles is being examined. Nanoparticles have unique size and chemical composition this allows them to have a wide application range. These uses include medicine, technology, agriculture and many others. Platinum chloride precursor salts are reduced with hydride to form a metal-metal platinum bond. In a secondary step, the chloride is replaced with a thiol to form the initial seed for the larger nanoparticle.

### 1:45 **Latent Fingerprint Development: Reaction Mechanism Observation of 5-MTN and Serine using DFT** *Javier V. Castaneda II, Stephen F. Austin State University; Brian Barngrover, Stephen F. Austin State University*

Serine, the prominently abundant amino acid in perspiration, will be used in this study of 5-MTN. With a mechanism similar to ninhydrin, the reaction between 5-MTN and serine causes the nucleophile nitrogen to attach itself to the carbon bonded with a hydroxyl group, producing an eV value of -208.32. Thereafter, hydrolysis occurs, producing an eV value of -193.85. Additionally, carbon dioxide is removed, producing an eV value of -172.38. With an additional reaction of 5-MTN, both 5-MTN molecules will attach at the nitrogen. The purpose for using 5-MTN is to determine whether it is a more effective reagent compared to ninhydrin, DFO, and 1,2-indanedione. This process is determined through density functional theory (DFT).

### 2:00 **Optimization of a Solution Calorimeter** *Pete Camacho, Jr., Stephen F. Austin State University; Alyx Frantzen, Stephen F. Austin State University*

Calorimetry is used to measure the energy associated with a chemical or physical process. In solution calorimetry, temperature is measured during the mixing/reaction of two substances. The Parr 1455 Solution Calorimeter is setup to utilize volumes ranging from 90-120 mL of solvent and a maximum of 20 mL of solute. Using a simple acid/base system with a known reaction energy, the detection limit of the instrument was investigated and optimized for smaller volumes and concentrations. Hydrochloric acid and sodium hydroxide solutions were utilized due to their well-known and documented  $\Delta H = -55.83$  kJ/mol. Volumes from 100.0 mL, 50.0 mL, and 25.0 mL of solvent (HCl) were used with volumes of solute (NaOH) from 10.0 mL, 5.0 mL, 3.0 mL

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

with relatively low error. This experiment was setup to measure three samples size ratios with HCl acting as the limiting reactant. Standard size is 100.0 mL of solvent (HCl) and recommended by Parr. Reduced size is half of the standard size solvent and mini size is half of the reduced size. Each set up was standardized using TRIS and HCl. Using the standard size parameters, the lowest concentration measured was approximately 0.05 M HCl and 0.75 M NaOH while with the reduced size setup, concentrations down to 0.001 M HCl and 0.15 M NaOH were measured and the mini sample size was optimized with concentrations of 0.01 M HCl and 0.15 M NaOH.

### 2:15 **The Development and Validation of an LC-MS Method for Analysis of Nineteen Bile Acids in Human Plasma** *Mayte Gonzalez, Schreiner University; Adrian L Zapata, Schreiner University*

Bile acids enable and facilitate intestinal absorption, emulsification and transport of nutrients, lipids, and lipophilic vitamins. They are involved in many processes including energy expenditure and glucose metabolism. Alterations in bile acids are associated with obesity and type 2 diabetes. We aim to develop and validate a LC-MS method for the analysis of 19 bile acids. Separation of bile acids is challenging due to multiple structural isomers. These isomers are not distinguishable by the mass spectrometer and require chromatographic separation. We developed a separation method that used water: methanol with ammonium acetate and formic acid modifiers and a Waters BEH C18 UPLC column, which generates reproducible separations and sensitivity by the UPLC-triple quadrupole mass spectrometer. Two or more selected reaction monitoring transitions were optimized for each bile acid and deuterated bile acid internal standards. 68 human plasma samples were prepared, and 19 bile acids were measured in each sample. These samples were from 34 controls and 34 patients with Irritable Bowel Syndrome (IBS). Most of the bile acids had no statistically significant difference between the controls and IBS samples. GDCA was significantly reduced in the IBS cohort, and HCA was increased in the IBS cohort.

### 2:30 **Theoretical Stereochemistry of Co(II) IDA with Histidine Tags to Identify Binding Energies Utilizing DFT** *Lindsey Ohmstede, Stephen F. Austin State University; Brian Barngrover, Stephen F. Austin State University*

To keep different things together requires energy, this is referred to as binding energy. In this instance, we are combining Cobalt IDA to Histidine Tags and analyzing the binding energy between them. Using the density functional theory (DFT) calculations for the enthalpy of reaction, which would give us the binding energy. The specific method being modeled is called immobilized metal-affinity chromatography or IMAC. "In IMAC the adsorption of proteins is based on the coordination between an immobilized metal-ion and an electron donor groups from the protein surface" (Gutiérrez, 2007). Work done with Cobalt IDA to Histidine Tags is not commonly done. Nickel (Cong Li, 2014) is also commonly used (Velkov, 2008). The drawback is that Nickel (Gutiérrez, 2007) does not yield as much pure protein (Dong, 2010). Using DFT we will calculate the binding energies for Cobalt IDA to Histidine Tags and the resulting water that is produced from the reaction. The program processing calculation is ADF (te Velde, 2001). This will provide evidence to further understand the differences in the enthalpy between Cobalt IDA and other metals used when bonding with histidine tags.

### 2:45 **ZrP Immobilized Cobalt Porphyrins as Heterogeneous Electrocatalysts for Oxygen Evolution**

### **Reaction** *Isabel Barraza, The university of Texas at El Paso*

Molecular metallated porphyrins have been extensively studied as homogeneous electrocatalysts for the oxygen evolution reactions (OERs). Anchoring molecular catalysts to a catalyst supporting platform is an efficient way for the heterogenization of homogeneous catalytic systems so as to enhance their efficiency and stability. In this work we try to explore a convenient one-step synthesis of cobalt porphyrin molecules supported by zirconium phosphate (ZrP) layered material, where the metallation of two different porphyrins, which are meso-tetraphenylporphyrin (TPP) and meso-tetra(p-bromophenyl)porphyrin (TBrPP), by cobalt and the immobilization of the molecular metalloporphyrins by ZrP can be achieved simultaneously. Several synthetic methods were probed to try to obtain these CoTPP/CoTBrPP anchored ZrP materials. Some of the resulting materials were characterized using powder x-ray diffraction (pXRD) measurements, Fourier transform infrared (FT-IR) spectroscopy and inductively coupled plasma mass spectrometry (ICP-MS). Electrocatalytic activities towards the OER of the as-prepared materials were evaluated in basic aqueous media (0.1 M KOH) using cyclic voltammetry and chronopotentiometry.

## 012. **Cell and Molecular Biology Oral Session & Section Meeting**

### Cell and Molecular Biology

#### Paper Session

2:00 to 3:00 pm

*Winebrenner Science Building: Floor first - 123*

Participants:

### 2:00 **Investigating Synergy Between PA28 $\gamma$ and IKK $\epsilon$**

*Hannah Butterfield, Austin College; Lance Barton, Austin College*

Cancer is characterized by excessive cellular proliferation and by dysregulation of signaling pathways related to growth. PA28 $\gamma$  is a proteasome activator frequently increased in cancer and involved in regulation of multiple cellular pathways that affect proliferation, including the Nuclear Factor  $\kappa$ B (NF $\kappa$ B) pathway. Inhibitor of Nuclear Factor  $\kappa$ B Kinase  $\epsilon$  (IKK $\epsilon$ ) is a breast cancer oncogene that affects multiple pathways that implicate PA28 $\gamma$ , including the activation of NF $\kappa$ B. This study aims to elucidate whether PA28 $\gamma$  is required for normal IKK $\epsilon$  activity. I hypothesize that PA28 $\gamma$  enhances the timely nuclear export of IKK $\epsilon$ , and consequently aids IKK $\epsilon$ -mediated cell signaling. I am assessing this through evaluating differences in IKK $\epsilon$  nuclear concentration in PA28 $\gamma$ <sup>+/+</sup> and PA28 $\gamma$ <sup>-/-</sup> murine embryonic fibroblast (MEF) cells. This will be followed by evaluation of differences in IKK $\epsilon$ -implicated cellular processes including transcriptional activation, phosphorylation of target proteins, and animal weight gain. Preliminary data indicates that cells lacking PA28 $\gamma$  have a higher proportion of nuclear IKK $\epsilon$  than cells containing PA28 $\gamma$ , supporting a potential role for PA28 $\gamma$  in the nuclear export of IKK $\epsilon$ .

### 2:15 **Isolation and characterization of novel antibiotic producing soil isolates** *Luis Grado, Sam Houston State University*

The overuse and misuse of antibiotics has facilitated the development of antibiotic-resistant bacteria which has become a global crisis. Existing mechanisms of antibiotic discovery have many obstacles that prevent a robust response to the growing emergency. At SHSU, we implemented the Small World Initiative in our general microbiology courses to isolate and characterize novel antimicrobial producing soil isolates. Random bacterial

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

samples were collected from various locations across east Texas then cultured, isolated, and screened for antibiotic properties against the following test organisms: *Bacillus subtilis*, *Staphylococcus epidermidis*, *Escherichia coli*, *Erwinia carotovora*, *Pseudomonas putida*. We currently have 50 isolates that display antibiotic properties against at least one of the organisms indicated above. The identity of each of the antibacterial producing isolates was identified via sequencing of the 16S ribosomal RNA subunit in addition to biochemical screening. Phylogenetic analysis of the 16S ribosomal sequence data indicates that 74% of isolates belong to Pseudomonadaceae, 8% to Actinomycetales, 6% to Flavobacteriaceae, 4% to Bacillaceae, and 2% each of Oxalobacteraceae, Sinobacteraceae, Methylococaceae, and Moraxellaceae. Among our antibiotic producing isolates several appear to be uncharacterized bacterial species. Taken together, our data demonstrate that undergraduate students in a general microbiology course can isolate novel, phylogenetically diverse antibiotic producing bacteria from the soil with the potential to produce previously undiscovered antibiotics.

**2:30 Isolation and characterization of novel bacteriophages** *Tiffany Lujan, Tarleton State University*

Bacteriophages are viruses that infect bacteria, and are a potential therapeutic for antibiotic resistant infections. We isolated 16 bacteriophages from soil samples in north Texas. For bacteriophages Arlo, Ryadel, Finny, and Gustopher, soil samples were placed in liquid media and filtered for direct isolation of virus. Transmission electron microscopy identified these bacteriophages to have siphoviridae morphology, however Ryadel is composed of an unusual prolate capsid that was 160-nm in length by 40-nm in width (4:1 ratio). DNA from Arlo and Ryadel was extracted and genomic DNA sequencing libraries were prepared and sequenced at the Pittsburgh Bacteriophage Institute. Arlo genome was determined to be 52,069 base pairs in size with a 10 base overlap of 5'-CGGATGGTAA-3' and contains 96 predicted protein-coding genes, while Ryadel genome is 72,658 base pairs in size with a 4 base overlap of 5'-GTGT-3' and predicted to contain 132 protein-coding genes. Analysis of potential viral open reading frames indicate that Arlo Gene 67 could encode for a RecB protein that is similar to Cas4, a component of CRISPR genome editing systems. In addition to having an unusual capsid morphology, Ryadel genome contains 31 copies of a unique 17 bp sequence with dyad symmetry consisting of a 7 bp inverted repeat separated by 3 bp (5'-TGTTCCGNNCCGAACA-3'). Future directions include cloning and expressing Arlo Gene 67 for functional analysis and morphometric studies of unusual bacteriophage capsid shapes. These phages could provide further insights into bacterial immune functions and function of elongated capsid structures.

**2:45 Section Meeting Cell and Molecular Biology**  
*Susan Klinedinst, Schreiner University*

**013. Neuroscience Oral Session and Section Meeting**

Neuroscience

Paper Session

2:15 to 2:45 pm

*Winebrenner Science Building: Floor first - 121*

Participants:

**2:15 Hemodynamic mechanisms for augmentation of cognitive brain functions with transcranial lasers**

*Francisco Gonzalez-Lima, The University of Texas at Austin; Emma Holmes, The University of Texas at Austin; Douglas W. Barrett, The University of Texas at Austin*

Hemodynamics refers to the measurements and mechanisms

governing blood flow. Blood flow is critical for all brain functions, including cognition. Transcranial infrared laser stimulation (TILS) is a novel, non-invasive method to stimulate the cerebral cortex that when applied to the right forehead results in cognitive improvements in sustained attention, as measured by the psychomotor vigilance task (PVT), and working memory, as measured by the delayed match-to-sample task (DMS). To investigate the hemodynamic mechanisms by which laser-enhanced cognition occurs, we used functional near-infrared spectroscopy (fNIRS) of the human prefrontal cortex. fNIRS is a safe, non-invasive method of monitoring hemodynamics. We measured fNIRS changes in oxygenated and deoxygenated hemoglobin (HbO<sub>2</sub> and Hb, respectively) due to both TILS and cognitive testing with PVT and DMS tasks. We calculated changes in HbO<sub>2</sub> concentration ( $\Delta[\text{HbO}_2]$ ) and Hb concentration ( $\Delta[\text{Hb}]$ ) relative to baseline, and calculated total hemoglobin ( $\Delta[\text{HbT}] = \Delta[\text{HbO}_2] + \Delta[\text{Hb}]$ ) and differential concentrations of hemoglobin ( $\Delta[\text{HbD}] = \Delta[\text{HbO}_2] - \Delta[\text{Hb}]$ ). We assessed hemodynamic changes in 18 healthy adults at baseline, during the PVT and DMS cognitive tasks, before and after TILS of the right prefrontal cortex (1064 nm, 250 mW/cm<sup>2</sup>, 8 minutes). The fNIRS data showed increased prefrontal cortex oxygenation after TILS:  $\Delta[\text{HbO}_2]$ ,  $\Delta[\text{HbT}]$ , and  $\Delta[\text{HbD}]$  all showed significant increases [F(1,17), 17.0-17.8;  $p < 0.001$ ]. Hb did not show a significant difference [F(1,17) = 0.17,  $p = 0.69$ ]. The present TILS-fNIRS combined approach may be used to non-invasively monitor the hemodynamic effects of TILS on cerebral oxygenation associated to the augmentation of cognitive brain functions.

**2:30 Neuroscience Section Meeting** *Danielle D Grove, Texas Lutheran University*

**014. Poster Presentation and Judging: Anthropology, Conservation Ecology, Freshwater Science, Geoscience, Mathematics and Computer Science, Neuroscience, Physics and Engineering, Plant Biology, STEM Education, Terrestrial Ecology and Management**

3:00 to 4:30 pm

*Winebrenner Science Building: Winebrenner Science Building, Corridor*

**014-1. Poster Presentation and Judging: Anthropology, Conservation Ecology, Freshwater Science, Geoscience, Mathematics and Computer Science, Neuroscience, Physics and Engineering, Plant Biology, STEM Education, Terrestrial Ecology and Management**

Texas Academy of Science Annual Meeting  
Poster Session

Anthropology, Conservation Ecology, Freshwater Science, Geoscience, Mathematics and Computer Science, Neuroscience, Physics and Engineering, Plant Biology, STEM Education, Terrestrial Ecology and Management

**014-2. Conservation Ecology Poster Session**

Conservation Ecology

Poster Session

Participants:

**Aquatic habitat survey for the Jollyville Plateau salamander (*Eurycea tonkawae*), a threatened endemic of Central Texas.** *Sean Rangel, Concordia University Texas; Courtney Findley, Concordia University; Alyssa Kaylynn Olivarez, Concordia University Texas; Mary Kay Johnston, Concordia*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

*University Texas*

The Jollyville Plateau Salamander, *Eurycea tonkawae*, is a freshwater amphibian restricted to Central Texas. This threatened species is endemic to Travis and Williamson Counties, including the Jollyville Plateau and Brushy Creek areas of the Edwards Plateau. We surveyed habitat characteristics and the invertebrate community of a section of the Balcones Canyonlands Preserve where these salamanders are known to occur. The literature suggests salamanders are found near springs in shallow pools that consist of leaf litter or cobble substrates (Bendik et al., 2016). They primarily consume zooplankton and small invertebrates such as copepods, ostracods, mites, and various types of larvae. Our findings suggest that *E. tonkawae* is found in sandy, shallow, low flow pools with high nitrate levels and constant temperature. Sites with these habitat characteristics have an abundance of copepods and fly larvae present. Additionally, our data indicates that fish abundance significantly predicts invertebrate community structure and chlorophyll abundance. Our data assists future researchers and preserve managers in locating salamanders and protecting their habitat.

**Carolina wren (*Thyrothorus ludovicianus*) nesting success in urban and rural habitats** *Gabriel Alexander Barragan, Sam Houston State University; Diane Neudorf, Sam Houston State University*

With habitat loss occurring in the USA at record levels, many bird species are forced to utilize non-natural habitats for nesting. More than 50% of wildlife habitats have been altered or lost in Texas, and one of the leading causes of this loss is urbanization. Urbanized habitats present birds with different challenges from those of natural areas. Foraging areas may be limited due to less natural vegetation. Human disturbances may impact foraging behavior and nestling feeding. There may also be differences in the predator community (e.g. feral or domestic predators). These differences may result in reduced reproductive success of birds in urbanized habitats. Examining how different birds respond to human disturbance will be crucial to understanding which species may succeed in urbanized habitats. Carolina wrens (*Thyrothorus ludovicianus*) are resident, cavity-nesting songbirds of the eastern United States that inhabit both forested habitats and urban habitats with large trees. We erected nest boxes in both the City of Huntsville, TX and the Sam Houston State State field station to compare nesting success of wrens in these two habitats. We will present the results of our comparison of clutch initiation date, clutch size, hatching success, and fledgling success over an 8 year period and discuss the implications for urban nesting birds.

**Flight Initiation Distance in Eastern Fox Squirrels (*Sciurus niger*) Varies with Threat Assessment in Urban and Rural Environments.** *Krista Joy Ward, Stephen F. Austin State University*

Due to increasing urbanization, natural predators of Eastern Fox Squirrels (*Sciurus niger*) have decreased in urban environments which may affect squirrel behavior. We hypothesize that squirrels in urban environments will have shorter flight initiation distances compared to squirrels in rural environments. We also hypothesized that squirrels will have a shorter flight initiation distances when observer approach speed is slow. We observed and recorded flight initiation distances by approaching squirrels between two types of environments: rural (n=30) and urban (n=30). Observers approached the squirrels at one of two speeds: fast (1.2 m/s, n=30) or slow (0.6 m/s, n=30). Both hypotheses were supported by our analyses. Flight initiation distances were significantly shorter in urban environments ( $p >$

0.0001) and when observer approach speed was slow ( $p = 0.0108$ ). These results suggest that human influences are decreasing anti-predator behaviors of squirrels which could lead to loss of important behavioral traits that squirrels in natural environments require for survival.

**Invasive Plant Impact On Tadpole Survivability** *Joshua Vincent Medovich, Schreiner University*

A variety of invasive plants have managed to find themselves in foreign habitats conducive to their propagation. Amphibian populations worldwide are going through drastic declines, and invasive species have been identified as one stressor. This study focuses on the survival of tadpoles of the native Rio Grande Leopard Frog (*Lithobates berlandieri*) with invasive plants. Three plant species as well as a control were utilized across twenty different tanks. The three invasive plant species were collected in Kerrville Texas and consisted of *Arundo donax*, *Melia azedarach*, and *Ligustrum* sp. The trial was run for two months with each trial lasting a month each. Specimens were observed daily. Surviving tadpoles at the end of the two trials were released back into the wild. Mass and total number of survivors were accounted for at the conclusion of two trials. In the end, there was mortality of specimens which leads to the conclusion that the plants used did have an effect on survivability of the tadpoles.

**The Effects of the Reintroduction of Native Grasses on Native Bird Populations in West Texas** *Francisco A Velasco, Hardin Simmons University; Bryson T Holcomb, Hardin Simmons University; Kayli A Bragg, Hardin Simmons University; Wendi K Wolfram, Hardin Simmons University*

There are many species of bird that live in the grasslands of West Texas. These native birds often rely on the native and non-native grasses in this area. They forage these grasses and also use them when building nests. The native grasses: Side Oats Gramma (*Bouteloua curtipendula*), Big Bluestem (*Andropogon gerardii*), Little Bluestem (*Schizachyrium scoparium*), and Indian Switchgrass (*Sorghastrum nutans*), have been reintroduced into the ecosystem after land development for farming and agriculture drove them out. We believe that the birds will show preference when choosing which grasses to both nest and forage. We believe that the reintroduction of the native grasses in the area have a positive impact on the birds that nest and forage them. Species of bird are being identified by their song through the use of sound recorders. Preliminary data for species within the reintroduction area include but are not limited to: the Northern Mockingbird (*Mimus polyglottos*), White Crowned Sparrow (*Zonotrichia leucophrys*), Yellow Rumped Warbler (*Setophaga coronata*), American Robin (*Turdus migratorious*), and the Blue Jay (*Cyanocitta cristata*).

**The Infection of the Protozoan Parasite, *Ophryocystis elektroscirrha*, in the Monarch Butterfly, *Danaus plexippus*, across Central Texas.** *Brad Burden, Texas A&M University - Central Texas; Jackelyn Ferrer-Perez, Fort Hood AIM Program; Charlie Plimpton, Fort Hood AIM Program; Chelsea Blauvelt, Fort Hood AIM Program; Laura Weiser Erlandson, Texas A&M University - Central Texas*

The monarch butterfly, *Danaus plexippus*, migrates annually through Central Texas on its way to its overwintering sites in Mexico. Over the course of its migratory route, the monarch butterfly must rest and feed on nectar-bearing plants such as milkweed. Milkweed (*Asclepias* spp.), the host plant of the monarch butterfly, is found throughout Texas. A protozoan parasite (*Ophryocystis elektroscirrha*) that infects monarch



## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

butterflies is commonly found on the tropical spp. of milkweeds. *Ophryocystis elektrosirrha* can negatively impact monarch butterflies in a variety of ways in all of their life stages. In this study, we captured monarch butterflies during their migration season to collect samples of *O. elektrosirrha*. By quantifying the number of monarch butterflies infected with *O. elektrosirrha*, we can determine if further action is needed to help reduce the spread of this protozoan parasite.

### 014-3. Freshwater Science Poster Session

Freshwater Science

Poster Session

Participants:

**Bullseye! Hitting the target on primer optimization**  
*Shellsea Elizabeth Miller, Southwestern University;*  
*Lauren Elizabeth Muskara, Southwestern University;*  
*Matthew A. Barnes, Texas Tech University; Romi L Burks, Southwestern University*

Environmental DNA (eDNA), the genetic material shed by an organism into its abiotic environment, offers a powerful conservation tool in detecting organisms without having to visually confirm their presence. Successful detection of eDNA depends on a variety of factors, including primer design and qPCR conditions. To test for eDNA in filtrate from water samples (250 mL), we developed primers designed to amplify a non-native apple snail, *Pomacea maculata*. To create *P. maculata* specific primers, we used known sequences from the Folmer region of the cytochrome c oxidase subunit I (COI) of *P. maculata* as the template and developed four primers of varied length and location. All four primers successfully amplified *P. maculata* tissue samples, but we also wanted to confirm their specificity for only *P. maculata*. Consequently, we conducted several target experiments with tissue-derived DNA from other *Pomacea* species (e.g. *P. canaliculata*), other ampullariids, such as *Marisa cornuarietis*, and Japanese mysterysnails, *Cipangopaludina japonica*, a non-native invasive species of freshwater snail belonging to another family (Viviparidae). We optimized our qPCR process by increasing annealing temperature in 2° increments so that our primers only amplify *P. maculata* at higher temperatures, but amplify other non-native snails at lower temperatures. Amplifying multiple snails at lower temperatures would allow for the detection of multiple invasive snails using one primer. However, higher temperature specificity would narrow amplification to a specific target. Optimizing primer performance increases the accuracy of eDNA detection efforts and promotes its use in conservation ecology.

**Determining the effect of agricultural pollutant accumulation on Guadalupe river water quality**  
*Dalton Rollins Reid, Schreiner University; Jacob Vargas, Schreiner University*

This research attempts to determine how agriculture in Texas Hill Country effects the water quality of the Guadalupe River. The research looks at whether the proximity to agricultural land, or distance traveled through the Texas Hill Country has a greater effect on water quality. Samples from the Guadalupe River were taken from five separate areas along the River: South of Junction, near Ingram, near Center Point, near Boerne, and near Bulverde. When each sample was taken, attention was paid not only the proximity to agricultural land, but nearby geographical features that could affect the water quality. The three indicators of water quality this report focuses on are dissolved oxygen, suspended chlorophyll, and nitrates. Dissolved oxygen was measured using the Winkler method, and both chlorophyll and nitrates were measured using spectrophotometry. Using these

components of a freshwater ecosystem as indicators will signal if pollutants from agricultural land decrease the water quality, in turn increasing the chance at eutrophication as the Guadalupe River passes through the Hill Country. The increased chance of eutrophication will indicate areas susceptible to hypoxic conditions that could harm aquatic life in the area and offset the ecosystem.

**Evaluating the health of saline lakes via environmental DNA analysis of microbial communities**  
*Matthew Owen Jones, Texas Tech University; Kristen Heath, Texas Tech University; Warren C Conway, Texas Tech University; Matthew A. Barnes, Texas Tech University*

Saline lakes, landlocked bodies of water with a salinity >3g/L, represent unique and productive ecosystems that provide critical habitat for a wide variety of indigenous and migratory wildlife species. However, degradation of saline lake ecosystems in the Southern High Plains of Texas due to continued disconnectivity of Ogallala Aquifer discharge threatens the continued survival of wetland dependent migratory birds, which use them as migratory stopovers and nesting habitat. For example, breeding populations of Snowy Plover (*Charadrius nivosus*) in these regional saline lakes have declined >50 % in recent years. Microorganisms such as cyanobacteria, algae, and fungi are often overlooked in biodiversity assessments despite the fact that they represent critical drivers of community metabolism and energy transfer, may be driven by ecosystem change, or act as drivers of ecosystem change themselves. To understand differences in microbial communities among regional saline lakes, we applied environmental DNA (eDNA) methodology to quantify microbial indicator species in sediment samples collected from four saline lakes representing a gradient of observed shorebird breeding activity. Both presence and abundance of cyanobacteria, fungi, and the golden alga *Prymnesium parvum* varied among lakes and microhabitats within each lake. For example, *Microcystis* spp. were most abundant in marshes, less abundant in silty soils, and absent in salt flats. A more comprehensive understanding of the microbial communities of regional saline lakes may offer clues for overall biodiversity management, as such changes and variation in microbial activity and community composition are likely true harbingers of ecosystem degradation in these saline lake systems.

**Highway to shell: Troubleshooting methods of genetic detection and identification in two invasive species, *Cipangopaludina chinensis* and *C. japonica***  
*Nicole Kelly, Southwestern University; Shannon Odell, Southwestern University; Hannah Winkler, Southwestern University; Shannon Walsh, Southwestern University; Russ Minton, Gannon University; Romi L Burks, Southwestern University*

*Cipangopaludina chinensis* and *C. japonica*, i.e. Asian mysterysnails, represent invasive species native to China and Japan, respectively. First introduced to California in the 1890s, populations of both species subsequently appeared across the continental United States, with strongholds in the Great Lakes and Northeast. These snails share morphological similarities, but represent distinct species genetically. To investigate whether our own finding of a Japanese mysterysnail (*C. japonica*) in Texas matched other collections where these snails occur, we requested samples from the Illinois Natural History Survey. Sequencing genetic information requires consistent and quality extraction of total genomic DNA (tDNA) from snail tissue samples, some of which date back to 2004. Based on previous success with extracting apple snail (*Pomacea* spp.) DNA, we started with spin kits (Macherey-Nagel), which curiously provided

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

amplifiable species-specific DNA, but not sequenceable product (N = 55). Consequently, we switched to chloroform-isoamyl alcohol (24:1) extractions with hopes of generating better sequences. Quantification of DNA concentration of all extracted samples (spin kit and chloroform) via a Qubit fluorometer provided a comparison of yields, but not a full sense of quality. So far, chloroform extractions appear superior to spin kits, as they yield higher DNA concentrations in both fresh and museum-preserved tissue samples. However, sequences of mysterysnails still do not reflect the quality of previous apple snail work. Thus, we want to explore qualities of samples that amplify well, but still fail to sequence properly. Collectively, these efforts will help us find genetic connections between Texas and other populations.

### **Predicting East Texas freshwater mussel distributions using current and future climate data**

*Kinza Iftikhar Ashraf, University of Texas at Tyler; Ashley D Walters, US Forrest Service Rocky Mountain Research Station; David Ford, EcoAnalysts; Marsha G Williams, University of Texas at Tyler; Neil B Ford, University of Texas at Tyler; Lance R Williams, University of Texas at Tyler; Joshua A Banta, University of Texas at Tyler*

Many freshwater mussels in East Texas are considered to be endangered or threatened. Mussels are bioindicators of good water quality and have important functional roles in aquatic ecosystems that humans depend on. This study focuses on six species of unionid freshwater mussels in East Texas that are state-listed as threatened. We use climate data to find associations between mussel locations and the environment, in order to make predictions about the ranges of these species landscape-wide. We then use these associations, in combination with future climate predictions, to forecast mussel distributions into the future (2050). Interestingly, our work suggests that groundwater infiltration is important to the mussels' distributions, and suggests that future changes to the precipitation regime will negatively influence the groundwater contribution to stream flows. Overall, our work demonstrates that freshwater mussel distributions can be studied using climate data, and that the future climate in East Texas appears less hospitable to them. This knowledge can be used to craft active habitat management strategies for these species and/or to focus on protecting long-term refugia for these species that will still be suitable in the future.

### **The effect of Independence Creek inflow on Pecos River water quality**

*Susan Aina, Midland College*  
Midland College Clean Rivers Partners (CRP) participants have collected water quality data since May 2014 from two Pecos River sites located on the Chandler Ranch upstream and downstream of the Independence creek confluence in Terrell County, Texas. Additionally, historical water quality data have been obtained from these sites going back to 1995. Regional trends in water quality from 1995-2017 were also assessed at established Pecos River monitoring sites near Sheffield (upstream of the Chandler Ranch) and the Lower Pecos River near Val Verde County (downstream of the Chandler Ranch), and at Independence Creek at the Chandler Ranch. The water quality data parameters evaluated include stream flow, conductivity, total dissolved solids (TDS), chlorides and sulfates. Pecos River Chandler Ranch sites revealed through statistical analysis that the Independence Creek confluence significantly dilutes the Pecos River. Furthermore, from a regional standpoint, the river enters the Sheffield area under the saline influence of the Cenozoic Pecos Alluvium Aquifer, then freshwater inflow from spring systems of the Edwards Trinity Plateau Aquifer most notably Independence Creek, significantly dilutes the Pecos River,

enhancing its water quality.

### **Tracking invasives in Texas: A comparison of spatial distribution of invasive fish over the last decade**

*Kaylei Diane Chau, Environmental Institute of Houston - UHCL*  
Non-native species introduced through anthropogenic influences, or invasive species, cause harm to native systems in numerous ways. Generally, invasive species have such high success in many types of ecosystems through their ability to outcompete native species, to spread and multiply rapidly, and to adapt to a variety of environments. Each year, invasive species account for billions of dollars worth of damage to these native systems. Every five years, the nation's rivers and streams are assessed using an array of EPA standard methods that quantify the health of the systems and the biotic factors associated with those systems. Fish abundance and diversity are collected through means of electroshock fishing and all fish are identified down to species by a fish taxonomist. Since this assessment is repeated using the same methodology each time, it provides an excellent way to track the abundance of invasive fish species throughout the years to help determine if invasive suppression efforts have been successful or if more rigorous efforts need to be made. This study looks at non-native fish abundance collected from the same areas of selected rivers and streams in Texas from 2008/09, 2013/14, and 2018 and compares the quantities over the years. This study also shows the spatial distribution of selected invasive fish species by drainage basin throughout Texas in attempts to track the patterns of movement in order to help isolate areas where heavier suppression efforts are needed.

### **014-4. Geosciences Poster Session**

Geosciences  
Poster Session

Participant:

### **Structural Analysis of Barite Precipitation in Porous Media**

*Bruce Nicholas Lomeli, Department of Physics, The University of Texas at El Paso; Jose Leo Banuelos, Department of Physics, The University of Texas at El Paso; Vitalii Starchenko, Geochemistry and Interfacial Sciences, Oak Ridge National Laboratory; Gernot Rother, Geochemistry and Interfacial Sciences, Oak Ridge National Laboratory*

Mineral precipitation is driven by several factors including solution saturation index and flow rate, temperature, pressure, and the surface composition of nucleation sites, and it is often difficult to quantify its nanoscale origins, especially if precipitation occurs within a porous matrix. Barite (BaSO<sub>4</sub>) precipitation imposes a barrier to the extraction of hydrocarbons in enhanced recovery methods by reducing the permeability of porous rocks in petroleum reservoirs. The dynamic pore space geometry and transport properties of porous media greatly affect the precipitation rate of minerals within pores. Barite precipitation within a sintered silica glass particle (SGP) matrix, which served as a proxy for porous sedimentary rocks, was induced by flow of a supersaturated solution. The saturation index and flow rate were varied to yield various barite precipitation amounts and permeability decrease rates. Scanning electron microscopy was used to characterize the morphology of barite within the pore spaces and surfaces of the SGPs. Small-angle and wide-angle x-ray scattering (SAXS/WAXS) experiments were carried out to quantify the extent of barite crystallization and the growth of nanoscale precipitates due to different precipitation conditions. SAXS is a quantitative nanostructure characterization technique and WAXS provided molecular-scale information on quantities of amorphous and crystalline phases in the system. The local

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

microstructure of each sample was probed at different locations along the flow direction to determine precipitate concentration and morphology differences. SEM, SAXS, and WAXS analysis of barite precipitation will be presented along with current efforts to carry out *in-situ* SAXS measurements during the flow-induced precipitation reaction.

### 014-5. Neuroscience Poster Session

Neuroscience  
Poster Session

Participants:

Characterization of ferroptosis inductors in neuronal cells *Elaine Michelle Hollibaugh, UTSA; George Perry, UTSA; German Plascencia-Villa, UTSA; Leslie Michelle Fuentes, University of Texas at San Antonio*

Elaine Hollibaugh, Leslie Fuentes, Germán Plascencia-Villa and George Perry Department of Biology, The University of Texas at San Antonio (UTSA). Alzheimer's disease (AD) is a chronic neurodegenerative disease becoming a major health issue in the US. AD is characterized by presence of abnormal protein aggregates, synapsis loss and progressive neuronal death. The mechanisms of cell death in affected areas of the brain in AD are not clearly identified. In this work, we studied the role of a recently described mechanism of cell death, defined as ferroptosis which is an iron-dependent cell death process. This mechanism is characterized by accumulation of bioavailable redox active metals, mitochondrial dysfunction, nuclear alteration, inflammation responses and high oxidative stress that overall disturb the normal neuronal cell functions. The research conducted analyzed the role of small drug ferroptosis inductors (artemunate and RSL3) and ferroptosis inhibitors (glutathione and ferrostatin) on *in vitro* cultured neurons. The alteration of cellular redox homeostasis measured as reactive oxygen species (ROS) was analyzed with bioassays. Whereas the alterations in morphology and other cell responses were analyzed by optical and fluorescence microscopy, confirming the effects of ferroptosis inductors on cell viability and proliferation. In conclusion, our experiments tested the effects of small drug inductors and inhibitors of cell death mechanisms ferroptosis in neurons as an alternative avenue to understand the mechanism of cell death in affected areas of the brain with AD. This work was supported by Semmes Foundation, The Lowe Foundation and Alzheimer's Association (AARFD-17-529742).

**Characterizing the role of autophagy gene product BEC-1 in neuronal longevity in the model organism *Caenorhabditis elegans*** *Nicholas Ashley, St. Edward's University; Andrea Holgado, St. Edward's University*

Aging can be defined by many different physiological pathways that emphasize changes in a variety of cells and tissues. Central Nervous System (CNS) neural networks have been important for understanding cellular processes that cause aging, which is partly characterized by cell death and can be observed as a result neurodegenerative diseases such as Parkinson's Disease (PD). Previous studies have identified defects in autophagy, a cellular inducible mechanism that recycles products via degradation, as one of the triggers of the early onset of neuronal degeneration. Moreover, work from the *Caenorhabditis elegans* (*C. elegans*) field shows that autophagy gene product BEC-1 is essential for autophagy and its induction. Thus, we hypothesize that neuronal longevity will be affected in animals lacking BEC-1, suggesting an important role of autophagy in neuronal survival. Examination of *C. elegans* with the *bec-1(ok691)* mutation and balancer nT1 showed that the majority of homozygous *bec-1(ok691)* mutants are

embryonic-larval lethal and a small proportion of them are marginal surviving homozygous *bec-1(ok691)* mutants. Motility assays performed using nose-touch stimulation demonstrated that homozygous *bec-1(ok691)* mutants have significant defects in backward locomotion. Studies of lifespan revealed that homozygous *bec-1(ok691)* mutants live up to 7 days versus the 21 days seen in controls. Last, analysis of neuronal cell bodies using the *juls76* transgene (*unc-25p::GFP*) showed that homozygous *bec-1(ok691)* mutants suffered of VD motor neuron developmental delay rather than early neurodegeneration. Taken together, these findings support a role of autophagy in the neurodevelopment in *C. elegans*.

**Exercise precludes salt craving and fat consumption in satisfied female athlete** *Gracia Sebastiao, Presenter*

Previous results from our laboratory showed that salt addiction is gender specific in college students from WBU: male satisfied athlete displays signs of salt addiction while female satisfied athlete avoids salty foods. We also confirmed that in athletes repeated bouts of exercise dehydrate both genders similarly. However, using the National Nutrient Database for Standard Reference Release from USDA for specific food content, macronutrients were listed for comparison to investigate if other macronutrients rather than only sodium had an effect on satisfied female food avoidance. Potassium, calcium, iron, water, total lipid, total trans fatty acids, carbohydrates, total sugars, and glucose percentages were calculated for 29 food items. Satisfied female athletes avoided bacon (1,250 mg sodium/100g food), ham (1,000 mg sodium) and peanut butter (555 mg sodium) that range from high to medium sodium content. The macronutrients were ranked by 1st, 2nd, and 3rd highest percentage within their food content. Bacon has 53.3% total lipid, 25.6% water, and 9.4% carbohydrates; ham has 75.7% water, 12.0% total lipid and 3.5% potassium; and peanut butter has 54.7% total lipid, 23.7% carbohydrates, and 9.1% total sugars. In conclusion, female satisfied athlete not only avoid salty but also fatty foods. Exercise-induced hypoestrogenism may explain the gender specificity for salty and greasy avoidance. Perhaps, low levels of the carcinogenic hormone estrogen is beneficial to avoid food addition for sodium and fat content, which in turn improves the overall cardiovascular health in 21 years old female satisfied athlete.

**Initial studies examining bisphenol S effects on hippocampal neurons** *Amber S Lancaster, Texas Lutheran University; Danielle D Grove, Texas Lutheran University*

The studies were conducted on hippocampal neurons in order to gain understanding of how environmental estrogens affect neurons on the molecular level. Environmental estrogens are not produced endogenously but can effectively bind to the estrogen receptors within the body, causing various side effects because we are exposed to these estrogens daily through manufactured products such as plastic water bottles, thermal receipt paper, and the lining of canned goods. Bisphenol A (BPA) is an example of an environmental estrogen whose effects on the brain have been well documented in many behavioral studies, however, less is known about the effects of its recent substitute bisphenol S (BPS). In an attempt to further our knowledge about the effects of BPS on the brain, hippocampal neurons were cultured and exposed to various concentrations of the compound to observe if a transcription factor, phosphorylated CREB (pCREB) was activated. The amount of pCREB that is activated reflects the response of the neurons, either inhibitory or excitatory, in the presence of certain concentrations of BPS. These values are measured using an indirect ELISA, a colorimetric immunoassay that

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

quantifies the data by measuring the intensity of the color produced by the reaction. While there seemed to be some observed trends at certain concentrations, overall the results are inconclusive at this time. Future experiments would need to be conducted in order to draw a more supported conclusion about the molecular effects of BPS on neurons.

### **Salt addiction in male satisfied athlete possibly explained by preparation of home-made food less salty than restaurant and processed food.** *Aaron white, Wayland Baptist University*

Preceding results from our test center confirmed that male satisfied athletes dehydrate by repeated exercise training: their sweat intensity is greater than non-athletes ( $p < 0.05$ ). Our data also showed that male athlete crave salty foods when hydrated while female athlete avoids salty foods under the same condition. The objective of the present research project was to assess the macronutrients present on food items surveyed. Therefore, utilizing the National Nutrient Database for Standard Reference Release from USDA the percentage of potassium, calcium, iron, water, total lipid, total trans fatty acids, carbohydrates, total sugars, and glucose were calculated for 29 food items. Satisfied male athlete craved ham (1,000mg sodium/100g food) and spaghetti (125mg sodium); however, soda (10mg sodium) intake was avoided. The macronutrients were categorized by 1st to 5th highest percentage within their food content. Ham has 75.7% water, 12.0% total lipid, 3.5% potassium, 1.2% carbohydrates, and 0.8% glucose; spaghetti has 51.1% carbohydrates, 40.3% water, 2.5% total sugars, 2.3% potassium, and 2.1% total lipids; and soda has 84.9% water, 6.4% carbohydrates, 4.9% total sugars, 3.6% glucose, and 0.1% potassium. Since soda intake was prevented, we can conclude that male athletes are not interested in ingesting carbohydrates in hydrated condition. In conclusion, even though ham is a high sodium content food that is known to promote gastric, renal, and cardiovascular injuries, male athlete may be also seeking lipids (a great source of energy storage for exercise activities) and potassium (preventative of muscle cramps and muscle/nerve restoration of potential resting membrane) in ham and spaghetti.

### **Study of neuronal toxicity of amyloid-beta aggregates conjugated with copper ions** *Leslie Michelle Fuentes, University of Texas at San Antonio; Elaine Michelle Hollibaugh, UTSA; German Plascencia-Villa, UTSA; George Perry, UTSA*

Alzheimer's disease (AD) is characterized pathologically by two principal hallmarks: amyloid-beta plaques and neurofibrillary tangles. The over accumulation of amyloid-beta plaques causes a disruption in the normal, healthy aging brain and accentuating AD pathogenesis. From our previous studies, we determined that amyloid-beta plaques are conjugated with copper, iron and zinc ions since amyloid-beta peptide contains metal binding sites. In this work, we present the formation of aggregates of synthetic amyloid-beta peptide in the presence of copper ions and the characterization of their toxicity in neuronal cells. The synthetic aggregates were produced by optimizing the concentration and ratio of amyloid-beta:Cu ions, then characterized by optical microscopy, fluorescence microscopy and polarized light. Then, the aggregates of amyloid-beta were tested with in vitro cultured neurons, to determine dose- and time-dependent neurotoxicity. The neuronal responses were analyzed with viability kinetics, bioassays and morphological changes with optical and fluorescence microscopy. In conclusion, we were able to form in vitro synthetic aggregates of amyloid-beta peptide conjugated with copper ions, confirming the resemblance of the synthetic aggregates to the amyloid-beta aggregates

present in the AD brain. These hybrid aggregates showed neuronal toxicity in a dose- and time-dependent manner, including changes in neuronal morphology, overproduction of reactive oxygen species and drastic reduction in viability. This work was supported by Semmes Foundation, The Lowe Foundation and Alzheimer's Association (AARFD-17-529742).

### **Zebrafish as a model for nicotine cessation** *Norma Perez-Garcia, The University of Texas at Tyler; Maria Alejandra Rivero, The University of Texas at Tyler; Amanda Solorza, The University of Texas at Tyler; Ayman K Hamouda, The University of Texas at Tyler; Brent Bill, University of Texas at Tyler*

Nicotine is a highly addictive drug derived primarily from smoking tobacco cigarettes. Smoking is correlated with increased risk of cancer and death. Smoking cessation can be beneficial for long-term health with 50% reductions in risk of coronary heart disease and cancer risk 1 year and 5 years respectively after cessation compared to continued smokers. Unfortunately, smokers trying to quit, even with current pharmaceutical-assisted cessation, have a 75% relapse rate. Current nicotine cessation screening approaches utilize murine models, which are expensive and time consumptive; therefore, our goal is to determine the value of the zebrafish for cessation drug screening. Three assays have been identified in zebrafish that correspond to nicotine responses that may be useful for cessation screening. We are attempting to replicate the zebrafish novel tank test, an assay for anxiety, with acute exposure to nicotine. We have observed that tank substrate, wall color, and light levels are important for defining the behaviors, and replicating previous work on nicotine. Our data suggests that all of these factors should be included for proper replication. We are currently optimizing conditions for tracking and assessing the effects of Nicotine, the commercially available (Varenicline) and a novel cessation drug. Future work will look at how behavior varies when these drugs are used in combination.

### **014-6. Physics and Engineering Poster Session**

Physics and Engineering

Poster Session

Participant:

### **Novel Analytical Technique for Dendritic Microstructures of Directionally Solidified Alloys and Synthesis of Alloy Fabrication Protocols to Optimize Physical Properties** *Arman Sharma, The Academy of Science and Technology*

Exponentially increasing necessity for stronger and long-lasting turbine blades to power our industrial world calls for major development in the solidification protocol of metallic alloys. A increasingly applied process known as Directional Solidification (DS) utilizes columnar single crystal expansion to achieve structural uniformity, thereby optimizing physical properties. As optimal properties are dependent on homogeneous microstructures of the solidified alloy, the purpose was to establish a relationship between controlled DS protocol factors (solidification speed and thermal gradients) and microstructural homogeneity using a novel, conclusive, reproducible, and industry-applicable method of analysis: an individual cell-to-cell approach rather than a convoluted macro analysis. Within the individual cells, cellular size (CS) and cellular spatial orientation measure (CSO) were the morphological variables created and analyzed. It was hypothesized that increased solidification speeds would result in decreased consistency of CS' and CSO's. A custom constructed DS setup was used to melt and resolidify alloys at various speeds and thermal

# Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

gradients. Complex image analysis of resulting substructures (in resolidified alloy samples) in which advanced statistical software and computer coding were used found that increased solidification speeds result in increased consistency of CS and CSO values within a given sample. Using the established relationship coupled with higher-level statistical forecasting, a new protocol for alloy fabrication was developed through which manufacturers would save hundreds of millions of dollars and turbine-based engineering would enable fabrication of novel energy solutions, exceedingly efficient transportation, and major advancement of global industry.

## 014-7. Plant Biology Poster Session

Plant Biology

Poster Session

Participants:

**At the root of it: Investigating the effects of noise pollution on directional root growth** *Shayna Marie Engdahl, St. Edward's University; Molly Williams, St. Edward's University*

It has long been understood that roots exhibit directional growth in response to stimuli such as moisture, gravity, and touch. However, a recent study found that in the absence of a moisture gradient or any other known stimuli, *Pisum sativum* roots use vibrations to locate water sources. This has led to questions regarding any correlations between noise pollution and the effectiveness of plant roots to locate water sources using solely vibrations. Previous research has demonstrated the devastating effects of noise pollution on aquatic life, humans, and other organisms but has yet to investigate the effects on plant life. In this study, we tested the impact of competing noise on the roots' effectiveness to acoustically locate a water source. Our findings suggest that when competing noise is present, the accuracy is diminished, therefore potentially illuminating consequences of noise pollution on plant life.

**Bryophyte abundance on *Liquidambar styraciflua*** *Teslin Chaney, Stephen F. Austin State University*

This project focuses on determining if the percent abundance of Bryophytes on sweetgum trees is variable based on the direction they face on the tree. Twenty sweetgum trees were identified and the percent abundance of Bryophytes recorded. To do this, a 5.0 cm quadrant with 0.5 cm grid printed on a transparency was placed at chest height at each direction (Northeast, Northwest, Southeast, Southwest). Once percent abundance was calculated, it was then analyzed by creating an ANOVA: Single Factor table, along with a Bar Graph detailing the average percent abundance for each direction. The ANOVA data was found to be statistically significant as the P-Value with 3 degrees of freedom was 0.00031 while the F value (7.03139) was larger than the F crit value (2.724944). The t-test table of p-values not only confirms that there is a statistical difference between the directions, but compares each direction against the others. The results suggest that there is a statistical correlation between percent abundance and direction. The directions Northwest and Northeast seem to be favored when it comes to abundance of Bryophytes.

**Chlorophyll content and net photosynthesis in an intercropping and crop rotation system with *Zea mays* and *Medicago sativa*** *Samuel Kenyon, St Edward's University Student*

The effects of nitrogen fixation by leguminous crops has long been used as a basis for crop rotation. While that benefit has consistently been based on yield of commodity crops, relatively little work has been done to show the residual effect of leguminous N fixation on physiological

markers in target species. In this study, *Zea mays* (corn) was grown in pots in a controlled environment with and without *Medicago sativa* (alfalfa). An alfalfa only block was also grown. The chlorophyll a concentration and the net photosynthetic rate in mature leaves of corn grown in both treatments were determined and compared. The chlorophyll a concentration in mature leaves of alfalfa grown in both treatments was also measured. For both chlorophyll concentration and net photosynthesis, corn plants grown in conjunction with alfalfa plants showed statistically significant higher levels. To date, the residual effect of N fixation in pots in which alfalfa was grown alone in the fall and corn was grown alone in the following spring show more ambiguous results.

**Comparing mesh traps against standard traps to avoid the capture of *Tamarixia radiata*, a biological control organism of the ACP** *Gisel Garza, The University of Texas-Rio Grande Valley; Genevieve Carriles, Co-Author; Teresa Feria Arroyo, Associate Professor*

The Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama is the vector of *Candidatus Liberibacter asiaticus*, a bacterium that causes citrus greening disease (CGD). This disease makes citrus fruit unfit for sale and ultimately causes the death of the tree. CGD has no current cure and mitigation is primarily done by control of vector populations. Assessing ACP populations is an important step when preventing the spread and establishment of CGD. Currently, standard ACP traps are used to assess ACP populations, but they often capture beneficial organisms that serve as biological controls of the ACP. Traps with mesh have been shown to successfully capture ACP, however, there have been no assessments that compare the effectiveness of mesh traps against standard traps in avoiding the capture of *Tamarixia radiata*, an important biological control agent of ACP. To compare how successful these two trap methods are in avoiding capturing *T. radiata*, data was collected from 17 independent citrus groves where both types of traps were placed in four separate corners (A, B, C, and D) of the grove at similar conditions. Data collected from April 2018 to November 2018 were used to compare the mesh traps against the standard traps at assessing ACP and *T. radiata* populations. There was no significant difference between the mesh and standard trap methods at assessing ACP populations. However, mesh traps were more successful in avoiding *T. radiata* trapping. Qualitative observations show a decrease in the number of beneficial organisms captured in the mesh traps (e.g., lady bugs).

**Dendrochronological suitability and climate sensitivity of *Quercus mohriana* in the Texas Panhandle** *William R. Watkins III, Wayland Baptist University; Sarah A. Macha, Wayland Baptist University; Matthew S. Allen, Wayland Baptist University*

Variability in tree-ring growth is used as an indicator of historic environmental conditions, but few dendrochronological studies have been conducted in the Texas Panhandle region. In this study, we obtained cores from Mohr oak (*Quercus mohriana*) at Caprock Canyon State Park in Briscoe County, TX in order to determine their suitability for dendrochronological analysis. The objective of our study was to determine if tree-ring growth patterns were consistent among individual trees and then assess their sensitivity to climate conditions. Trees ranged from 31 to 81 years of age. Growth patterns were consistent across trees with an average interseries correlation of 0.674 which facilitated the assignment of calendar years to each tree-ring. Additionally, most sampled trees exhibited cambial damage

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

from early spring freeze events (frost rings) in some years. Preliminary analysis suggests the tree growth is significantly correlated with annual precipitation ( $p = 0.0007$ ), but further analysis is needed to help better understand the contribution of streamflow/hydrological variability from groundwater in this canyon environment. Ongoing research will examine these issues and will focus on sampling more trees in order to build a robust chronology of tree-ring recorded environmental variability in the region.

### **Discovering microbial networks in plant microbiomes**

*Lauren Yancy, St. Edward's University; Dr. Charles Hauser, St. Edwards*

Microbiomes are necessary for the health and development of many biological systems, including the human gut. Within these microbiomes, microbes often form dynamic communities, or networks, which benefit from each other. The Wild Basin is a nature preserve in Travis County, Texas which is home to several endangered species. The survival of this preserve begins in the soil with plant microbiomes. Using the operational taxonomic unit (OTU) data obtained from the several sample sites of varying proximity to plant roots, this research attempts to identify networks of co-occurring OTUs throughout Wild Basin. Additionally, it attempts to show if those networks form mutualistic, parasitic, or other relationships. Given the microbial association, the research attempts to predict co-occurring OTUs. Networks were assembled using OTUs from previous research and the statistical programs MENAP, CoNet with Cytoscape, and SparcC. These programs use several statistical processes to analyze the OTU data to conclude patterns in occurrence. CoNet with Cytoscape successfully created networking maps but more remains to be understood about the statistical significance of the data. MENAP failed to process the OTUs. SparcC can process the OTUs through a portion of the pipeline but errors in the code prevent a complete analysis. Additional research is continuing to further understand these programs and the relevance of the data they produce. With a successful understanding of plant microbiomes, the soils at Wild Basin or elsewhere can be optimized for plant sustainability. Also, these programs can be applied to understanding additional biological systems in the future.

### **Effect of nitrate supplementation and input frequency on lipid production in *Chlorella vulgaris***

*Cherokee Rivera Chatterton, Concordia University; Ashleigh Wostarek, Concordia University; Lauren Shuffield, Concordia University; Mary Kay Johnston, Concordia University Texas*

The production of algal biofuels depends on the extraction of lipids from algae and removing glycerol from the lipids by transesterification. Previous research indicates that nitrogen limitation increases lipid production in *Chlorella vulgaris*. We propose that nitrogen limitation in conjunction with altering the frequency of nitrogen inputs will increase lipid production. We assessed how different nitrate concentrations (40mg/L, 85mg/L, 170mg/L) and input frequency (once, every three days, and weekly) affect *C. vulgaris* growth and lipid production over a two week period. For each treatment, algal abundance peaked at day 7. Our results show that algal growth rates significantly vary with nitrate concentrations, and there was a significant interaction effect between nitrate concentration and timing of nitrogen supplementation. Additionally, lipid yield from our strain of *C. vulgaris* (UTEX395) was similar to literature values.

**Range extension for the rare sedge *Schoenoplectiella erecta*** *Mark Gustafson, Texas Lutheran University; Alan Lievens, Texas Lutheran University; George Yatskievych, Billie L. Turner Plant Resources Center,*

### *University of Texas at Austin*

We collected specimens of a sedge in southern Guadalupe County, Texas, and identified them as *Schoenoplectiella erecta* (Poir.) Lye subsp. *raynallii* (Schuyler) Beentje (Cyperaceae). Voucher specimens are deposited in TEX, MO, and TLU. The plants were found in June and July 2018 around the edges of stock ponds on two adjacent private properties in the post oak savannah ecoregion. A review of unidentified specimens collected at one of these properties in June 2017 also revealed a collection of this taxon from one of the same stock ponds, thus showing that this taxon persisted at this site through at least two growing seasons. Previous collections in the United States for *Schoenoplectiella erecta* have documented this species from Florida, Georgia, and southern Texas. The northernmost collections in Texas previously were from San Patricio and Aransas counties, so our find extends the range northward by 160 km. This species is fairly rare, with only seven prior Texas collections found in the database of herbaria of the southeastern states (Southeast Regional Network of Expertise and Collections [SERNEC]). Along the margins of one of the ponds, we also collected *Helanthisium tenellum* (Mart. ex Schult. & Schult. f.) Britton (Alismataceae), which frequently co-occurs with *Schoenoplectiella erecta*.

### **Soil carbon amendments: Vireo Habitat Restoration approach** *Serena Lynn Gibbs, St. Edward's University; Dr. Charles Hauser, St. Edwards*

The symbiotic relationship between plant roots and the surrounding soil microbiome can influence growth, metabolism, disease resistance, and aid in plant evolution. Given the importance of plant-microbe interactions, determining which variety of microbes contribute to healthy plant growth could be useful agriculturally and in plant restoration projects. The research reported herein focused on Black-Capped Vireo restoration efforts within the Vireo Preserve. To examine the impacts of carbon additions to soils on microbial populations, mulch socks containing a variety of carbon sources were placed at two sites. Four treatments were laid down behind the mulch socks consisting of: a control; mulch; composted mulch; biochar, and composted mulch-biochar combination. To determine the impact on soil microbial populations, total DNA from soil samples was isolated, and the V3-V4 region of 16S ribosomal DNA was sequenced. The sequences obtained were analyzed using the open source bioinformatics pipeline, QIIME. Preliminary results indicate that: (1) alpha rarefaction of the data suggested sufficient sequencing depth to characterize the bacterial populations for each treatment; (2) the alpha diversity analysis identified that the most common bacterium, which comprised at least 50-60% of variables, was found within the class *Rubrobacteria* while the least abundant bacterium of an unnamed class Sva0725 was identified within the mulch treatment; (3) Principle Component Analysis (PCA) using Bray-Curtis distance matrix revealed 2 clusters of bacterial populations: mulch-biochar, composted mulch biochar samples were distinguished from others. Further analysis is in progress.

### **The evolutionary origins of *Mentzelia bartonioides* (LOASACEAE)** *Destiny J. Brokaw, Abilene Christian University; Joshua Michael Brokaw, Abilene Christian University*

*Mentzelia* section *Trachyphytum* is a clade of annual flowering plants containing about 25 species distributed primarily in North America. Based on the most recent taxonomic revisions of *Mentzelia*, *M. bartonioides* is considered to be the only species in *Trachyphytum* that is native to South America, suggesting a dispersal origin from North America. North American species with similar

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

morphology, habitats, and equally large ranges are closely related to *M. albicaulis* and *M. montana*. In this study, we used phylogenetic reconstructions to create a hypothesis of the evolutionary origins of *M. bartonioides* based on the chloroplast intergenic spacers *ndhF-rpl32*, *rpl32-trnL*, *trnS-trnG*, *trnS-trnM*, and *trnL-trnF*. DNA was extracted from a *M. bartonioides* specimen obtained from Mendoza Province Argentina, and its chloroplast sequences were determined and aligned with existing Genbank accessions for phylogenetic reconstructions by maximum likelihood. Surprisingly, *M. bartonioides* was not most closely related to similar species in North America. Instead, *M. bartonioides* was related to a narrow endemic with specialized soil adaptations and large flowers called *M. packardiae* from the Owyhee Desert in eastern Oregon. This suggests that South American populations from section *Trachyphytum* represent a unique previously unknown genetic lineage with homoplasious similarities to widespread species in North America. This study supports previous work that has indicated that distantly related species in section *Trachyphytum* often obtain similar habitat niches through convergent evolution.

### 014-8. Terrestrial Ecology and Management Poster Session

Terrestrial Ecology and Management

Poster Session

Participants:

#### Altered landscapes: how rapidly do soils change?

Megan Davis, University of the Incarnate Word; David Starkey, University of the Incarnate Word

The Headwaters Sanctuary (HWS) is a 53-acre urban site located in San Antonio, Texas. Two fields in the HWS were utilized by the University of the Incarnate Word (UIW) for the last decade as practice soccer fields. In the spring of 2017, the HWS reclaimed one of the fields with the intent of allowing it to revert back to its native state. For this to be accomplished, the field was covered with plastic, for approximately 6 months, resulting in the elimination of all vegetation on site. A portion of the former soccer field is being utilized for instructional purposes and has been altered by the addition of stonework, benches, and native plants. The remaining areas of the former soccer field are being allowed to return to a natural, or native, state. In order to monitor how quickly this site may revert to a natural state, we are monitoring several key soil nutrients (e.g., calcium, sodium, and sulfur), pH, and soil conductivity. Soil samples will be taken from 2 transects at 3 timepoints. To date, we have sampled 2 timepoints. We will take samples from the 3rd timepoint in the spring of 2019. Then, we will compare these key factors at our sites, and timepoints, to each other and to a 3rd unmanaged site located within the HWS. Overall, the results of this study should allow us to address how rapidly these factors are changing and, ultimately, how rapidly soil conditions are being altered in the HWS.

#### Burrow Occupancy in Relation to Territoriality

Maclin Miller, Schreiner University; Dominique Nicole Muniz, Schreiner University; Abigail Rose Garcia, Schreiner University

In this study a new methodology for studying behavior of burrowing mammals was field tested to gain an understanding of its practical utility. The benefit to understanding such concepts may aid in the development of future capture and release programs of burrowing mammals in relation to predation and territoriality. Secondarily, this type of study can provide farmers and ranchers the knowledge of movement patterns regarding burrowing mammals. This can be accomplished through burrow

mapping and is necessary for the development of land and crops. The purpose of this study was to observe and detect behaviors exhibited by burrowing mammals, such as foxes and armadillos, along with skunks and raccoons which might inhabit abandoned burrows. These specific behaviors include how frequent burrowing mammals arrive and depart from their burrows, as well as how territorial these mammals are amongst themselves in addition to other animal species. The collection of data began in early September through early November during which climate changes may have affected the results. Tools used to formulate and document burrowing behaviors include game cameras, endoscope, and mapping software. It was hypothesized that the distance between burrows affects the number of occupied burrows. We report pros and cons of this field methodology.

**Caudates as prey: Predator diversity and size-relationship patterns** Kasey L. Jobe, Department of Biology, Stephen F. Austin State University; Carmen G. Montaña, Department of Biological Science, Sam Houston State University; Christopher Schalk, Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University

Predators play important roles in their ecological communities that can affect both its structure and function. Salamanders are prey to a variety of predators that differ in their foraging tactics (e.g. specialists vs. generalists), morphology, behavior, and ecology. Salamanders are an ideal group to explore and quantify patterns that may affect the evolution and persistence of defensive strategies. Here we examined patterns of predator diversity and body-size relationships of prey salamander species and their predators. We compiled observations predator-prey interactions using natural history notes from Herpetological Review (1975-2018) and Herpetology Notes (2008-2017). Our database contains 156 salamander predator-prey interactions comprised of 68 salamander species that were preyed upon by 88 predator species from 30 orders. Snakes were the most frequently reported predators, followed by salamander predators, and birds (35%, 24% and 16% of predations reported, respectively). Exploring the body-size relationship of the prey, both snake and salamander predators were consistently eating salamander prey that were smaller than themselves. This pattern is likely attributed to the fact that both types of predators are gape-limited, and are unable to eat prey that attain a certain size refuge. These patterns can serve to help generate hypotheses on the defensive strategies of salamanders.

#### Comparison of tracking tubes and camera traps for assessment of relative abundance of small mammals

Madison Alexander, East Texas Baptist University; Ariana Lopez, East Texas Baptist University; Troy A. Ladine, East Texas Baptist University

Thirty tracking tubes were placed ca. 10 m apart in a 6 X 5 pattern on the Environmental Studies Area (EnStA) of East Texas Baptist University. Concurrent with the tracking tubes, three stations of camera traps were established to assess differences in the two methods for relative abundance index (RAI). The EnStA is part of a larger urban ecosystem located in Marshall, TX (32°33'N; 94°22'W) with private homes located on the west and east sides, a five-lane highway on the north and the athletic fields of ETBU located on the south. Tubes were checked for tracks once a week from 1 Oct. - 17 Nov. 2018. Tubes were baited with oatmeal through the duration of the study. Cameras were baited with oatmeal through 16 Oct. when baiting was terminated. Fifteen identifiable tracks of two species (*Peromyscus* sp. and *Blarina carolinensis*) were found during the 7 weeks of the study in the tracking tubes and eight pictures of

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

*Peromyscus* were taken at the camera locations. The difference between the RAI for tracking tubes (0.011) and RAI for the cameras (0.057) was not significantly different ( $t_2 = 1.48$ ,  $p = 0.277$ ). While the difference was not statistically significant, due to interference from environmental conditions the cameras may give a better assessment of RAI than tracking tubes.

**Host plants of the Lepidoptera of the Coastal Bend, Texas** Richard Patrock, Dept. of Biological and Health Sciences, Texas A&M University-Kingsville

Beta-diversity is a description of concurrent associations among species in a local community. Across landscapes, these descriptions can inform us as to the number and degree of symbiotic affiliations we might expect from the distribution of the taxa. For instance, obligate mutualists are found always together in any community, such that the finding of one species predicts the presence of the other(s). In a parasitic relationship, a suitable host is an important aspect of the fundamental niche of the parasite but not necessarily of the host. The symbiotic association has a looser definition than for mutualists. We therefore expect a lesser degree of predictability as to host-parasite tandem occurrences that likely slides with the parasite's level of host specialization. I have been collecting field, museum and literature records of species of Lepidopterans and plants, as well as their possible interactions for insect communities in the Coastal Bend region of Texas. I offer a preliminary description of this data for around 100 families of moths and butterflies, using Sphingid Hawkmoths as an exemplary group of my approach to data collection and analysis. For these, as well as all other families, I compare local associations known or otherwise expected relative to a broad sampling of known species relationships globally.

**Prey composition of Barn Owl (*Tyto alba*) pellets from three different habitats in the Southern High Plains, Texas** Evelyn Simmons, Wayland Baptist University; Andrew Kasner, Wayland Baptist University

Barn owl regurgitated pellets were collected from 3 different roost sites representing 3 different habitat types in the Southern High Plains of Texas: farmland in the Llano Estacado (Hale County); brushy canyonland along the Caprock escarpment (Floyd County); and an urban roost in Plainview (Hale County). Prey items were identified to genus, when possible, and percentages of pellets for each prey type were calculated for each roost site to determine relative contribution to the diet and any differences among habitats. A total of 63 pellets were collected, containing 82 skulls from 8 genera and 3 orders of mammals (Rodentia, Lagomorpha, Eulipotyphla). The urban roost samples (20 pellets) contained 4 genera (*Sigmodon*, *Peromyscus*, *Sylvilagus*, *Cryptotis*); farmland roost samples (20 pellets) contained 3 genera (*Sigmodon*, *Sylvilagus*, *Microtus*); canyon roost samples (23 pellets) contained 6 genera (*Sigmodon*, *Peromyscus*, *Microtus*, *Onychomys* and two of uncertain identity but distinctly different skulls); suggesting that prey diversity may be slightly higher in the brushy canyonland, with moderate overlap of genera among sites. *Sigmodon* was the most prevalent prey item at all 3 roosts/habitats (urban = 80% of pellets; farmland = 75% of pellets; canyons = 65% of pellets; 73% of all pellets), and the only genus detected in all three sample sites.

**Response in activity patterns of white-tailed deer (*Odocoileus virginianus*) to lunar cycles and cloud cover** Lindsey Settles, East Texas Baptist University; Troy A. Ladine, East Texas Baptist University

Activity patterns of white-tail deer (*Odocoileus virginianus*) were investigated in an urban ecosystem. The study occurred at East Texas Baptist University Environmental Studies Area

(EnStA) from 14 October 2014 to 30 November 2018 located in Marshall, TX (32<sup><sup>o</sup></sup>33'N; 94<sup><sup>o</sup></sup>22'W). The EnStA is bordered on the east and west by private homes and a cemetery, the north by five-lane highway, and the south by the athletic fields of East Texas Baptist University. The site is located entirely within the city-limits of Marshall; therefore, hunting is not allowed on the site. The objective of our study was to examine the effects of lunar phases incorporating cloud cover on the activity of deer. Results of our study indicate that activity of deer is related to the cloud cover deviating from expected activity for both day ( $\chi^2 = 9.90$ ,  $p = 0.0071$ ) and night ( $\chi^2 = 19.22$ ,  $p > 0.0001$ ). Activity increased during nights when the full moon is not obscured by clouds (partly cloudy nights vs. clear nights  $t_{<sub>18.7</sub>} = 2.42$ ,  $P = 0.257$  and cloudy night vs. clear nights:  $t_{<sub>15.9</sub>} = 2.92$ ,  $P = 0.010$ ). Changes in distributional patterns were observed during all lunar phases with the greatest changes between full moon and new moon activity ( $D = 0.85$ ,  $P > 0.0001$ ). Nightly cloud cover, on primarily clear and overcast nights, during full and new moon lunar phases but not waxing and waning moon phases also affected the distributional pattern with the greatest changes occurring during the new moon lunar phase.

**Tardigrades in Texas: Fifth Graders add a New Record for the State** Hannah Catherine Cotten, Education; William R. Miller, Baker University

A National Science Foundation objective is to reach out with science and educate the public about the mystery, discovery, and facts of the sciences. Tardigrades, or water bears, are charismatic, microscopic animals that can help the public experience science. They have the ability to survive harsh environments and stress, such as high pressures, inordinate amounts of ultraviolet rays, lack of oxygen or water, and the vacuum of space. Few adults, let alone students, have ever seen in person one of these fascinating critters. When the fifth graders of Hill Elementary saw their first water bear, they were in awe. Hooked by the mystery of tardigrades, they ached to learn more, so they asked a scientific question, "Are there more tardigrades living in lichen or moss?" They carried out a survey of the tardigrades in the environment surrounding their school. They consulted Dr. William R. Miller and learned how to find, process, and identify tardigrades. They collected samples and kept track of the populations. After the first year, students began making slides and identifying species in an after school club they started. With the help of Dr. Miller, they not only answered their original question, but also discovered a tardigrade never seen before in the state of Texas. This experience demonstrated that students can catch this animal at an early age and contribute to our understanding of these creatures. They added a new record for the state and brought about more youthful ideas for better stewardship of our world.

**The effects of urbanization and habitat density on alarm call propagation in Carolina Wrens (*Thryothorus ludovicianus*)** Stephen Scribner, Sam Houston State University

Urbanization has caused many songbird populations to decrease. Habitat loss due to increased urban land cover, decreases in biodiversity, reduced food resources, and light pollution have all been documented as harmful side effects of urbanization. More recently, anthropogenic noise caused by urbanization has been looked at with more scrutiny. Birds rely heavily on vocal communication to define territory, attract and locate mates, and warn conspecifics of potential threats. Urban landscapes possess an ambient background noise frequency set lower than that of a natural rural environment. Several bird species raise their minimum song



## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

frequency and amplitude to combat the urban background noise but little has been studied on the effects of urban noise levels on the alarm calls of birds. We studied how the alarm calls of Carolina Wrens (*Thryothorus ludovicianus*) are influenced by urbanization and habitat density. We measured the effect of vegetation density in both urban and rural habitats on wren alarm call propagation and selection. We also documented responses by heterospecific species to different alarm calls of the wren in both habitats to determine if population isolation influences alarm call effectiveness. We will present initial results from this research.

### **Use of landscape shrubs by mammals** *Hunter Barnes, East Texas Baptist University; Troy A. Ladine, East Texas Baptist University*

Investigation of the use of landscaping by small mammals was conducted during the fall of 2018 on the campus of East Texas Baptist University. The objective of the study was to determine to extent of the use of the shrubs by mammals making up the landscaping around selected buildings using tracking plates. Tracking plates were coated with axle grease to observe tracks of small mammals. Mammals observed through tracks along the buildings were mice, domestic cats (*Felis sylvestris catus*), Virginia opossum (*Didelphis virginiana*), squirrels (*Sciurus* sp.) and domestic dogs (*Canis lupus familiaris*). Mice (48.4%) and cats (39.1%) were the most common mammal tracks observed. Buildings located on the periphery of campus exhibited the largest use of landscape shrubs by small mammals. The landscaping along both buildings was primarily ornamental holly (*Ilex* sp.). Other building plants were a mixture of ornamental holly, Chinese fringe flower (*Loropetalum chinense*) and little gem Magnolia (*Magnolia grandiflora* var. Little Gem). Our study indicates a preliminary finding that shrubs with more dense foliage located on the periphery of campus support greater movements of mammals.

### **014-9. Mathematics and Computer Science Poster Session**

Mathematics and Computer Science

Poster Session

Participants:

### **Dynamic Fourier Technique Applied to Discriminate Between Seismic Signals from Natural Earthquakes and Mining Explosions** *Md Al Masum Bhuiyan, The University of Texas at El Paso; Maria C. Mariani, The University of Texas at El Paso; Osei Kofi Tweneboah, The University of Texas at El Paso; Hector G. Huizar, The University of Texas at El Paso*

This work is devoted to the study of modeling geophysical time series arising in natural earthquakes and mining explosions. We observe that the measurements of a seismic sequence are stochastically dependent on the time needed. In other words, there is a correlation among the numbers of data points at successive time intervals. A sequence of intraplate earthquakes occurred in Arizona at the same location where mining explosions were carried out in previous years. The explosions and some of the earthquakes generated very similar seismic signals. We propose a Discrete Fourier Transform (DFT) to determine the power spectrum of these seismic signals in a stationary environment. The modeling of stationary time series with consistent properties helps to characterize the key variables. To estimate the power spectrum, we used the tapering process with DFT technique by avoiding spectral leakage or discontinuity in the sequence. Our results suggest that the Dynamic Fourier Technique is effective in discriminating the power spectrum between natural earthquakes and mining

explosions. This type of analysis permits identifying characteristics in the seismograms frequency yielding to detect potentially risky seismic events.

### **Estimating the volatility of geophysical time series by using stochastic volatility models** *Osei Kofi*

*Tweneboah, The University of Texas at El Paso; Md Al Masum Bhuiyan, The University of Texas at El Paso; Hector G. Huizar, The University of Texas at El Paso; Maria C. Mariani, The University of Texas at El Paso*

This work is dedicated to the study of modeling geophysical time series. A stochastic technique with time-varying parameters is used to estimate the volatility of data arising in geophysics. In this study, the volatility is defined as a logarithmic first-order autoregressive process. We observe that the inclusion of log-volatility into the time-varying parameter estimation significantly improves forecasting which is facilitated via maximum likelihood estimation.

### **Optimal corrections to slam light shifts in human circadian rhythms using light and melatonin perturbations** *Carrie Fulton, Schreiner University*

Almost every living thing exhibits daily cycles in behavior and physiology known as circadian rhythms. In humans, disrupted circadian rhythms have been implicated in a spectrum of both mental and physical health maladies including cancer, diabetes, addiction, depression and sleep disorders. A common circadian disruption occurs when individuals suddenly move between timezones resulting in so-called "jetlag". Treatment for jetlag typically involves altering light input or oral doses of melatonin. However, the timing of light and melatonin doses during the biological day will greatly effect the recovery time from jetlag. We present a mathematical model for human circadian rhythms which accounts to daily perturbations in light as well as melatonin dosage. We study light and melatonin schedules which will minimize re-entrainment time to suddenly shifted light schedules. These results will have implications for frequent travelers as well as shift workers.

### **Optimizing performance using mathematical models for circadian rhythms** *Tiara Hendricks, Schreiner University; Samuel Brice, Schreiner University*

Circadian rhythms in behavior and physiology have been observed in every taxa of life ranging from single cellular organisms to plants, fungi, insects and mammals. To be of evolutionary value these internal rhythms must be tied to an outside entraining force. In mammals the principle entraining force is the daily light cycle. The circadian clock responds differently to light exposures presented at different times in the biological day. Light exposure in the morning hours will advance the clock and light in the evening will delay the clock. In a mathematical sense we may use the light exposure as a control parameter. In this study we use a mathematical model for the effect of light on the circadian clock to move the circadian phase of maximal alertness to a specified time of day. Thus, we develop light schedules to optimize performance.

### **015. Biomedical Sciences Oral Session 2 and Section Meeting**

Biomedical Sciences

Paper Session

4:30 to 5:45 pm

*Winebrenner Science Building: Floor first - 121*

Participants:

### **4:30 Novel Therapeutic Organotin compound against *Leishmania major*** *Izuel Amacalli Tejada, University of Texas at El Paso; Keith h pannell, the university of texas*

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

*at el paso; Rosa Maldonado, University of Texas at El Paso*

*Leishmania major* (*L. major*) is a parasitic infection transmitted by a sandfly that causes an approximate of 70,000 deaths per year and affects millions of people worldwide. Despite its epidemiological importance it is often neglected since its biggest impact is on underdeveloped areas with low socioeconomic status. The current treatment, amphotericin B, is highly toxic and expensive. Therefore, the development of low-cost, effective, new drugs is imperative. Organotin compounds have been proven to be broad and potent biocides against eukaryotic infections ranging from fungicides to acaricides. However, the use of these compounds against such parasitic infections has not been investigated, possibly due to their immunotoxicity. For this project a novel immuno safe organotin compound [MeS(CH<sub>2</sub>)<sub>3</sub>]<sub>2</sub>SnCl<sub>2</sub> and its oxygen analog, [MeO(CH<sub>2</sub>)<sub>3</sub>]<sub>2</sub>SnCl<sub>2</sub>, were evaluated and compared to Amphotericin B. Our experiments suggests that [MeS(CH(CH<sub>2</sub>)<sub>3</sub>)<sub>2</sub>SnCl<sub>2</sub> EC<sub>50</sub> of 12.5 uM against *L. major* promastigotes while maintaining a low toxicity against macrophages, monkey kidney cells and human osteoblasts with an EC<sub>50</sub> of 25 uM and 50 uM respectively. To this date the bioactivity of [MeO(CH<sub>2</sub>)<sub>3</sub>]<sub>2</sub>SnCl<sub>2</sub> has been proven to be mild towards *L. major* and mammalian cells.

**4:45 Pathobiology and Therapy of Acute Myeloid Leukemia with KLF4 Gene** *Abraham Fausto Jornada Cooper, Howard Payne University*

Acute myeloid leukemia (AML) is a cancer that can be induced by various genetic mutations. Specifically, our lab has studied Kruppel-like Factor 4 (KLF4) and its association as a tumor suppressor in AML. It is observed that the gene expression levels of KLF4 are decreased compared to healthy blood cells and ectopic KLF4 expression induces apoptosis in AML cells. This led to the hypothesis that KLF4 has a tumor suppressor function in AML, and thus induction of KLF4 will inhibit viability of AML cells through cell cycle arrest and apoptosis. The goals of this study are to observe cell viability in vitro through chemical activation of KLF4 with standard of care drug APTO-253 as well as understand the mechanism of KLF4 driven apoptosis. Cytotoxicity assays confirmed that APTO-253 induced cell death in AML cell lines. Immunoblot analysis showed that 3 of 6 AML cell lines increased in KLF4 protein levels with treatment. Flow cytometry with Propidium Iodide (DNA) and Annexin V/7AAD(Apoptosis) confirmed DNA fragmentation and apoptosis respectively. The next facet of the project studied the role of KLF4 in the leukemic stem cell (LSC) population with Cas9/CRISPR technology to knockout KLF4 in NB4 cell line. Three cells lines were successfully created with KLF4 deletion. In conclusion, apoptosis in AML cells are associated with an increase in KLF4 in some cell lines; therefore, KLF4 may have tumor suppressor function in AML. The KLF4 deleted cells lines will also be used for future studies of drug cytotoxicity, immunoblot, and qPCR.

**5:00 Survey of Wild Turkeys for reticuloendotheliosis virus** *Faith Josephine Cox, Tarleton State University1010*

Reticuloendotheliosis virus (REV) is an immunosuppressive and sometimes oncogenic avian retrovirus. REV can infect B-cells, a component of blood, and has been identified in wild galliform birds. REV-infected Wild Turkeys roaming near at-risk captive flocks, such as the related and highly endangered Attwater's prairie chicken (*Tympanuchus cupido attwateri*; APC), could act as a reservoir for transmission. During 2016–2017, nearly half of all captive adult APC mortality at Fossil Rim Wildlife Center captive breeding

facility (Glen Rose, Texas) was attributed to REV infection. Due to the unusually high REV incidence, we conducted a survey for this virus in Wild Turkeys throughout the region. From 2016–2017, 393 Wild Turkeys from two subspecies were captured using a

combination of walk-in funnel traps, drop nets, and rocket nets by state wildlife agency staff. Blood samples collected from the captured Wild Turkeys were tested for REV proviral DNA through amplification of the viral 3' long terminal repeat and segments of the viral pol gene. In REV-affected counties, 5/98 (5.1%) of native Rio Grande Wild Turkeys (*Meleagris gallopavo intermedia*) were identified as REV positive and confirmed by sequencing. In addition, we detected REV in one Eastern Wild Turkey (*Meleagris gallopavo silvestris*) that had been imported for conservation efforts. To better determine protective measures, continued surveillance is necessary to identify sources of outbreaks in captive APC flocks. We are currently designing a multiplex qPCR assay to simultaneously test for multiple infections, including the emerging avian retroviruses lymphoproliferative disease virus.

**4:45 Toxicity Profile and Localization of Virus Like Particles (VLPs) in *Danio rerio*** *Bridget Fitzgerald, University of Texas at Tyler; Olivia Brandenburg, University of Texas at Tyler; Baylie Catrett, University of Texas at Tyler; J. Michael King, University of Texas at Tyler; Dustin Patterson, University of Texas at Tyler; Brent Bill, University of Texas at Tyler*

Virus Like Particles (VLPs) are multi-subunit, self-assembling protein cages which mimic the construction of a viral capsid. These cage-like nanostructures are being investigated as a next-generation cell-specific drug delivery vector. They have numerous advantages over previous technologies including easy construction, biostability, and compatibility. We aim to use the zebrafish as a rapid in vivo model to test new formulations of VLP with the ultimate goal of using this as a chemotherapeutic delivery system. We demonstrated that toxicity of VLP HK97 is minimal at biologically relevant doses, and that the untargeted VLP is evenly distributed within embryonic zebrafish. Currently, we are assessing delivery methodologies and localization of fluorescently labeled VLP HK97. Toxicity and localization of VLP HK97 in *Danio rerio* is necessary for understanding the biological effects of these nanoparticles and their potential therapeutic capabilities.

**5:00 Biomedical Sciences Section Meeting** *Joni H Ylostalo, University of Mary Hardin-Baylor*

### **016. Terrestrial Ecology and Management Oral Session 2 and Section Meeting**

Terrestrial Ecology and Management  
Paper Session

4:30 to 6:30 pm

*Winebrenner Science Building: Floor first - 123*

Participants:

**4:30 Mosquito Ecology and Nectar Preferences** *Ben Sloan, Austin College; Anusha Jacob, Austin College; Loriann Garcia, Austin College*

In nature, both male and female mosquitoes require nectar as a food source to carry out daily activities. Flower nectar composition greatly influences overall mosquito health and vector capacity. We investigated the effects of different plant nectar sources on *Aedes aegypti* mosquitoes' longevity using several native and ornamental plants present in the local Sherman (Grayson County, TX) area. We have found that mosquito longevity varied between plants as we saw increased longevity in mosquitoes that fed on milkweed

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

(*Asclepias curassavica*) compared to blackfoot daisy (*Melampodium leucanthum*) and lantana (*Lantana camara*).

We also explored whether visual cues affect mosquito nectar-host preference. White, yellow, and red artificial flowers were constructed to determine which color attracts mosquitoes to nectar resources. There was a red flower preference trend over other colors and controls of 10% sucrose and water. We ran taste preference assays of yellow, blue, and red dyed sucrose to determine if the food dyes used in our color experiment influenced mosquito preference. Male and female mosquitoes preferred sucrose over colored food dye. Females preferred blue over the other colors while males had no preference. This study offers important information into ecological mosquito nectar-host relationships and will aid in the design of future experiments. Floral olfactory and visual cues may influence mosquito nectar preferences thus consequently influencing the mosquito's ability to vector diseases.

**4:45 Novel ecosystems correlate with high biodiversity in urban areas** *Damari Anderson, Alamo Colleges; Eric Nathan Madrid, Northwest Vista College*

Biological nutrient cycles sustain life on Earth and are dependent on healthy ecosystems for proper function. Three popular ways to categorize ecosystems are as natural, impacted, or designed. Natural ecosystems are in protected areas with limited or no disturbance; impacted ecosystems have experienced or are experiencing significant disturbance events, whereas designed ecosystems have been restored to or attempted to mimic pre-disturbance conditions. These are all, in various ways, influenced by human interaction; whether it's to protect and leave it alone, to damage or destroy it, or to make it work alongside human living. A fourth kind of ecosystem design just recently recognized is as a novel ecosystem. Novel ecosystems are engineered to create the greatest biodiversity without consideration necessarily of their pre-disturbed natural condition. In this investigation, we identified and examined comparatively the biodiversity and ecological health of these four ecosystem types around urban areas of San Antonio, TX, USA. We hypothesized that novel ecosystems, regardless of the original biome, will have the greatest species richness. So far, our data support this hypothesis and rank novel ecosystems the most diverse, followed by restored, then disturbed and natural as equivalent and below novel and restored. We believe natural ecosystems ranked low because the protected areas where they are found experience high levels of disturbance in the form of fire suppression.

**5:00 Survey and life history of bee fly parasitoids (Diptera: Bombyliidae) of Hymenoptera within Brewster and Jeff Davis counties of Texas** *Lauren G Garrett, Sul Ross State University; Chris M Ritzi, Dept of BGPS, SRSU*

Bee flies (Diptera: Bombyliidae) are pollinators as adults and larval parasitoids of various insect groups, including bees and wasps. Despite over half of all Texan bee fly genera exploiting hymenopterans, the prevalence, range, and specific life histories of these species are heavily lacking or non-existent in description. With increasing concerns for pollinators and native bee populations, expanding the current knowledge of bee fly life cycles and host usage may help illuminate some complex ecological interactions and fluctuations within these insect communities. This study was conducted to determine the prevalence and diversity of bee flies exploiting hymenopterans within Brewster and Jeff Davis counties. Trap-nests, sand pits, and a novel pan trapping method were employed between late-March through early-November 2018 in three geographically distinct study areas: Chihuahuan Desert Research Institute

(grasslands), Davis Mountains Preserve (sky island), and Terlingua Ranch (desert scrub). Pan trap assays collected bombyliids of subfamilies Anthracinae, Bombyliinae, Phthiriinae, and Usiinae, while members from subfamily Toxophorinae were solely retrieved from trap-nests. Bee flies were captured from the pan trap assays at all three study areas, however trap-nest collections only yielded bombyliids from the grassland sites.

**5:15 Monitoring of Three Biocontrols for Salt Cedar in the Trans Pecos Texas and Southeastern New Mexico** *Chris M Ritzi, Dept of BGPS, SRSU*

Saltcedar (*Tamarix spp.*) is a deciduous shrub or small tree that was introduced into the United States from Eurasia in the early 1800s to stabilize riverbank erosion, serve as a windbreak, and as an ornamental. However, due to a high reproductive potential, saltcedar has become invasive on many river systems in the western United States. Some of the most dense tamarisk infestations have occurred in the southern areas of the Rio Grande, and in an attempt to control this plant by biological means, a consortium consisting of the USDA, NRCS, and Sul Ross State University released several species of tamarisk leaf beetle (*Diorhabda spp.*) in southern Brewster and Presidio counties in Texas. The suitability of the species was evaluated, and data suggested that the Tunisian Subtropical species (*D. sublineata*) was best suited to this region. Observations have also shown that the tamarisk leaf beetles are capable of establishing on a close relative non-target species, the athel tree (*T. aphylla*). Six sites along the Rio Grande River, from Lajitas, TX to Candelaria, TX, have been routinely monitored to determine the long-term impact of leaf beetle defoliation on saltcedar and the non-target athel trees in the region. While defoliation by *D. sublineata* has been sporadic this past year, activity by other biocontrols, namely the splendid tamarisk weevil (*Coniatus splendidulus*) and the tamarisk scale (*Chionaspis spp.*), has been increasing. Efforts were made to broaden the search for all three biocontrols, documenting activity across the Trans Pecos Texas and southeastern New Mexico.

**5:30 Section Meeting Terrestrial Ecology and Management** *Richard Patrock, Dept. of Biological and Health Sciences, Texas A&M University-Kingsville*

**017. Systematics and Evolutionary Biology Oral Session and Section Meeting**

Systematics and Evolutionary Biology

Paper Session

4:30 to 5:00 pm

*Winebrenner Science Building: Floor second - 218*

Participants:

**4:30 Visual communication in Gray Treefrog (*Hyla versicolor*): are yellow leg patches sexually selected?** *Taylor Nicole Black, Stephen F. Austin State University; Jennifer Gumm, US Fish and Wildlife*

Communication serves many functions in animals including the establishment of territories, competition for resources, predator deterrence, and mate selection. Growing evidence suggests visual signals may be important in anuran communication, even in nocturnal situations. The Gray Treefrog (*Hyla versicolor*) has yellow-to-orange patches located on the hind legs between the thigh and side, as well

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

as on the front legs between the chest and arm. These patches are displayed when male frogs are in the “push-up” stance. I hypothesized that these patches may be used in visual communication related to sexual selection in the Gray Treefrog (*Hyla versicolor*). To test this hypothesis, I quantified differences in yellow coloration 1) between the sexes and 2) between mated and unmated males. During the mating season, I collected calling males (n=14), and amplexed male/female pairs (males=8, females=8). In the lab, I measured coloration using reflectance spectrophotometry and quantified standard color variables (hue and brightness). Color patch size was quantified using photography. Both males and females displayed color patches and patch size varied between individuals. However, patch size was not significantly different between males and females or between mated and unmated males. Preliminary analyses of coloration also find no differences in color metrics between males and females or mated and unmated males. Taken together, these results suggest that Gray Treefrog coloration is not sexually dimorphic, or related to male quality. Thus, yellow coloration is likely not used in sexual communication but may function in a different context such as predator deterrence.

**4:45 Systematics and Evolutionary Biology Section Meeting** *Simon Scarpetta, University of Texas at Austin*

**018. Mathematics and Computer Science Oral Session and Section Meeting**

Mathematics and Computer Science

Paper Session

4:30 to 5:30 pm

*Winebrenner Science Building: Floor second - 219*

Participants:

**4:30 A Toy Problem and it's Twisted Solution**

*Nicholas Alexander Petela, Tarleton State University;*

*Randi Brianna Kelleher, Tarleton State University;*

*Jaryd Stone Domine, Tarleton State University*

In the shadow of the Rubik's Cube lay the Rubik's Snake, a wistable chain of triangular prisms. The Snake presents us a combinatoric conundrum: Each segment can turn four ways, but the Snake fills space as it goes and cannot pass through itself. While commercial versions of the snakes tout “endless possibilities”, can this be true? Of course not! We present here our search for the number of “legal” configurations and explore the problem's relation to the self-avoiding walks on the cubic lattice and string restrictions involving self-similarity and symmetry. Patterns, algorithms, and visualizations have been found in twisting corners of our path as we continue to shed light on the Rubik's Snake.

**4:45 Math vs. Gerrymandering** *Preston Ward, Tarleton State University*

Courts at all levels are struggling with the increasingly pressing and complex issue of political gerrymandering. Deadlines for the post-2020 census redistricting are quickly approaching. At the heart of our difficulties to fairly divide ourselves into voting districts lies a math problem – how do we measure fairness? How can we use that measure to draw fair district boundaries? Our project is part of nationwide collaboration of mathematicians, demographers, lawyers, mapmakers, political leaders, and citizens attempting to develop tools for this purpose. We will survey Markov Chain Monte Carlo methods used in the PA Supreme Court case and our recent work to improve and apply it to more states. We will discuss several commonly used compactness metrics and present a new idea called transit time compactness that aims to use the Google Maps API to measure cohesiveness of people, not just land. This talk derives from participation in the Voting Right Data Institute

at MIT, Harvard, and Tuft Univ in Summer 2018 under Dr. Moon Duchin.

**5:00 Predicting the Evolution of the Spotted Owl Population** *William Rommel Serrano, Sul Ross State University*

In 1990, the northern spotted owl became a center of debate over whether the species was considered endangered due to deforestation in the Pacific Northwest. Mathematical ecologists applied a stage-matrix model (also called a discrete linear dynamical system) to the Spotted Owl's population dynamics to understand if continued logging in old-growth forests would threaten the species with extinction. Looking at various data sources, this study will use stage-matrix models created by field data from demographic studies to compare predicted populations to current populations.

**5:15 Mathematics and Computer Science Section Meeting** *Scott R. Franklin, Wayland Baptist University*

**019. Geosciences Oral Session and Section Meeting**

Geosciences

Paper Session

4:30 to 6:30 pm

*Winebrenner Science Building: Floor second - 220*

Participants:

**4:30 Development of rill marks on washover fans, on Bryan Beach, Freeport, Texas** *Russell LaRell Nielson, Stephen F. Austin State University*

Well-developed rill marks are present on the washover fans on Bryan Beach along the eastern side of the new Brazos River delta, southwest of Freeport, Texas. The rill marks and channels on the washover fans on Bryan Beach develop following a storm event where waves are high enough to cross the beach and flood the washover fan surface. Rill marks are produced as the flood waters drains out of the sand following the flooding of the washover fan by storm surges. Water cuts channels and rill marks, as it drains from the sheet sands deposited on the washover fan. The washover fans are composed of fine to medium grained sands that were deposited on the clay size clasts of the lagoon. Water flows through the sand above the clay of the lagoon deposits, flowing out of the lower part of the fan. This flow of water from the sediments of the washover fan produces larger channels and smaller rill marks along the sides of the channels and along the toe of the fan. Branching, meandering, comb and conical rill marks have been observed on the washover fans of Bryan Beach. The types of rill marks that develop are controlled by the slope on the washover fan surface, depth of the channel cut and the porosity of the sand. Rill marks are rarely preserved because they are destroyed by the next rain and storm event or off road vehicles.

**4:45 Modeling high resolution soil organic matter profiles: insights into soil carbon stabilization** *Lily Serach, The University of Texas at Austin*

The stability of soil organic carbon (SOC) stocks is one of the largest sources of uncertainty in global carbon cycle models and is central to identifying potential feedbacks to warming climate. Soil profiles, i.e. vertical trends in physical, biological, and chemical properties, have long been a mainstay in soil science and are used to elucidate the key processes involved in soil carbon cycling. The response of SOC as a carbon sink or source is dependent on the response of net primary productivity and soil carbon dynamics to rising atmospheric CO<sub>2</sub> concentrations. Upper levels of the soil (0-20cm) exchange rapidly with the atmosphere, therefore it is important to determine which processes drive

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

carbon stabilization in these levels. However, very few Earth system models simulate SOC stocks by considering their vertical distributions and even fewer do so using high resolution profile data. We hypothesize that high-resolution profile data are necessary to constrain carbon cycling processes in different soils. To test this, we developed a 1-dimensional, 3-pool soil carbon model to simulate the development of SOC,  $\delta^{13}C$  and  $^{14}C$  profiles in a well-drained forest soil. Model parameters were then optimized using a Markov Chain Monte Carlo Metropolis-Hastings algorithm. We found that profile sampling resolution has a strong effect on variation among optimized parameter values. In particular, advection rate constants were constrained primarily by high-resolution radiocarbon profiles. Our results highlight the importance of using high-resolution profile data to model vertical trends in soil carbon cycling and understanding key processes involved in carbon stabilization.

**5:00 Sedimentology analysis of the source of the Lanana Creek sediments in Nacogdoches, Texas**  
*Jessica L. O'Neill, Stephen F. Austin State University; Russell LaRell Nielson, Stephen F. Austin State University*

Seventeen sediment samples were collected systematically at different locations along Lanana Creek in Nacogdoches, Texas. A binocular microscope was used to conduct a point count and describe petrographic characteristics of each sample. Analysis showed a bimodal distribution with the larger proportion being ironstone clasts and the smaller proportion being sand-sized quartz grains with rounded to subrounded clasts. A sieve analysis was conducted to measure grain size characteristics. A histogram, frequency and cumulative curve for each sample was generated and statistically analyzed to determine the mean, median, sorting, skewness, and kurtosis. A graphical representation illustrating the bimodal distribution of the grains in each sample was constructed. Statistical analyses showed that most of the grains were poorly sorted, positively skewed, and leptokurtic. Analysis showed a difference between the upper and lower point bars, with the lower point bars being more poorly sorted, more positively skewed, and less leptokurtic than the upper point bars. This study indicates that the larger clasts were mainly derived from the Weches Formation, and the sand-sized clasts were derived from the Sparta Sandstone. Since significantly smaller amounts of fine-grained material were found in the point bars on Lanana Creek, the energy in the environment must have been high enough to transport this fine-grained sediment throughout the system, but not high enough to remove the larger ironstone clasts.

**5:15 The Pleistocene Capybaras of Texas** *Pershing Darrow Gervais, Liva Nova PLC, Houston TX; Camille Gervais, League City Intermediate School; Jon Alan Baskin, Texas A&M-Kingsville*

Fossil capybaras have been known in North America since the 1850s when Leidy described a few isolated teeth from South Carolina which he assigned to the extant genus *Hydrochoerus*. With the discovery of a lower jaw and teeth from near Sinton in South Texas, Hay in 1926 named a new genus *Neochoerus* for this material. A partial capybara jaw was recovered by the first two authors from Beaumont Formation dredge spoils on Pelican Island in Galveston Bay. The Galveston jaw is approximately 70% the size of the Sinton jaw and similar in size to the recent capybara *H. hydrochaeris* and to *H. holmesi* from the Pleistocene of Florida. Unlike most mammals, cheek tooth size in recent capybaras increases significantly with age. Three possible species names can be assigned to Rancholabrean (Late

Pleistocene) capybaras from the United States: *Neochoerus aesopi*, Leidy's original specific epithet, for nearly all late Pleistocene capybaras from Argentina to South Carolina; *H. holmesi* for a species the size of living capybaras from Florida and South Carolina; and *N. pinckneyi* for a larger species from Texas, Florida, and South Carolina. Because there are difficulties in characterizing the type and topotypes of *N. aesopi* and given the tooth size variability of capybaras, we assign the Pelican Island specimen to *N. pinckneyi*.

**5:30 The rise, fall and resurrection of Caplen, Texas: 10 years after Hurricane Ike** *James Westgate, Lamar University*

The beach community of Caplen, Texas is located on Bolivar Peninsula just west of Rollover Pass. In 1931 only 17 buildings existed at Caplen. Explosive growth occurred after World War II and by 1987 there were 333 buildings on both sides of Highway 87 between Rollover Pass and the Caplen Oil Field. Several experimental engineering projects in the late 1990's and early 2000's attempted to protect beach houses located adjacent to the beach. On September 13, 2008, Category 2 Hurricane Ike devastated Caplen, destroying 99% of it's houses. FEMA held a buyout of up to 650 properties on Bolivar Peninsula including numerous ones in Caplen. These properties are now Galveston County parkland that cannot be built on, but may be modified to improve drainage. Most of the remaining property in Caplen has been redeveloped with new beach houses and there is little evidence of the destruction which occurred 10 years ago.

**5:45 Section Meeting Geoscience** *Erin M Keenan Early, University of Texas at Austin*

### 020. Freshwater Science Oral Session and Section Meeting

Freshwater Science

Paper Session

4:30 to 6:30 pm

FLC: Floor second - 221

Participants:

**4:30 A snail out of water: Apple snail detection along Oyster Creek (Missouri City/Sugar Land, TX)** *Lauren Elizabeth Muskara, Southwestern University; Shellsea Elizabeth Miller, Southwestern University; Matthew A. Barnes, Texas Tech University; Romi L Burks, Southwestern University*

Environmental DNA (eDNA) refers to residual material an organism leaves in its environment. Collecting and analyzing eDNA to detect species offers a non-invasive way to document presence and track species spread, both within and across environments. The four pillars supporting the "ecology of eDNA" examine how material origin, state, transport and fate influence detection ability. Using eDNA, we first aimed to detect apple snails (*Pomacea maculata*) at one known (White Lake) and one suspected site (Oyster Creek), both located in Cullinan Park (Sugar Land, TX). We later explored the possibility of eDNA transport along Oyster Creek by collecting samples at nine locations, starting with a known population of *P. maculata* in nearby Missouri City, TX. For all samples, we filtered 250 mL of water using 1.2  $\mu m$  isopore membrane filters and used CTAB/chloroform to extract eDNA for amplification with quantitative PCR (qPCR). In our first collection, White Lake samples taken near shore exhibited the highest concentration of apple snail eDNA and confirmed visual sightings. eDNA samples from Oyster Creek, a close-by stream with no obvious surface connection to White Lake, indicated apple

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

snails presence at lower quantities, despite the absence of visual evidence of the population. Our continued analysis of Oyster Creek samples will provide insight into the likelihood of a resident population versus greater influence from upstream locations. Overall, our work provides the first successful detection of apple snails using eDNA and helps strengthen our knowledge within the specific subfield of the ecology of eDNA.

**4:45 Determining the specific status of an unusual, phreatic, Texas cavesnail (Mollusca; Gastropoda; Hydrobiidae)** *Dominique Alvear, University of Texas Rio Grande Valley; Pete Diaz, U. S. Fish and Wildlife Service; Randy Gibson, U. S. Fish and Wildlife Service; Ben Hutchins, Texas Parks and Wildlife; Benjamin Schwartz, Texas State University; Kathryn Perez, University of Texas Rio Grande Valley*

Limited research has been done on the freshwater snail family Hydrobiidae across the Edwards Aquifer region of Texas, besides the initial description of species 40-140 years ago. The Texas members of this family are mostly phreatic, meaning they are found in freshwater springs and underground aquifers. Some of the Edwards Aquifer freshwater snails appear to be derived from southwestern U.S. and Northern Mexico freshwater fauna, but others are potentially marine relicts. Texas has 16 described hydrobiid species, 14 of which are of conservation concern. In recent surveys of the Edwards aquifer fauna in Comal, Travis, and Val Verde counties, we encountered populations of a snail with unusual shell features that do not resemble any of the existing named species. We use examination of the shell and phylogenetic analysis of mitochondrial (CO1) and nuclear genes (LSU) of this unusual snail to determine if it is an undescribed species endemic to Texas and to place it into the broader phylogenetic context of the Hydrobiidae.

**5:00 The effect of cheliped function and color on male mating success in the red swamp crayfish, *Procambarus clarkii*** *Hayden Hays, Sam Houston State University; Diane Neudorf, Sam Houston State University*

The red swamp crayfish, *Procambarus clarkii*, is a large-bodied crayfish that is native to northeastern Mexico and the south-central United States, with a breeding season ranging June through November in warmer climates, including a second mating in the spring. This system combined with the r-selected

characteristics of this species allows it to produce a massive amount of offspring, increasing its potential to become invasive. Despite the extensive research on the invasive potential of this organism, the behavioral aspects of the mating system have been mostly neglected. Previous research showed that females preferred males of larger body size, with little evaluation of other physical characteristics. We investigated how chelae presence, function, size, and color, affect female choice when evaluating potential mates. These traits were chosen to act as a proxy for various naturally occurring physical states. For example, chelae presence was used to evaluate the situation in which an individual lost a chelae as a result of predation or interspecific interaction. Females were given a choice between two different males in two different mate choice experiments. We will present the importance of these traits in male mating success.

**5:15 Unraveling the mystery: Genetic identification of non-native Asian Mysterysnails, *Cipangopaludina chinensis* and *C. japonica*** *Hannah Winkler, Southwestern University; Nicole Kelly, Southwestern University; Shannon Odell, Southwestern University;*

*Shannon Walsh, Southwestern University; Russ Minton, Gannon University; Romi L Burks, Southwestern University*

Similar to other non-native mollusks, Asian mysterysnails (*Cipangopaludina* spp.) threaten ecosystems by disrupting nutrient cycling, competing with native species, and potentially acting as an intermediate host for parasites. In 2015, our laboratory documented the first known occurrence of *C. japonica* in Texas, at a site far from previous records of *C. chinensis*, a morphologically similar species that also shares ecological traits with *C. japonica*. Our discovery raised suspicion that Asian mysterysnails might suffer misidentification across their non-native range. Thus, our project seeks to elucidate scientifically valid identities of ~200 Asian mysterysnails through dissection, tissue extraction, target amplification, genetic sequencing, and phylogenetic analysis. In mysterysnails and other freshwater mollusks, sole reliance on morphology makes species identification difficult, prompting need for genetic analysis. Our barcoding efforts of COI failed to yield sufficient usable sequence. To attack this question from another angle, we recently began sequencing the 16S rRNA gene of snails visually-identified as *C. chinensis* to determine accurate genetic identification. At this time, we have 51 sequences of sufficient quality (ranging from 281-505 base pairs with an average length of 438 base pairs) to include in phylogenetic analyses. We continue to add to this total for ongoing phylogenetic analysis. Preliminary results confirm the majority of samples as *C. chinensis*, however, at least one site contained *C. japonica*, and two samples suggest another viviparid co-occurring. Knowing correct genetic identities of non-native species provides insight into patterns of spread and allows for greater understanding of the potential dangers they present to ecosystems.

**5:30 Use of diatom communities in aquatic biological assessments** *Cynthia Hobson, Texas Parks and Wildlife Dept*

Many diatom species have specific environmental requirements, for example, for pH and dissolved oxygen levels. As a result, diatoms have been used in other states and countries as indicators of water quality. Over fifty diatom community samples (periphyton) were collected over a ten-year period at wadeable streams in three Texas ecoregions. Multivariate analysis revealed significant differences in the diatom communities between the three ecoregions, probably relating to differences in water quality characteristics between ecoregions. This type of analysis could lead to a diatom index of biological integrity (IBI) for Texas streams.

**5:45 Section Meeting Freshwater Science** *Matthew A. Barnes, Texas Tech University*

**021. STEM Education Oral Session 2 and Section Meeting**

STEM Education  
Paper Session  
4:30 to 5:45 pm  
FLC: 222

Participants:

**4:30 Controversial Issues in Biology: a Senior-Level Assessment** *Kathleen Wood, University of Mary Hardin-Baylor*

Many biology students are required to take a public speaking course as part of their undergraduate coursework. However, many of these students still lack confidence in their communication abilities in front of groups. Therefore, the Department of Biology at UMHB decided that one of our

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

student learning outcomes (SLOs) would be good oral communication. The final assessment for this SLO is the Capstone Seminar for graduating seniors. Each student investigates and presents a controversial issue in biology from eleven different perspectives, maintaining an unbiased stance during the entire 30-minute presentation. They then lead the class in a 15-minute discussion. Each speaker is required to submit a professional-quality abstract and bibliography prior to the presentation and students within the audience are required to critique each speaker, providing good feedback and making them more familiar with the skills they are trying to develop themselves. Although students do evidence some fear of taking this course, we have received feedback indicating that students entering graduate programs feel more prepared than their peers to do the public speaking required in those programs. Some additional value to this course is the practice students get in critically thinking through these different perspectives and trying to understand where the perspectives come from while gaining valuable information literacy skills as they research their topics. The overall communication skill gained has made this a valuable course in our department.

### **4:45 Design and implementation of activities to improve student performance on foundational concepts in biochemistry** *Mary Kopecki-Fjetland, St. Edward's University*

Students entering a first semester biochemistry course are expected to possess knowledge of certain foundational concepts from prerequisite coursework. These foundational concepts are essential for gaining mastery of threshold concepts in biochemistry such as the physical basis of interactions. Unfortunately, many students who enter a biochemistry course possess misconceptions or an incomplete understanding of these foundational concepts. A published analysis instrument was utilized as a pre-assessment of student abilities in seven foundational concepts. In successive semesters, activities following the learning cycle were designed and implemented to target lower scoring post-assessment foundational concepts. These activities served as a targeted review as well as a contextual bridge between pre-requisite knowledge and application in biological systems. Posttest results, student survey results, and in-class observations of student interactions indicate that these exercises enhanced student engagement during class time, increased collaboration in solving problems, and improved their ability to explain and correct their own misconceptions. The process of developing and introducing these activities along with their impact on student learning will be discussed.

### **5:00 Development of an engaging and rigorous microbiology online course** *Joni H Ylostalo, University of Mary Hardin-Baylor*

Online courses are becoming more and more common. However, transferring a course online is not simple in regards to promoting student engagement and academic rigor. In this presentation, I describe my experiences in developing an online microbiology majors course. To start the development process, I identified 7 main learning objectives for the course. This was followed by dividing the course material into 15 sessions, one for each week of the semester and identifying 2-4 more detailed learning objectives for each session. These detailed learning objectives then served as the basis for lesson content, learning activities, and assessments. Each session had a short lecture video (4-8 min) containing embedded self-check questions. A bullet point list of the key content of the lesson, an interactive keyword/concept list, and interactive slides were also provided for the students. Each session

contained learning activities divided into reading, watching, and doing. These were comprised of assigned readings from the course textbook, 3rd party videos (e.g. YouTube, Publisher), discussions with prompts, assignments, online Publisher homework, case studies, and quizzes. The course also contained three online exams and a proctored comprehensive final exam. The key for student engagement was to ensure that students had tasks to complete every day. The discussions allowed course wide participation and enabled me to address any misconceptions. In conclusion, the development of an engaging and rigorous online science course is a demanding but a gratifying task. Data is being collected to compare the performance of the students in the online and on person classes.

### **5:15 Identifying Unknowns: Real Science for Middle-School Students** *Steven Keith Mittweide, Covenant Classical School*

Many teachers engaged in science education may recall that, when they themselves were students of high-school chemistry, they were assigned the task of identifying an unknown solution. Such an assignment brilliantly thrusts the student into the heart of the scientific enterprise—namely, observation and experimentation. But why wait until so late in a student's academic experience to introduce them to real science, especially when younger students are developmentally suited for such endeavors? Insofar as having students actually "do science" is a lofty but altogether realistic goal of science education, why not get them started early in order to hone their skills of observation and experimentation? A three-stage "Observation Exercise" using unknown rock specimens has proven to be a superb means of such honing among middle-school Earth Science students. Because the exercise is done in stages, the students move from 1) being neophytes with no knowledge of rocks and minerals, to 2) becoming practical experimenters who use diagnostic physical and chemical properties to identify the minerals of which their specimens are comprised, and finally to 3) a stage in which they are able—on the basis of their mineral identifications, and using both class notes and textbook charts—to identify the rock type of their own particular specimens. As they advance in stages from the unknown to the known, middle-school students do real science.

### **5:30 STEM Education Section Meeting** *Phillip G Greco, Temple College*

## **022. Marine Science Oral Session and Section Meeting**

Marine Science

Paper Session

4:30 to 6:30 pm

FLC: Floor first - Jackson A

Participants:

### **4:30 A longitudinal study of fish assemblages on the Mesoamerican Barrier Reef, in Roatán, Honduras** *Scheila Rene Corujo, Texas Tech University*

Composition of fish assemblages is recognized as an indicator of ecosystem health and productivity. Fish community structure has been associated with coral coverage and diversity. Recent events, such as ocean warming, have caused extensive coral bleaching, resulting in a loss of habitat for fish and fish abundance. This study was conducted to assess changes in fish assemblage structure across depths between 2017 and 2018 on the Mesoamerican Barrier Reef in Roatán, Honduras. Fish communities were characterized for species presence and abundance and each dive site was sampled twice. No significant difference in species richness was identified between the two depths or study sites surveyed. Four Sponges data collection site had

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

the greatest diversity, and Bear's Den had the least diversity in 2018. In 2017, Pillar Coral had the greatest diversity and Mandy's Eel Garden had the least diversity. Fish Den and Bear's Den had less similar species composition in 2017, whereas the two sites had a more similar composition in 2018. In 2017, the dive sites visited had a larger difference in species composition than the dive sites visited in 2018, which had a more similar composition. Fish community assemblages did not statistically differ between 2017 and 2018 for either depth. This study continues to provide a baseline of the reef-fish community structure on the Mesoamerican Barrier Reef in Roatán, Honduras and future studies can use these results to measure changes in community structure over time.

**4:45 Detection and Comparison of Bacterial Pathogens in the American Oyster in South Texas Waters** *Mohammad Maruf Billah, The University of Texas Rio Grande Valley; MD Saydur Rahman, University of Texas Rio Grande Valley; Wendy Guerra, The University of Texas Rio Grande Valley; alehli silguero, The University of Texas Rio Grande Valley*  
The American oyster (*Crassostrea virginica*) is also known as Atlantic or Eastern oyster, a popular sea food for its delicacy and high nutritional value with concomitant significant commercial importance. Oyster is a filter feeder and accumulate considerable amount of pathogenic bacteria specially in its gill, digestive gland and connective tissue. Presence of deadly bacterial pathogens has made raw oyster consumption extremely hazardous to its consumer's health as bacterial pathogens rapidly facilitate and transmit chronic infectious diseases to its consumers. Based on increasing concern about bacterial pathogen contamination from raw oyster, our objective of research has been focused on detection and comparison of two important bacterial pathogens, *Escherichia coli* (*E. coli*) and *Salmonella* spp. proliferation in the American oyster of South Texas water (South Padre Island and San Martin Lake), local market and laboratory samples. Coelomic fluid (CF, a body fluid) glucose levels were relatively constant, whereas fluid pH levels were significantly higher in oyster collected from San Martin Lake compared to South Padre Island. Histological observation and immunohistochemical analysis showed substantial bacterial pathogen's presence in gill, digestive gland and connective tissue in oyster collected from San Martin Lake compared to South Padre Island. Laboratory sample analysis showed increasing trend of bacterial pathogen growth with increasing temperature (28 and 32°C) compared to control (24°C). Collectively, our histological and immunohistochemical results, together with coelomic fluid pH and glucose levels suggest that the American oyster is prone to water-borne pathogen contamination in south Texas waters.

**5:00 Determination of iron (II) and iron (III) concentrations in coral reef waters at Roatan, Honduras; August 18 – 25, 2018** *Patrick Edward Mileski, Midland College*

Coral have a competitive relationship with phytoplankton for nutrients. In general, high nutrient concentrations of Nitrate, Nitrite, and ortho-Phosphate favor phytoplankton growth over coral growth and low concentrations of these nutrients favor coral growth over phytoplankton growth. Coral are not known to utilize iron ions as nutrients. Cyanobacteria, a component of the phytoplankton population, require iron ions for growth. In fact, iron ions have been shown to be the limiting nutrient for cyanobacteria in most marine environments. Hence, determination of iron ion concentrations of interest because of their direct relationship to the cyanobacteria population. Water samples were

collected from coral reef waters at three different sites off the Northwest corner of Roatan Island, Honduras during the week of August 18 – 25, 2018. Individual samples were collected at 3 depths; 20ft, 40ft, and (benthic) approx. 60ft. While most iron ion assays are reported as total iron concentrations (via AAS or ICP measurements) irrespective of oxidation state, this work measures individual Fe<sup>2+</sup> and Fe<sup>3+</sup> concentrations using both standard colorimetric methods and a colorimetric assay based on complexation with alizarin red S that allows simultaneous measurement of both iron ions to the sub-ppm level. Results show that, in general, iron ion concentrations decreased with depth and at 60ft was below the detection limit of the assay.

**5:15 Impacts of Global Warming on Gonadal Functions, Heat Shock Protein Expression, and Cellular Apoptosis in Atlantic Sea Urchin** *Jackson Brooks Johnstone, University of Texas Rio Grande Valley; MD Saydur Rahman, University of Texas Rio Grande Valley*

Increasing global temperatures are having an increasing impact on marine environment as well as aquatic organisms. Sea urchins are ideal model organisms to focus on, as they are excellent indicator species in regards to their response to global climate changes. They are also an ancient and relatively simple species, meaning that there are fewer internal mechanisms to deal with when observing responses. In this study, we tested the effect of higher temperatures on reproductive functions, heat shock protein expression, and coelomic fluid (CF, a body fluid which regulates important physiological processes) conditions in Atlantic sea urchin (*Arbacia punctulata*) at three different temperatures. Ten sea urchins were placed in each of six aquariums (capacity: 20-gallon) with high temperatures (28 and 32°C) and control variable (24°C) under controlled laboratory conditions for a 7-day period. Sea urchin exposed to high temperature had the lower gonadal growth (gonad weight/body weight\*100) compared to controls. The percentage of mature eggs (ova) was also significantly lower at high temperature compared to controls, indicating impaired ovarian functions at high temperatures. Sperm production also displayed a tendency to decrease from the lower to higher temperatures. Sea urchin exposed to high temperature showed an increased heat shock protein expression in eggs, follicles, and sperm, as well as increased cellular apoptosis and decreased CF pH compared to controls. These results suggest that elevated water temperature decline/acidify CF pH which might be involved in the impairment of reproductive functions and cellular apoptosis in Atlantic sea urchin.

**5:30 Lunar Reproductive Rhythms of Atlantic Sea Urchin in the Southern Gulf of Mexico** *Eleazar Hernandez, University of Texas Rio Grande Valley; Omar A. Vázquez, University of Texas Rio Grande Valley; André Torruco, University of Texas Rio Grande Valley; MD Saydur Rahman, University of Texas Rio Grande Valley*

The Atlantic sea urchin (*Arbacia punctulata*) is a unique invertebrate and a primaevial species of the phylum Echinodermata. Natural phenomena such as water temperature and moonlight act as external cues that stimulate the reproductive activity of aquatic organisms. In order to acquire a better understanding of the correlation between gonadal maturity, lunar reproductive rhythm and spawning season in the economically and environmentally important marine species, we focused the objective of our study to determine the annual and lunar reproductive rhythms of the Atlantic sea urchin in the southern waters of Texas in the Gulf of Mexico. Sea urchins were sampled weekly in accordance with the lunar cycle from May to July in 2017 in



## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

South Padre Island, Texas. The gonadosomatic index (GSI, a biological indicator of isometric growth in gonads) of each sea urchin was calculated as the percentage of gonad weight/total body weight measurements. Gonadal tissues were sectioned and stained with hematoxylin-eosin. Subsequent histological examination of ovaries and testes was performed: maturity levels and spawning phases were determined quantitatively by calculating the percentage of oocytes (immature egg) and ova (mature egg) for each female and the production of sperm for each male. Histological observations showed that the gonads developed synchronously toward the last quarter moon and the percentage of sperm and mature eggs decreased around the new moon during summer months in June and July. Collectively, our histological analysis suggests that Atlantic sea urchin spawns synchronously according to the lunar cycle in the southern Gulf of Mexico.

### 5:45 **The Effects of Prozac on Feeding Behaviors and Reproductive Success in a Sex Role-Reversed Saltwater Fish** *Dylan Joseph Wichman, Saint Edward's University; Samuel Alexander Cornelius, St. Edwards university; Raelynn Deaton Haynes, St. Edward's University; Sunny Scobell, St. Edward's University*

Fluoxetine, commonly known as Prozac, is a pharmaceutical found in human waste and in freshwater bodies as a result of sewage outflows. It is known to impact various behaviors and embryonic development of freshwater vertebrates; however, it has been poorly studied in saltwater systems. The male Gulf Pipefish, *Syngnathus scovell*, presents an ideal model for the study of fluoxetine on saltwater vertebrates. This species has an easily identifiable mode of reproduction, male pregnancy, in which eggs develop in a regulated brood pouch, and well-described feeding behaviors commonly called "snicks." They also serve as a key bioindicator species for the seagrass ecosystem. We hypothesized that chronic exposure of male Gulf pipefish to fluoxetine at environmental levels would decrease paternal feeding, and subsequent reproductive success and brood survivorship. To analyze this, we exposed male populations to three concentrations of fluoxetine: 0 µg/L (Control), 1 µg/L (Low), and 10 µg/L (High) in a double-blind design. Feeding behaviors, liver mass, body mass, brood weight, brood number, and brood development were used to assess the effects of fluoxetine in Gulf pipefish. If such aspects of behavior and physiology in pipefish are affected by fluoxetine levels, it is likely that a number of saltwater and brackish water vertebrates may be affected by fluoxetine exposure. Because seagrass beds are a major spawning ground for a number of species throughout the entire biome and are already threatened by a number of other anthropological disturbances, effects of fluoxetine could impact population dynamics and biodiversity.

### 6:00 **Effects of elevated carbon dioxide level on bioactive metabolite accumulation in freshwater and marine cyanobacteria** *I-Shuo Huang, Texas A&M Corpus Christi; Xiping Hu, Texas A&M Corpus Christi; Paul V. Zimba, Texas A&M Corpus Christi*

Global climate change and anthropogenic nutrient inputs are responsible for increased frequency of cyanobacterial blooms potentially containing >55 classes of health-threatening toxins. This study investigated the effects of CO<sub>2</sub> availability on two cyanobacterial strains: a marine *Synechocystis* sp. and a freshwater *Microcystis aeruginosa*. Cyanobacterial strains were semi-continuously cultured in mesotrophic growth media at pH 7.5, 7.8, 8.2, and 8.5 via a combination of CO<sub>2</sub> addition and control of alkalinity. Accumulation of most toxins by both cyanobacterial strains increased at elevated CO<sub>2</sub> concentrations. At pH 7.8, toxin

accumulation by *M. aeruginosa* and *Synechocystis* was 1.5 and 1.2 (respectively) times greater than the other three treatments, and microcystin accumulation was greatest by both strains compared to other treatments. Microginin accumulation in *M. aeruginosa* at pH 7.5 was reduced by 50% compared to the other three treatments, indicating that high CO<sub>2</sub> availability inhibited its production. Microcyclamide-bistratamide B accumulation was decreased in *M. aeruginosa* and increased in *Synechocystis* at elevated CO<sub>2</sub> concentration. Overall, the algal density did not increase with the elevation of CO<sub>2</sub> availability, but toxin accumulation per cell was enhanced at greater CO<sub>2</sub> concentrations, indicating the need for cyanotoxin monitoring in future water source management.

6:15 **Section Meeting Marine Science** *Stephanie Lockwood, Texas Tech University*

### 023. **Chemistry and Biochemistry Oral Session 3 and Section Meeting**

Chemistry and Biochemistry

Paper Session

4:30 to 6:30 pm

FLC: Floor first - Jackson B

Participants:

4:30 **Assessing the Immunotoxicity of RNA Nanorings with Varied Functional Orientations** *Yelixza Idalys Avila, Sul Ross State University; Morgan Chandler, University of North Carolina at Charlotte; Kirill A. Afonin, University of North Carolina at Charlotte*

Characterization studies provide a suite of approaches to probe the use of nanotechnology in therapeutic applications such as for drug delivery. RNA nanorings offer an intriguing window of opportunity to revolutionize cancer therapeutics. However, there has not been a clear investigation of the RNA nanoring's immunotoxicity in the design of therapeutic nucleic acids. From this arises the question of whether orientation of the different functionalities affects the efficacy and immune responses of the nanorings. In this study, the immune response to RNA nanorings with variations in the orientation of the functionalities that can extend from the sides of the nanorings were analyzed. RNA nanorings are hexagonal in shape and are assembled from intermolecular interactions between intramolecularly assembled monomers. Synthesis of the monomers incorporates the use of polymerase chain reaction, purification, and run-off transcription of DNA templates. Once each strand of the nanoring is synthesized, assembly of the ring is confirmed using electrophoretic mobility shift assays and atomic force microscopy. Immune response is characterized using a multiplex assay with peripheral blood mononuclear cells (PBMCs) transfected with RNA nanorings and then fluorescence is measured for human interferons alpha, beta, lambda, and omega. Preliminary results suggest that the number of functionalities and their orientation influence the immune response, which is also donor dependent. Results will be used to refine nanoring design to reduce or induce a desired immune system response.

4:45 **Designing a Simple Catalytic System for C-H Bond Oxidation** *Roberto Napoleon Silva Villatoro, Stephen F. Austin State University; Randy J. Romero, Stephen F. Austin State University; John Brannon Gary, Stephen F. Austin State University*

Non-heme iron-oxo enzymes are one important class of biological enzymes capable of oxidizing carbon-hydrogen

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

bonds. Given the potential synthetic and industrial chemistry applications of the oxidation of organic molecules, this class of enzymes has been heavily studied in regard to the design of new catalytic systems. Many simple models of these enzyme active sites have been made using tetradentate nitrogen ligands, tris(2-pyridylmethyl) amine (TPA) being a commonly used ligand. While enzymatic systems employ oxygen as the oxidant, model systems often employ hydrogen peroxide, a 2-electron reduced surrogate. While hydrogen peroxide can serve as an effective oxidant, it suffers from potential side reactions and often requires incredibly slow addition of the oxidant solutions by syringe pump methods to achieve desired reactivity. To provide an operationally simple alternative to slow addition through syringe pump methods, a simple one-pot addition of a salt-based oxidant will be discussed. The application of this system will be discussed in terms of the chemo- and regio-selectivity of the oxidation of C-H bonds in organic substrates.

**5:00 Development of Synthetic Carbohydrate Biomimetics as Urinary Tract Infection (UTI) Prophylactics** *Juan C. Mora, Sul Ross State University; David J Leaver, Sul Ross State University*

Approximately 20 million women suffer from urinary tract infections (UTI) and the majority of UTI are caused by gram-negative uropathogenic *Escherichia coli* (UPEC). There is a great need to develop prophylactics that can prevent UTI from occurring. UPEC utilizes the mannose-binding type I pilus adhesion protein FimH to colonize the bladder epithelium during UTI. The work described herein focuses on the development and synthesis of novel alpha-C-linked mannopyraoside triazoles as potential UTI prophylactics that have the ability to act as FimH antagonists. One of the key reactions utilized was the copper(I)-catalyzed azide-terminal alkyne cycloaddition (CuAAC) reaction. The synthetic methodology developed in this project can easily be modified to synthesize a large number of novel compounds that can be screened against UPEC.

**5:15 Implications of RecA in Tuberculosis Drug Resistance** *Kyle Rickman, Wayland Baptist University; Robert Moore, Wayland Baptist University*

Almost all drug resistance in *Mycobacterium tuberculosis* (*Mtb*) results from single nucleotide polymorphisms. When left alone, the *Mtb* genome has a low mutation frequency compared to other microorganisms. During drug treatment, however, mutation is much more common. RecA is a protein used to repair a sequence of damaged DNA by copying in a similar sequence from elsewhere in the genome. If the repair is not a perfect match, the RecA has been observed to release after it repairs if a thermostable mismatch is present, but will ideally remain attached to the sequence if a perfect match is not found. In *Mtb* there is no mismatch repair mechanism, meaning that after RecA releases the sequence from repair, there is no proofreader mechanism to replace an incorrect match. To investigate the potential of RecA involvement in drug resistant mutation events, relative binding strength of RecA to specific *Mtb* short sequence triplets (83-mer single stranded oligonucleotides of triplicated 27 nucleotide sequences) was evaluated using electrophoretic mobility shift assays (EMSA's) at or near the S315 codon on the katG gene and the S450 codon on the rpoB gene. Mutation at these locations imparts isoniazid and rifampin resistance respectively. Particularly on the SST's that include the codon of interest, weak binding observed suggests that RecA is highly tolerant of mismatches at the drug resistant

mutation sites.

**5:30 Investigating Programming of a Virus Like Particle for Cell Specific Chemotherapy** *Savannah Marie Seely, The University of Texas at Tyler*

Cell specific drug delivery is a major challenge in chemotherapeutic strategies targeting, particularly in cancer strategies. Side effects for non-specific uptake of chemotherapeutic drugs by normal healthy cells include, hair loss, vomiting, nausea, and other negative symptoms. The use of nanoparticles such as those derived from protein cage structures, like viruses, present useful agents for drug delivery by encapsulation of drugs on the interior of the protein cage nanoparticle. However, while encapsulation strategies are abundant, methods for programming site/cell specific delivery are needed. The protein cage derived from the bacteriophage HK97, known as a virus-like particle (VLP), is an interesting protein because it has been observed to require cell targeting moieties to be added to the exterior for entry into cells. The research presenter here looks to examine a proof of concept strategy for localizing HK97 VLPs based on chemo-sensitive programming of the exterior. The approach looks at exploiting the property of cancer cells to upregulate metalloproteinases in the cancer microenvironment. By appending peptides that respond to proteinases, HK97 VLP solubility might be lowered allowing localized deposition of HK97 VLPs loaded with drugs. A model peptide containing poly-phenylalanine flanked by a solubilizing poly-lysine peptide sequence with an aspartic acid separating the two peptide sequences has been genetically attached to the GP5 protein C-terminus, which projects to the exterior of the GPHK97 VLP and analyzed for chemo-selective deposition upon treatment with N-aspartate protease.

**5:45 Molecular Analysis of *Eryngium Foetidum* L.** *Paulo Bryant Flores, Howard Payne University*

*Eryngium Foetidum* L. is a native plant of Central America and other parts of Latin America. It is a herb used in culinary practices having a common resemblance to *Coriandrum Sativum* L. It is commonly addressed as a more potent herb than *Coriandrum Sativum* L. The purpose of this investigation is to conclude the differences in molecular compounds found in *Eryngium Foetidum* L. and *Coriandrum Sativum* L. through GC-MS analysis. The goal is to prove that *Eryngium Foetidum* L. has a similar or greater presence of characteristic compounds that correspond to the flavonoids of *Coriandrum Sativum* L. such as aldehydes. Extraction of essential oils was done by taking (15 g) samples of leaf clippings through a Soxhlet extraction using xylenes as a solvent to complete multiple cycles. Gas chromatography-mass spectrometry analysis will be used to collect qualitative data on both specimens. Along with oil analysis aroma will be analyzed through Headspace analysis to find a requiring pattern in compounds and intensity.

**6:00 Section Meeting Chemistry and Biochemistry** *Brian Barngrover, Stephen F. Austin State University*

## SATURDAY, MARCH, 2

### 024. Past Presidents Breakfast

Texas Academy of Science Annual Meeting  
Special Event  
7:00 to 8:00 am  
Mabee Center: Balcony

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**025. Poster Presentation and Judging: Biomedical, Cell and Molecular Biology, Chemistry and Biochemistry, Marine Science, Systematics and Evolutionary Biology**

8:00 to 9:30 am

Winebrenner Science Building: Winebrenner Science Building, Corridor

**025-1. Poster Presentation and Judging: Biomedical, Cell and Molecular Biology, Chemistry and Biochemistry, Marine Science, Systematics and Evolutionary Biology**

Texas Academy of Science Annual Meeting  
Poster Session

**025-2. Biomedical Sciences Poster Session**

Biomedical Sciences

Poster Session

Participants:

**Antitrypanosomal activity of novel  $\alpha,\beta$ -unsaturated ketones and 15 N-aroyl derivatives** Karsten Dieter Amezcua, UNIV OF TEXAS-EL PASO; Felipe Rodriguez, UNIV OF TEXAS-EL PASO; Jonathan Dimmock, University of Saskatchewan; Rosa Maldonado, University of Texas at El Paso

Chagas disease is an indigenous parasitic disease causing 15,000 annual deaths in South America, Central America, and in the south borderline area of the United States. It is estimated that 8-10 million people are currently infected in Latin America with new cases reported in the United States. *Trypanosoma cruzi* is a protozoan parasite that causes Chagas disease. Only two drugs are available to treat this disease, benznidazole and nifurtimox. They have partial efficacy in the chronic phase of the disease and are highly toxic. It is imperative to find a more effective and less toxic treatment. In this study, we evaluated a drug library consisting of 21  $\alpha,\beta$ -unsaturated ketones and 15 N-aroyl derivatives for anti-trypanosomal activity and cytotoxicity against mammalian cells *in vitro*. Epimastigote forms of *T. cruzi* CL Brenner Luc were used to assess the antiparasitic activity of the compounds through a luciferase viability assay. The compounds showed low toxicity to human osteoblast cells (U2-OS). Thirteen of  $\alpha,\beta$ -unsaturated ketones and three N-aroyl compounds showed good anti-trypanosomal activity with an EC50 ranging from 0.016 to 1  $\mu$ M and a selective index (SI) ranging from 16.5 to 3,125. The compound NC1833 showed the highest SI. Our future directions include a) to determine the compounds activity against amastigotes (intracellular form of the parasite) by High-Content imaging (HCI), b) test in the murine model of Chagas disease, and c) to explore the possible mode of action of the lead(s) compounds.

**Delivery of Virus Like Particles (VLPs) in *Danio rerio***

Baylie Catrett, University of Texas at Tyler; Bridget Fitzgerald, University of Texas at Tyler; Olivia Brandenburg, University of Texas at Tyler; J. Michael King, University of Texas at Tyler; Dustin Patterson, University of Texas at Tyler; Brent Bill, University of Texas at Tyler

Specific drug delivery is of significance because it reduces toxicity by only targeting the tissue of interest and reducing the effective concentration of drug. However, issues with biocompatibility, drug concentration, and *in vivo* stability still exist. This project focuses on virus-like particles (VLP) and an *in vivo* model to investigate delivery. VLPs are multi-unit, self-assembling protein cages that mimic a viral capsid. Because they are made of proteins, VLPs can be

genetically modified for easy optimization, are biocompatible, and can deliver large amounts of usable drug. These experiments utilize VLP HK97, a bacteriophage-derived particle proposed to be inert in multiple vertebrate model systems due to its lack of vertebrate recognition peptides. We hypothesized that VLP HK97 would be uniformly distributed throughout the embryo and adult, furthermore, addition of RGD peptide would provide tissue-specific localization. VLP HK97 was injected into one-celled embryos and observed at multiple developmental time points, while adults were soaked in ~2mg/ml VLP HK97, sectioned, and imaged. The distribution of VLP as defined by fluorescent intensity was determined using ImageJ software. We are currently testing RGD peptide to determine if the target molecules alter the localization of VLP. Future plans include making external chemical modifications on the protein cage to optimize cell-specific targeting. Our goal is to apply this reagent to a previously established zebrafish cancer model. If successful, this has the potential to be an effective drug delivery system for multiple diseases.

**Finding cytotoxic activity of thiadiazole a potential anti-cancer compound on leukemia cell lines** Karla Gabriela Cano Hernandez, The University of Texas at El Paso; Austre Schiaffino, UTEP; Armando Varela, UTEP; Renato Aguilera, UTEP

According to American Cancer Society, an estimated 60,300 new leukemia cases are expected to be diagnosed in the United States in 2018. This disease is expected to cause the deaths of an estimated 24,370 people in the US in 2018. Even though there are current treatments, they are not being as effective as they should be. Consequently, the identification of new anti-leukemia compounds is of great importance. A recently developed thiadiazole is being investigated for its selective effect on leukemia cell lines. Preliminary results indicate that this compound has anti-leukemia/lymphoma activity. The Differential Nuclear Staining (DNS) assay was used to determine the cytotoxic activity of the compound on the Jurkat and CEM acute T-cell leukemia cell lines. The compound displayed cytotoxicity towards these leukemia cells. Compound 414 had a CC50 (cytotoxic concentration that causes 50% cell death) of 2.36  $\mu$ M on the Jurkat cell line. In addition, compound 414 displayed a selectivity index of 13.33 towards cancer cells compared to non-cancer cells. Additional assays were performed to determine the pathway(s) used by the compound to induce cell death. The compound was found to induce phosphatidylserine externalization, which is a hallmark of apoptosis. In addition, cell cycle analysis revealed DNA fragmentation. Further assays are underway to determine if the compound induce additional features of programmed cell death. Experimental compound 414 exhibited higher toxicity and selectivity towards leukemia cells. Our findings warrant further studies on the effects of the compound on other types of cancer cells.

***Streptococcus mutans* genotyping from a predominantly Hispanic population in South Texas** Lazaro Tobias, University of Texas Rio Grande Valley; Thomas Eubanks, University of Texas Rio Grande Valley; Kristine Lowe, University of Texas Rio Grande Valley

*Streptococcus mutans* is an oral bacterium that is one of the principal causes of dental caries (cavities) in humans. The bacterium forms biofilms (e.g., plaques) on tooth surfaces that erode the enamel leading to tooth damage; in addition, the bacterium is acid-tolerant and flourishes in acidic environments. Like many bacterial species, *S. mutans* may be subdivided into strains that display genetic differences.

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

Strains with genetic differences are known as genotypes that can be distinguished by sequencing and analyzing marker genes. Genotypes represent non-lethal mutations in a bacterium's genetic code and may be induced by factors in the bacterium's environment. This ongoing research study examines *S. mutans* genotypes in the predominantly Hispanic population of the Rio Grande Valley. Samples of plaques were collected from volunteers, their DNA was extracted and genotyping was performed using the Polymerase Chain Reaction and DNA sequencing. Volunteers completed a brief questionnaire to assess the types and frequency of beverages that they consume and socio-economic factors that may contribute to dental problems. This is the first study examining *S. mutans* genotypes within a predominantly Hispanic population that has a high incidence of Type II diabetes and obesity. The consumption of acidic beverages may contribute to genotype variation in *S. mutans*. Importantly, different bacterial genotypes may be able to colonize teeth more effectively than others, and might serve as indicators of future dental health concerns.

**NKT cell subsets regulate the cytokine storm during *Francisella tularensis* infection** Leslie Rodriguez, University of Texas at El Paso; Nicole Setzu, University of Texas at El Paso

A variety of deadly pathogens cause disease by triggering excessive inflammation and the release of a storm of pro-inflammatory host molecules, called a cytokine storm, which are responsible for the severity of symptoms and ultimately for the death of the host. The overarching hypothesis for our research program is that an immunotherapy designed to activate regulatory immune cells will restrict the cytokine storm. Using a model of *Francisella tularensis*, published studies found that natural killer T (NKT) cells, a population of white blood cells displaying both pro-inflammatory and regulatory functions, contribute to the immune response. Our preliminary studies demonstrate that NKT cells consist of two subsets, at least one which suppresses the cytokine storm. Therefore, the goal of this project is to understand how NKT cell subsets function in regulating the cytokine storm and whether one of the NKT cell subsets could be a potential target for immunotherapy. To achieve this goal, this research project will test the type I and II NKT cell subset(s) having opposing roles in regulating the cytokine storm and development of disease. Type I and type II NKT cells will be individually purified using FACS and co-cultured with infected macrophages in a cell culture system to investigate this mechanism using mouse and human cells.

**Potency and efficacy of peppermint and Thieves® essential oil on *Escherichia coli* and *Staphylococcus aureus* compared to commercial cleaners** Hannah Justice, Howard Payne University

Studies show that occupational agents, such as chlorine, may be responsible for up to 25% of work-related asthma. Chlorine-based cleaning products are often used to prevent the spread of pathogens, including *Escherichia coli* and *Staphylococcus aureus*. Recently, "green" cleaners have been introduced as less harmful alternatives. Research indicates that "green" cleaners do not always display antimicrobial properties. Interestingly, essential oils (EOs) have seen increased popularity as cleaning agents. Numerous EOs have antimicrobial properties, but each EO targets specific groups of microbes. This study seeks to determine the antibacterial effectiveness of peppermint and Thieves® as alternatives to cleaning products like Clorox® and Seventh Generation™. Disc diffusion assays utilizing 100%, 50%, 25%, and 12.5% of Clorox®, Seventh Generation™, peppermint mixture, or Thieves® mixture were conducted

against *E. coli* and *S. aureus*. Water was used as a control. Clorox® presented antimicrobial properties when compared to control ( $p < 0.05$ ,  $n = 3$ ), however, peppermint oil, Thieves® oil, and Seventh generation did not ( $n = 3$ ) under the conditions tested. To determine if peppermint oil and Thieves® oil could remove surface bacteria, counter surfaces were swabbed before and after cleaning with the respective agents. Nutrient agar plates were then streaked with the applicators, and plates were incubated overnight at 37C. Colonies were then counted for each plate. Only Clorox® was effective at reducing colony counts ( $p < 0.05$ ,  $n = 3$ ) in the conditions tested. While peppermint and Thieves® oil may have antimicrobial properties for other microbes, these data suggest that peppermint and Thieves® oil alone are not effective disinfecting cleaning agents.

**Potential Impact of Climate Change on the Geographic Distribution of *Aedes albopictus* in Southern Texas** Wendy Westerheide, The University of Texas Rio Grande Valley; Jonathan Kasofsky, Student; Marcos Valdez, Student; Hamaad Gohar, Student; Teresa Feria Arroyo, Associate Professor

*Aedes albopictus* is a vector of arboviral diseases such as Zika, chikungunya, yellow fever, and dengue. Outbreaks of these diseases have been recently documented in Southern Texas. Recent articles have showed the likelihood for mosquitos to shift their distribution due to climate change. In this study we assessed the impact of climatic change on the potential distribution of the species in South Texas using a maximum entropy approach. We modeled the future distribution (year 2050 and 2070) using two different representative concentration pathway (RCP) of 4.5- and 8.5-degrees C and four general circulatory models (CM3, CMIP5, HADGEM) in the years 2050 and 2070. Our results showed a potential distribution of the species in South Texas with potential expansions to northern regions. South Texas is a very important region for trade import and export between Mexico and USA, it has the suitable climatic conditions, and lack of surveillance programs in addition of the high poverty and presence of *colonias* with multiple breeding areas for mosquito borne species. Thus, special attention needs to be considered to this region to help prevent the species from expanding northward and becoming a threat to society.

**025-3. Cell and Molecular Biology Poster Session**  
Cell and Molecular Biology  
Poster Session

Participants:

**Components of *Cinnamomum verum* (Cinnamon) and *Salvia officinalis* (Sage) are Cytotoxic to Murine 4T1 Breast Cancer Cells** Makayla Nicholson, Wayland Baptist University; Jai'Cee Tudman, Wayland Baptist University; Adam Reinhart, Wayland Baptist University; Gary Gray, Wayland Baptist University

Recent data indicate 1 in 8 women will develop breast cancer in her lifetime. It is estimated that there will be 266,120 new diagnoses of breast cancer in 2018, and 40,920 women will die of breast cancer in 2018. In pursuit of new potential chemotherapy options to treat breast cancer, our lab has been working to identify components in medicinal plants that may be selectively cytotoxic to breast cancer cells. Ethanolic extracts of *Cinnamomum verum* (Cinnamon) and *Salvia officinalis* (Sage) were found to be cytotoxic to the 4T1 murine breast cancer cells as compared to a control epithelial cell line (EpH4-Ev). These cytotoxic effects were measured using CellTiter-Glo luminescent cell viability assays at various concentrations and treatment times. Both Cinnamon and Sage were shown to induce caspase 3 activity in 4T1 breast cancer cells but not in the epithelial control

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

cells (measured by western blot analysis). Work is ongoing to purify the cytotoxic components of these plants and the mechanism(s) by which these components induce 4T1 breast cancer cell death. Bulk purification of these constituents is ongoing through flash chromatography and HPLC.

**Cytotoxic and apoptotic effects of gingerols and shogaols on 4T1 breast cancer and EpH4-ev non-tumorigenic epithelial cell lines** *Jai'Cee Tudman, Wayland Baptist University; Makayla Nicholson, Wayland Baptist University; Alana Quackenbush, Wayland Baptist University; Parvin Mirzaei, Center for Biotechnology and Genomics, Texas Tech University; Masoud Zabet-Moghaddam, Center for Biotechnology and Genomics, Texas Tech University; Gary Gray, Wayland Baptist University; Adam Reinhart, Wayland Baptist University*

Each year it is estimated that over 250,000 women in the United States will be diagnosed with breast cancer and more than 40,000 will die. Breast cancer is very common among women in the United States; 1 in 8 women will be diagnosed with breast cancer in her lifetime. Medicinal plants could provide new treatments for cancer. Previous studies in our lab have shown that multiple plants are cytotoxic to the 4T1 murine breast cancer cell line, one of those plants being *Zingiber officinale* (ginger root). This study sought to further investigate differential effects of ginger root on 4T1 murine breast cancer cells compared to the control, nontumorigenic cell line, EpH4-ev. Both cell lines were treated with various concentrations of ginger root and it was found that ginger is more cytotoxic and apoptotic to 4T1 cells as compared to EpH4-ev cells. Since ginger exhibited this differential effect, we sought to evaluate cytotoxic and apoptotic effects of the major bioactive molecules 6-, 8-, and 10-gingerols, as well as 6-, and 8-shogaols. Both cell types were treated with various concentrations (100ug/mL, 50ug/mL, 10ug/mL, 1ug/mL, .1ug/mL, .01ug/mL) of each molecule. Gingerols and shogaols were more cytotoxic to 4T1 cells as compared to EpH4-ev cells. Additionally, we found through western blot analysis that gingerols and shogaols caused 4T1 cells, but not Ep-H4-ev cells to activate caspase-3 suggesting apoptosis was induced. Caspase-3 was most active with shogaols 6 and 8 as compared to the gingerols.

**Detection of Parasite DNA in a Metagenome Sample** *Chloe Herman, St. Edwards University; Dr. Charles Hauser, St. Edwards*

The field of metagenomics examines the compilation of all the genetic material in a given environmental sample, for example, the human intestinal tract, or soil sample. While metagenomics has been used to identify and characterize viral and bacterial populations within particular environmental samples, there are very few reports published that characterize parasite DNA. This project implements a Hidden Markov Model (HMM) and associated methodologies to detect proteins from *Toxoplasma gondii* in a metagenome sample. *T. gondii* is a parasite that is found in felines, but can infect any warm blooded animal. It is hypothesized that *T. gondii* would be present in a wide variety of environmental metagenome samples due to its ability to infect a variety of hosts. To test this hypothesis, an HMM was trained on validated *T. gondii* proteins and employed against a soil metagenome data set (describe). A training set was generated using *T. gondii* sequences (3 strains VEG, GT1, ME49 and RUB), downloaded from ToxoDb, and processed as follows: all replicate sequences were removed (usearch), and the resulting set of singleton proteins clustered (MCL) and aligned (MAFFT) then built into a HMM set. As a control, the resulting HMM was

applied to the soil metagenome data set which had at least 150 validated *T. gondii* sequences. Of the 150 seeded sequences, the HMM detected 53 of the seeded sequences and 3 sequences originally from the Metagenome. Currently, the detection limits of the HMM are being evaluated

**Estradiol May Not be Anorexigenic in Hibernators** *Lisha Susan Jacob, Austin College; Taqwa Armstrong, Austin College; Monica Martinez, Austin College*

Hibernating animals are unique in the way they manage their energy, and it is known that there are several hormones that play an important role in the physiology and hibernation pattern of these mammals. This experiment examines how energy balance in thirteen-lined ground squirrels is affected by the sex hormone estradiol and its interactions with the energy-sensing enzyme AMP-activated protein kinase (AMPK). Previous research indicates that both estradiol and AMPK have a role in regulating metabolic rate, cellular energy homeostasis, and fatty acid oxidation in mammalian cells. However, the relationship between these molecules is as yet unclear, so in order to test it, we experimentally increased estradiol concentrations in pre-hibernation thirteen-lined ground squirrels. We hypothesized that estradiol would inhibit AMPK through the enzyme liver kinase B1 (LKB1) (a known activator of AMPK) and thereby decrease food intake and increase metabolic rate. Our preliminary results indicate that estradiol addition has limited effects on food intake, metabolic rate, and LKB1 in prehibernation ground squirrels. This may indicate differential or seasonal regulation of energy balance in hibernators, but further experimentation is needed to increase sample size and on the mechanism by which we analyzed the data.

**Looking for genetic superheroes: Genetic background affects mutant phenotypes in *Drosophila melanogaster*** *Maria Jose Cardenas Muedano, St. Edward's University; Lisa M. Goering, St. Edward's University*

Understanding the "genetic background" in which genes function is important, as the presence of mutations at modifier loci not linked to the locus being studied can cause phenotypic variation. This variation can complicate the diagnosis and analysis of complex diseases such as cancer. One major pathway that, when overexpressed, can alter the phenotype of a given species is the Epidermal Growth Factor Receptor (EGFR) pathway. Overexpression of these receptors in humans has been linked to breast cancer, and in *Drosophila melanogaster*, EGFR signaling is important in eggshell patterning during oogenesis, as well as wing and eye development. Preliminary research in our lab has shown that 'background' genetic variation in *Drosophila melanogaster* can influence the expression of EGFR mutations, with one background showing a 'protective' (lessening the effects of the mutation) effect and another background exacerbating the effect of the mutation. Here, we examine that relationship at a molecular level. Using flies from two different genetic backgrounds, Oregon (Ore R) and Samarkand (Sam), as well as several EGFR pathway mutations, we examine the potential for modifier loci in the Ore R and Sam backgrounds to affect phenotypes associated with EGFR mutations. We will use quantitative RT-PCR and immunohistochemistry to analyze these effects by examining transcription of pointed, and spatial distribution of pMAPK respectively. Both are targets of the EGFR pathway. This research may contribute to a better understanding of the role genetic background plays in determining complex disease phenotypes that arise from mutations in this pathway.

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**Screening of students' noses for *Staphylococcus* Loan Yen Vu, Ms.**

*Staphylococcus aureus* is a common skin bacterium that is found as a commensal species in many humans. For this research, we looked at the carrier rate in a population of mainly young women, ages 15-18. *Staphylococcus aureus* was targeted to find a specific strain called MRSA (*Methicillin Resistant Staphylococcus aureus*) in students' noses that participated during the Texas Lutheran University STEM woman's day, Nursing Boot Camp and the New Braunfels Science Fest in July and October 2018. Four in twenty-seven (14.8%) TLU participants carried *S. aureus* in their noses identified by the growth on Mannitol Salt agar plates. Only one (3%) of those turned out to have the MRSA gene, which confers the ability to resist many common antibiotics.

**The Effect of Dietary Protein on Parkinson's Disease Symptoms in *Drosophila melanogaster* Kaitlyn Matthey, St. Edward's University; Maria Jose Cardenas Muedano, St. Edward's University; Lisa M. Goering, St. Edward's University**

Parkinson's disease is a neurodegenerative disorder that displays symptoms of resting tremors, rigidity, and bradykinesia (compromised/slow movement). This is a result of the death of dopamine-generating cells due to the formation of Lewy bodies composed of alpha-synuclein. Previous studies have shown that the absorption of the drug used to treat Parkinson's disease symptoms, Levodopa, is inhibited by a high protein diet. Using *Drosophila melanogaster*, we test whether different levels of dietary protein would directly affect the severity of Parkinson's disease symptoms (in the absence of Levodopa). Transgenic flies expressing human alpha-synuclein, were raised on low, normal, and high protein diets. Climbing ability of the flies was measured on days 0, 4, 7, 14, and 21 days of age. We predicted that flies fed a high protein diet would display disease related motor deficiencies earlier than those fed normal or low protein diets, resulting in a higher climbing time. Because a shorter lifespan is commonly associated with Parkinson's disease, lethality was also recorded. Preliminary data suggests that diet is not a factor in the severity of Parkinson's disease symptoms in fruit flies; however, we observed a high degree of lethality and compromised movement in our control lines. Here we test a different transgene and use a new method for controlling the diet in order to confirm our initial findings.

**Using bioinformatics approaches to identify differentially expressed genes in Alzheimer's disease Adriana Calderone, University of Mary Hardin-Baylor; Joni H Ylostalo, University of Mary Hardin-Baylor**

It is estimated that 5.7 million Americans are currently living with Alzheimer's dementia. Alzheimer's disease is diagnosed by a process of clinical evaluation along with elimination of other differential diagnoses. However, in the Preclinical stage of Alzheimer's disease, neurodegenerative changes including amyloid accumulation may already be in effect without clinical evidence present. Current treatments revolve around symptom control and are not prescribed until some level of cognitive impairment is evident. Bioinformatics approaches employ biology, mathematics, and computer sciences, that can be used to analyze complex biological data to generate testable hypotheses. Through use of bioinformatics tools, patients at risk for developing cognitive impairment associated with Alzheimer's disease may be identified before clinical symptoms arise. The goal of this research was to analyze a large gene expression data set generated from postmortem human brain samples of Alzheimer's disease patients and

controls. Gene expression values were filtered with a fold change >1.5 and p value < 0.05. The overall gene expression was evaluated through principal component analysis and hierarchical clustering, that demonstrated a clear grouping of Alzheimer's samples based on the differentially expressed genes. Some of the identified differentially expressed genes including SNAP25 and SLC17A7 have been cited as potentially involved in preclinical neurodegeneration in Alzheimer's disease. This study demonstrated significant differences in the overall gene expression in postmortem brains with Alzheimer's disease compared to the controls. Furthermore, potential biomarkers involved in presynaptic neuron dysfunction were identified.

**025-4. Chemistry and Biochemistry Poster Session**  
Chemistry and Biochemistry

Poster Session

Participants:

**Acetaldehyde Determination in Home Distilled Liquors and Commercial Liquors** Renae Elizabeth Gosnell, Texas A&M University - Central Texas; Andrew Rhiner, Texas A&M University- Central Texas; Randy Stoneroad, Texas A&M University- Central Texas; Linh Pham, Texas A&M University- Central Texas; Coady Lapierre, Texas A&M University- Central Texas

Acetaldehyde is a known carcinogen, but is not currently regulated in food products by the FDA. An analysis of liquors to determine acetaldehyde levels of home distilled liquors and commercial liquors was done utilizing gas chromatography. This was done to determine the risk of acetaldehyde exposure in both home distilled liquors and commercial liquors.

**Analysis of the Amino Acid Content in Beef, Chicken and Turkey Bone Broth** Max Shaw, West Texas A&M University; Nick Flynn, West Texas A&M University

Quantifying key amino acids in various health products may help us better understand their contribution to general health and support or repudiate claims made by supplement companies. For this project we quantified 19 individual amino acids in bone broth from beef, chicken and turkey. Amino acids from commercial samples of each broth were analyzed using an HPLC method with ninhydrin post column derivatization for quantification. Norleucine was used as the internal standard for analysis. The comparison of the broth concentrations to meat and processed animal proteins (PAP) concentrations allowed us to see that broths may have an ability to contribute vital amino acids to one's diet, but do not appear to be a better source.

**Assessment of drinking water quality for metals in the eight natural springs of Manitou Springs, Colorado, using inductively coupled plasma-mass spectroscopy** Elijah Edward Miranda, University of the Incarnate Word; Yesenia L Bass, University of the Incarnate Word; Jason Gerding, University of the Incarnate Word; Alakananda Ray Chaudhuri, University of the Incarnate Word; Edward E Gonzalez, University of the Incarnate Word

The purpose of the study was to analyze the metal concentration of drinking water in eight natural springs of Manitou Springs, Colorado that are open to the public. The eight sites of active natural springs selected for study were: Cheyenne Spring, Shoshone Spring, Stratton Spring, Navajo Spring, Wheeler Spring, 7-Minute Spring, Twin Spring, and Iron Geyser. The EPA has set federal standards of the amount of pollutants and metal ions allowed for safety in surface, potable and recreational waters under the Safe

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

Drinking Water Act (SDWA). The water samples were analyzed for 27 metals using inductively coupled plasma-mass spectrometry (ICP-MS). Water samples were collected from eight operating natural springs that are located in the downtown area and within walking distance of each other. The water samples were preserved with (1 + 1) nitric acid and filtered in the lab through a 0.45  $\mu\text{m}$  filter. The samples were digested according to EPA method 200.8 and analyzed for metals by ICP-MS using a Varian 820-MS model. Percent recovery values for these metals in spiked control samples varied between 92% and 112%. Only the Iron Geyser water sample showed the arsenic concentration (0.009 mg/L) to be just below the permissible limit (0.010 mg/L) of EPA for drinking water guidelines. The remaining metals analyzed in all the eight spring water samples were well within the regulated limits of the EPA and the Colorado Commission on Environment and Water Quality. This study did not test the water for anions, pesticides or organic compounds.

### **Computational Analysis of Silver (II) NHC Complex** *Allison Marie McKee, University of Houston-Downtown*

Gaussian 16 and GaussView software was used to build the molecular model and obtain theoretical data for silver benzimidazole-based N-heterocyclic carbene (Ag-NHC). The computational chemistry software was used to compute the Ag-NHC molecular structure and frequency. Gaussian 16 runs many mathematical expressions that operated different approaches to match the experimental and theoretical calculations with accuracy. Basis-sets are methods of optimization and frequency calculations that have distinct atomic specifications and values. Basis-sets 3-21G, LanL2DZ, and LanL2MB were run using the density functional method (DFT). 3-21G performs a split-valance with three primitive core orbitals/ valance in two contractions: two primitives and a single primitive. Both LanL2DZ and LanL2MB are Hartree-Fock based calculations of effective core potential that are more commonly used for molecule containing a heavier metal, such as silver. LanL2DZ is a double zeta basis set (runs double the number of basis functions) while LanL2MB runs a minimal amount. Each basis set is run to calculate optimization, which yields data concerning equilibrium geometry, and frequency, which concerns other qualities such as harmonic frequencies and the HOMO-LUMO energy gap. Calculations run for ECP are faster as the electrons located in the inner orbitals are not as involved when bonding. The data produced by the Gaussian 16 software can then be tabulated for side by side comparison with pre-existing experimental data which can allow for greater determination of the capabilities of the molecule.

### **Construction and Evaluation of Low-Volume Flow through Asymmetric Membranes Devices for Gas Exchange** *Payton Alexia Wasemiller, University of Texas at Arlington; C. Phillip Shelor, Research Assistant Professor; Purnendu K Dasgupta, University of Texas at Arlington*

Flow-through gas exchange devices are important in many areas, blood gas exchange in flow-through multi-capillary modules for example, is widely used both for blood oxygenation and measurement of blood gases, respectively utilizing gas transport in to and out of a luminal fluid. Our laboratory has a particular interest in liquid and ion chromatography. In the latter, many different types of electroanalytic devices are used – some result in electroanalytic gas evolution in a stream where gas bubbles can cause problems [a]. In others, gases like CO<sub>2</sub> are deliberately introduced at high pressure into aqueous liquids to make chromatographic eluents [b]. It is important, if not

imperative, to remove all or most of the dissolved gases before detection to avoid bubble-induced noise. As many of these devices operate post-column after separation, it is also important to minimize dispersion. Narrow bore tubular membranes are ideal for the purpose. However, flow through small bore capillaries necessarily creates backpressure and to withstand this, the wall thickness must be sufficient to withstand the backpressure. This presents conflicting demands because a thicker membrane inhibits gas transport. This problem was solved early by coating a microporous membrane tube with a thin layer of a gas-permeable polymer, thus creating an asymmetric membrane with the structural strength of the host and transport properties of the thin coating [c]. This work will examine the performance of new host membranes and new polymer coatings.

### **Developing a Multifunctional Treatment Solution of TMPyP/DHN for the Treatment of Alzheimer's Disease.** *Matibur Rahaman Zamadar, Stephen F. Austin State University; Jacob Herschmann, Stephen F. Austin State University*

Alzheimer's disease (AD) is recognized as the six leading cause of the death in the United States. As of now, there is no cure for this fatal disease. Research data suggested that in the brain, there is an excess production of hydrogen peroxide, which in turn decomposes into deadly hydroxyl radicals causing the aggregation of amyloid  $\beta$  ( $\text{A}\beta$ ) peptide chain. This aggregation phenomenon seems to be the key and is playing the major role for Alzheimer's disease. We employed a derivative of hydroxynaphthalene, 1,5-dihydroxynaphthalene (DHN) and cationic porphyrin TMPyP for studying to stop or slow down the aggregate formation of amyloid  $\beta$  ( $\text{A}\beta$ ) peptide. We found a dramatic decrease in the rate of quenching reaction of methylene blue with hydroxyl radical in the presence of an optimum concentration of DHN. Furthermore, we noticed, the solution of DHN effectively slowed down the process of  $\text{A}\beta$  aggregation. In addition to the study of DHN effect on amyloid  $\beta$  ( $\text{A}\beta$ ) peptide, we further conducted experiments to determine a water-soluble porphyrin, TMPyP can influence the aggregation reaction of amyloid  $\beta$  ( $\text{A}\beta$ ) peptide. We found the Soret band absorption of TMPyP shifted from 422 nm to 430 nm upon interacting with amyloid  $\beta$  ( $\text{A}\beta$ ) peptide chains indicating TMPyP effectively binds with amyloid  $\beta$  ( $\text{A}\beta$ ) peptide chains through  $\pi$ - $\pi$  interactions mechanism. Therefore, the solution of DHN and TMPyP has the potential to stop or slow down the aggregate formation of amyloid  $\beta$  ( $\text{A}\beta$ ) peptide for the application of Alzheimer treatment.

### **Effect of Metal Ions on Photosensitized Singlet Oxygen Generation for Photodegradation of Polyaromatic Hydrocarbon Derivatives and Photoinactivation of Escherichia coli** *Aqeeb Ali, SFASU Chemistry and Biochemistry Department; Matibur Rahaman Zamadar, Stephen F. Austin State University*

Inorganic toxic metals, polyaromatic hydrocarbons, and pathogens are common contaminants found in aquatic and terrestrial environments. Here we report an experimental study of the effect of toxic metal ions on photosensitized singlet oxygen generation for photodegradation of PAH derivatives, Anthracene-9,10-dipropionic acid disodium salt (ADPA) and 1,5-dihydroxynaphthalene (DHN) and photoinactivation of E.coli bacteria by using cationic meso-tetra(N-methyl-4-pyridyl)porphine tetrachloride (TMPyP) as a singlet oxygen photosensitizer. Three s-block metals ions, such as Na<sup>+</sup>, K<sup>+</sup>, and Ca<sup>2+</sup> and five toxic metals such as Cd<sup>2+</sup>, Cu<sup>2+</sup>, Hg<sup>2+</sup>, Zn<sup>2+</sup>, and Pb<sup>2+</sup> were studied. The s-block metal ions showed no change of the rate of

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

photodegradation of ADPA or DHN by TMPyP whereas a dramatic change in the photodegradation of ADPA and DHN were observed in the presence of toxic metals. The maximum photodegradation rate constants of ADPA and DHN were observed for Cd<sup>2+</sup> ions [(3.91 ± 0.20) × 10<sup>-3</sup> s<sup>-1</sup> and (7.18 ± 0.35) × 10<sup>-4</sup> s<sup>-1</sup>, respectively]. Strikingly, the photodegradation of ADPA and DHN was almost completely inhibited in the presence of Hg<sup>2+</sup> ions and Cu<sup>2+</sup> ions. A complete inhibition of growth of E.coli was observed upon visible irradiation of E.coli solutions with TMPyP and toxic metal ions particularly, Cd<sup>2+</sup>, Hg<sup>2+</sup>, Zn<sup>2+</sup>, and Pb<sup>2+</sup> ions, except for Cu<sup>2+</sup> ions where a significantly slow inhibition of E.coli's growth was observed. A substantial dark toxicity for mercury and zinc ions against E.coli were observed in the presence of TMPyP.

### **Electrochemical Determination of A Silver**

**Intermediate Milka O Montes, UT Permian Basin; Michael Hayes, UT Permian Basin**

Silver nanoparticle size may be controlled during synthesis by manipulating a silver intermediate phase. The intermediate species can be either Ag(OH), Ag(OH)<sub>2</sub>, Ag(OH)<sub>3</sub>, or Ag(OH)<sub>4</sub>. This study proposes finding the intermediate by electroanalytical chemistry. An impedance meter (IM6) is being used to find the anodic and cathodic peaks of Ag(OH)<sub>x</sub>. Other characterization techniques employed in this project include pH determination, UV-visible spectroscopy, and FTIR. Preliminary results indicate an intermediate phase with changes in pH and Absorbance during the course of the nanoparticle synthesis. Cyclic voltammetry experiments are currently in process and results will be shown herein.

### **Encapsulation of Proteins inside the HK97 VLP**

**Bubacarr Ceesay, University of Texas at Tyler; Dustin Patterson, University of Texas at Tyler**

The virus-like particle (VLP) from Bacteriophage HK97 is a unique platform for nanomaterials construction. The mature VLP forms a catenane structure of interlocking protein subunits to form a robust 60 nm nanoparticle that is quite stable against denaturation. Presented here are the results for developing a strategy for the encapsulation of proteins on the interior of the HK97 VLP, with long term goals of developing the system as a platform for nanomaterials construction. The research results show the ability to encapsulate green fluorescent protein (GFP) on the interior by tagging the protein with a C-terminal peptide sequence from the GP4 protein of the bacteriophage HK97. In addition, the results for optimizing loading of the GFP protein are presented to show the ability to tune encapsulation.

### **Functional Significance of Point Mutations in Hsp27**

**that Lead to Neurodegenerative Disease Maria Iziar Grajeda, University of Texas at EL Paso**

Proteins become misfolded due to diverse environmental and physiological stressors. The resulting misfolded proteins can lead to diseases. Molecular chaperones are proteins that aid in the refolding of misfolded or unfolded proteins. Heat shock proteins (Hsp) are a subclass of molecular chaperones that assist in the folding of newly synthesized proteins or aid in the stabilization and refolding of damaged proteins. This study focuses on small heat shock protein 27 (Hsp27) that functions in preventing irreversible aggregation of substrates and transferring partially denatured substrates to ATP dependent chaperonin complexes for refolding. It is speculated that the chaperone active form of Hsp27 is a large oligomeric complex that is in equilibrium with smaller dimeric subunits. Upon phosphorylation this equilibrium shifts predominantly towards the dimeric form instead of larger oligomeric complexes. The shifting equilibrium of

Hsp27 to the dimeric form may have a role in the regulation of chaperone activity by shuttling competent folding substrates to larger chaperonin complexes. The hydrophobic regions on the dimer interface favorably interact with misfolded protein until transportation to a chaperonin complex can occur. Five specific point mutations in Hsp27 (S135F, R127W, R136W, T151I, and P182L) have been associated with Charcot-Marie-Tooth disorder, a neurodegenerative disorder that affects the motor and sensory neurons of the peripheral nervous system that has an affect weakness and atrophy of distal muscles. Therefore, this study focuses on characterizing the structure and activity of wild type Hsp27 and the four point mutations in there active oligomeric form in order for comparison.

### **Genomic Analysis of *C. acetobutylicum* for its**

**Potential as a Biofuel Source Sarah Reeder, University of Texas at Tyler**

The bacterium *Clostridium acetobutylicum*, (a spore-forming bacteria often used as a model species) naturally produces biofuels from organic sources like those found in food waste. Theory predicts that there is no stoichiometric or energetic reason why it should not be possible to shunt almost all metabolism towards butanol production. Approximately 1/3 of the genes in the genome are unannotated or poorly annotated and of the genes whose metabolic functions are described, 25% are inferred based on biochemical modeling rather than positional cloning. This relative dearth of genome sequences for *C. acetobutylicum* hampers progress on the comparative genomics of butanol production in this species. In collaboration with the Army Research Lab in Adelphi, MD, we have sequenced entire genomes of seven wild strains of *C. acetobutylicum* and three of the five available industrial strains of the above mentioned. We anticipate obtaining a fully assembled/annotated chromosome and plasmid(s) for each strain sequenced at high coverage, and will characterize variations among genomes including: SNPs, INDELs, rearrangements, inversions, and bacteriophage insertions, especially for those genetic variations likely related with butanol metabolism pathways. We will qualitatively compare the genomes of the industrial strains to the wild strains by examining whether specific genes appear to be enriched for INDELs, transposons, and other structural variants in the industrial strains as compared to wild strains. Methods of engineering such a reaction with increased butanol production can only be achieved through genomic analyses and then be utilized to provide a sustainable, renewable resource for an ever-growing global population.

### **Influence of Composted Wastewater Sludge (CWS)**

**on Cadmium and Manganese Uptake by Radish (*Raphanus sativus* L.) Oluwadamilola Olasumbo Fateru, Stephen F. Austin State University; Kefa K Onchoke, Stephen F. Austin State University**

The increased application of composted wastewater sludge poses potential risks of increased metal concentrations in the environment. In particular, the high affinity of composted wastewater sludge for toxic metals including Cd, may influence the extent of metal uptake by plants. In this study, a sequential extraction protocol was employed to determine the fractionation and bioavailability of metals Pb, Cu, Cr, Cd, Zn, Ni and Fe in CWS. To evaluate the influence of CWS on metal uptake, a fast growing plant *Raphanus sativus* L. (cultivated radish), was grown in CWS amended with perlite at four different compositions (0, 25, 50, 75, 100% w/w) treated with Cd and Mn. Plants were harvested after six weeks and analyzed for Cd and Mn. The extent of metal uptake, Cd and Mn upon application, at pH ~ 6.5 was assessed. Best growth was apparent at 25% to 50% (w/w)



Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

CWS composition. Higher metal concentrations of Cd and Mn were found in roots vis-à-vis shoot or leaves.

**Multidimensional Analysis of Texas Home Distilled Liquors** *Andrew Rhiner, Texas A&M University-Central Texas; Randy Stoneroad, Texas A&M University-Central Texas; Coady Lapierre, Texas A&M University-Central Texas; Linh Pham, Texas A&M University-Central Texas*

A multidimensional analysis of home distilled liquors was conducted to analyze for lead, copper, and methanol contamination using atomic absorbance spectroscopy and gas chromatography, respectively. Thirty-five home distilled liquor samples were acquired and analyzed alongside twelve commercial liquor samples. Lead and copper were found to exist in levels above the actionable limits (0.015 ppm and 1.3 ppm, respectively) set by the EPA. Methanol concentrations in the home distilled liquor samples were within the actionable limit (0.35 µg/mL) established by the FDA but exhibited a greater deviation than commercial samples.

**Quantification of Hydrolyzable Tannins in Acorns from Different Species of Oak Trees (*Quercus sp.*) in East Texas** *Russell J. Franks, Stephen F. Austin State University; Sarah E. Browning, Stephen F. Austin State University*

Tannin content in acorns has been suggested as a possible factor in food source preference by white-tailed deer (*Odocoileus virginianus*). Tannins are polyphenolic compounds that fall into two broad categories: hydrolyzable tannins and condensed tannins. Hydrolyzable tannins are composed of a carbohydrate center esterified to gallic acid (3,4,5-trihydroxybenzoic acid) at multiple sites, whereas condensed tannins are polymers of catechin (flavan-3-ol). Whole acorns (including the pericarp and cupule) were dried, crushed, and the hydrolyzable tannins were extracted and quantified using the Prussian blue spectrophotometric method. The hydrolyzable tannin content, reported in gallic acid equivalents (GAE) per gram of acorn, from four different *Quercus* species are reported: Hydrolyzable tannin content was determined to be 38.3 ± 7.8 mg GAE/g acorn (*Q. virginiana*), 49.5 ± 7.4 mg GAE/g acorn (*Q. alba*), 49.0 ± 7.3 mg GAE/g acorn (*Q. michauxii*), and 61.1 ± 5.6 mg GAE/g acorn (*Q. shumardii*). It is believed that white-tailed deer prefer acorns with low tannin content such as *Q. virginiana* and *Q. alba*. Efforts to quantify the dietary preferences of white-tailed deer and other deer species are in progress.

**Strain Management in an Extended Series of Lanthanide 2-Sulfonatoterephthalates, [Ln(tpso3)(h2o)2]n, with Ln = Ce - Lu, except pm** *Harry Maslen, Angelo State University*

Via hydrothermal syntheses we obtained thirteen lanthanide 2-sulfonatoterephthalates, [Ln(TPSO3)(H2O)2]<sub>n</sub> (TPSO3 = sulfonatoterephthalate, C<sub>8</sub>H<sub>3</sub>O<sub>7</sub>S<sub>3</sub><sup>-</sup>), with Ln = Ce – Lu, except Pm, as well as [Y(TPSO3)(H<sub>2</sub>O)<sub>2</sub>]<sub>n</sub>. All materials assemble as two-dimensional layers, that extend into three-dimensional networks via hydrogen bonds. They exhibit a triclinic crystal system with space group P<sup>-1</sup>. The compounds are based upon LnO<sub>16</sub> clusters that assemble from LnO<sub>9</sub> coordination polyhedra. The coordination polyhedra are interlinked by TPSO<sub>3</sub>-spacers along the b-axis, while adjacent Ln<sup>3+</sup>-ions are connected in the c-direction via carboxylate groups. Hydrogen bonds tie together the resulting 2D-layers along the a-axis. The cell volume shows a linear decline between Ce and Tm when plotted against ionic radii.

**Synthesis and Structural Study of (3-**

**Chloropropyl)Triphenyltin [Ph<sub>3</sub>Sn(CH<sub>2</sub>)<sub>3</sub>Cl] and (3-Chloropropyl)Diphenyltin Chloride [Ph<sub>2</sub>ClSn(CH<sub>2</sub>)<sub>3</sub>Cl]** *Henk Steven van den Bogaard, The University of Texas at El Paso*

Intramolecular coordination between tin and variety of donor ligands to form chelate compounds are prevalent in organotin chemistry. Recently, we have reported the structure and the biological activity of bis-(methylthiopropyl)tin dichloride, [MeS(CH<sub>2</sub>)<sub>3</sub>]<sub>2</sub>SnCl<sub>2</sub> [1] which forms 5-membered chelate rings involving Sn-S intramolecular bonding. The intramolecular Sn-S bonding is responsible for producing a benign compound with respect to its interactions with Human Natural Killer cells. In order to study the effect of intramolecular coordination on tin with other donor atoms, we have synthesized (3-chloropropyl)triphenyltin [Ph<sub>3</sub>Sn(CH<sub>2</sub>)<sub>3</sub>Cl], 1 in 40 % yield. Chlorination of 1 with 1.0 M HCl-ether solution produced (3-chloropropyl)diphenyltin chloride [Ph<sub>2</sub>ClSn(CH<sub>2</sub>)<sub>3</sub>Cl] 2 in 60% yield. <sup>119</sup>Sn NMR of 1 exhibited a resonance at -101 ppm which is comparable with a resonance at -90.1 for Ph<sub>3</sub>SnEt [2]. The <sup>119</sup>Sn NMR resonance for 2 at was found at -47 ppm. The chemical shifts for 1 and 2 are in agreement with chemical shifts for (o-MeS-C<sub>6</sub>H<sub>4</sub>)CH<sub>2</sub>SnPh<sub>3</sub> and (o-MeS-C<sub>6</sub>H<sub>4</sub>)CH<sub>2</sub>SnPh<sub>2</sub>Cl, at -115.5 ppm and -45.5 ppm respectively [3]. Reference: 1. Vargas, D. G. Metta-Magana, A. Sharma, H. K. Whalen, M. M. Gilbert, T. M. Pannell, K. H. Inorg. Chim. Acta. 2017, 468, 125-130. 2. Kapoor, R. N. Apodaca, P. Montes, M. Gomez, F. D. Pannell, K. H. Appl. Organometal. Chem. 2005, 19, 518-522. 3. Munguia, T.; López-Cardoso, M.; Cervantes-Lee, F.; Pannell, K. H. Inorganic Chemistry 2007, 46 (4), 1305–1314.

**The Design of Irreversible Inhibitors of Sterol C24-Methyltransferase (24-SMT) as Potential Therapeutics to Treat Parasitic Protozoan Infections** *Luis Payan, Sul Ross State University; David J Leaver, Sul Ross State University*

There are currently seventeen neglected tropical diseases (NTDs) in the world and three of them belong to the parasitic protozoan class: Chagas disease, leishmaniasis and African Trypanosomiasis (HAT, sleeping sickness). It is estimated that healthcare and related costs of Chagas disease in the US is almost US\$900 million annually making it comparable to better known infections such as Lyme disease and methicillin-resistant *Staphylococcus aureus* infections. It has been shown that ergosterol biosynthesis for these protozoan parasites is essential for survival and blocking this pathway with appropriate inhibitors is a valid therapeutic option. Sterol C24-methyltransferase (24-SMT) is required for protozoan parasites to survive, while it is absent from the human host and thus offers the potential for species differentiation and enhanced selectivity. The design of synthetic 24-SMT inhibitors that do not contain the ABCD sterol ring will be described.

**Toward the Synthesis of a Macroinitiator and its use in the Preparation of Poly(styrene-b-methacrylonitrile): An Undergraduate Laboratory Project in Polymer Chemistry** *Aaron Scoggins, The University of Texas at Tyler; Whitney Romero, The University of Texas at Tyler; Neil Gray, The University of Texas at Tyler; Sean Butler, The University of Texas at Tyler*

Here we report continued developments toward a new experiment involving the synthesis of a macroinitiator and its use in the living synthesis of the diblock copolymer poly(styrene-b-methacrylonitrile). Initially, 1-(1-phenylvinyl)pyrene is prepared from a multi-step synthesis requiring the use a various methodologies, including: proper

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

solvent and reagent preparation, organolithium and organomagnesium chemistry, oxidation, dehydration, and product purification and characterization. It is then used in the synthesis of a terminally functionalized polystyrene oligomer for use as an anionic macroinitiator for the subsequent preparation of poly(styrene-*b*-methacrylonitrile). This experiment is appropriate for a senior level lab course in advanced organic or polymer chemistry. Students will gain experience in multi-step organic synthesis, product separation and purification, living polymerization, polymer modification, and advanced characterization techniques. In particular, students will learn first-hand how important interactions are across the boundaries between several different disciplines of chemistry.

### **Using Virtual Screening to Identify Possible Inhibitors of S-adenosylmethionine in *Burkholderia pseudomallei*** Marie Pearce, University of Texas at Austin

The mortality rate combined with the low effectiveness of current medications as well as the bacteria's potential as a biological warfare agent makes *Burkholderia pseudomallei* an important pathogen to research. *B. pseudomallei* is a bacteria responsible for Melioidosis, a disease that is prevalent in northern Australia, Thailand, and Vietnam. It is contracted through standing water or soil that contains the bacteria, but is not transferred between people. Although the mortality rate is only 10% when antibiotics are available, it's 90% without antibiotics and 80% for cases with complications even when antibiotics are used. The essentiality of the enzyme S-adenosylmethionine synthetase (SAM synthetase) in *B. pseudomallei* makes it an ideal target for inhibition through small molecule drug discovery. SAM synthetase catalyzes the reaction of methionine and ATP in a two step process that results in S-adenosylmethionine, an important methyl donor and participant in DNA formation. In this research the virtual screening program GOLD was used to dock over 40,000 novel compounds from various libraries to the crystal structure (PDB ID: 3IML) of the S-adenosylmethionine synthetase enzyme. After running a set of positive and negative controls, the top 500 scoring compounds were saved to be considered for testing in the wet lab through biochemical assays. The initial steps to synthesize the coding DNA sequence have begun using primer overlap PCR. Future steps include cloning this sequence into an expression vector to produce the protein in *E. coli* BL21(DE3) cells for eventual inhibition assays that can validate the compounds found via virtual screening.

### **025-5. Marine Science Poster Session**

Marine Science

Poster Session

Participants:

### **Abundance and frequency of disease and bleaching in *Xestospongia muta* in Roatán, Honduras** Matthew Wayne Krueger, T.I.D.E.S

Sponges play vital roles in coral reefs by filtering large quantities of water, thereby increasing water clarity and by providing habitats for other species. *Xestospongia muta*, the giant barrel sponge, goes through cycles of bleaching and recovery; however, sponge orange band disease (SOB) often eliminates the recovery cycle, causing the sponges to bleach repeatedly until death. SOB is characterized by a distinct orange band that separates the bleached and healthy portions of the sponge. This study was conducted to quantify and compare *X. muta* abundance, disease status, and disease severity in Roatán, Honduras. Non-overlapping surveys were conducted using the Randell-Robertson technique (RRMST)

from May 15-18, 2018 at 4 dive sites. Giant barrel sponge depth, height, disease, bleaching status, and diameter of the osculum were recorded. Each sponge was given a pigmentation score, which quantified the presence of bleaching or associated diseases. Pertaining to sponge depth, healthy sponges were found at the deepest depths. Severely and slightly bleached sponges were found at shallow depths. The majority of sponges (60.53%) were bleached and 34.21% exhibited SOB. At one of the dive sites served (Four Sponges) 100% of the observed sponges were diseased or bleached. This may have been due to the site proximity to the Mud Hole landfill or due to the abundance of seasonal fresh water runoff in the area. The remaining sites exhibited 92.50% diseased or bleached sponges. The data collected suggest an abnormally high amount of disease and bleaching present on the giant barrel sponge.

### **A Methodological Comparison of the Belt Transect and Randell-Robertson Marine Survey Technique for Assessing Coral Health in Roatán, Honduras** Brittlinn O'Quinn, McLennan Community College; Madison Knight, McLennan Community College

Marine survey techniques vary greatly in detecting focal species in different oceanic environments. The Belt Transect (BT) is a research technique which samples along a predetermined transect line. The Randell-Robertson Marine Survey Technique (RRMST), created in 2014 by Stephanie Randell and Traesha Robertson, easily enables researchers to conduct research on singular reef species throughout their accessible range. This comparison study was a continuation in the validation of the RRMST using the BT method as a reference. This comparative study assessed the effectiveness of the BT and the RRMST for abundance and health status of Acropora and Starlet coral species. This study was implemented in Roatán, Honduras, from Fifteenth thru the eighteenth of May 2018 along the Mesoamerican Barrier Reef. Four dive sites; Bear's Den, Fish Den, Tuk's Treasure, and Four Sponges, were surveyed twice. The RRMST was more effective in the observation of rarer Acropora species. The BT was more effective in the observation of more abundant Starlet coral species and small, hidden coral species.

### **A one day continuous water quality record along the Lower Laguna Madre between the Brazos-Santiago Pass and the Arroyo Colorado** Estefania Andrade, The International Baccalaureate Program at Lamar Academy; Fathima Elizondo, The International Baccalaureate Program at Lamar Academy; Alexa Dezenea, The International Baccalaureate Program at Lamar Academy; Josiah Cabeza, Classical Conversations of Edinburg, TX; Itzel Salas, Classical Conversations of Edinburg, TX; Alfredo Salas, Classical Conversations of Edinburg, TX; Destiny Garcia, The International Baccalaureate Program at Lamar Academy; Julian Cabeza, Classical Conversations of Edinburg, TX; Daniel Santos, The International Baccalaureate Program at Lamar Academy; Sara Maldonado, The International Baccalaureate Program at Lamar Academy; Joseph Kowalski, The University of Texas Rio Grande Valley

As a bar-built lagoon with restricted circulation, the Laguna Madre (LM) has a bathymetry that defines distinct zones that can influence water quality. The Arroyo Colorado (AC) is a mesohaline stormwater, agricultural and municipal drain that empties into and influences the water quality of the LM at this confluence. The AC is one of the most polluted bodies of water in the state of Texas and is often subject to elevated

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

inorganic nutrients and fecal bacteria that exceed environmental thresholds. This can lead to algal blooms, diminished light levels, oxygen deficiency and increased rates of respiration. Salinity can diminish some pollution effects. We investigated the water quality of the LM as it transitions to the tidal AC by continuously logging chlorophyll a (Chl) and blue-green bacterial (BGA), and dissolved oxygen (DO) concentrations, salinity, turbidity, pH and temperature. Data-logging during the cruise was anchored by five sites used for separate studies. Highest Chl and BGA concentrations were centered on the AC area with values of 21.73 and 10.81 mg l-1, respectively. Likewise, DO, and turbidity were highest and salinity to lowest around the AC. pH increased to more than 8 along the south to north transect that also occurred with greatest primary productivity in the AC. Water quality of the AC is impaired and influences the water quality of the LM where these two water bodies meet and mix.

**Faunal diversity along a salinity gradient, Lower Laguna Madre, Texas** *Fathima Elizondo, The International Baccalaureate Program at Lamar Academy; Daniel Santos, The International Baccalaureate Program at Lamar Academy; Julian Cabeza, Classical Conversations of Edinburg, TX; Alfredo Salas, Classical Conversations of Edinburg, TX; Itzel Salas, Classical Conversations of Edinburg, TX; Josiah Cabeza, Classical Conversations of Edinburg, TX; Estefania Andrade, The International Baccalaureate Program at Lamar Academy; Sara Maldonado, The International Baccalaureate Program at Lamar Academy; Alexa Dezena, The International Baccalaureate Program at Lamar Academy; Destiny Garcia, The International Baccalaureate Program at Lamar Academy; Joseph Kowalski, The University of Texas Rio Grande Valley*

Stable salinities are expected around tidal passes connected to the ocean. Higher salinities in lagoons are expected away from passes, especially in the hypersaline Laguna Madre (LM). The Arroyo Colorado (AC), a stormwater, agricultural and municipal drain, introduces low salinity water to the estuarine waters of the LM. Where the AC drains to the LM (AC Mouth), salinity is highly dynamic having a negative effect on the fauna there. We tested these effects on faunal distribution and abundance at five sites along a south to north transect using stern trawls. Simpson's Diversity Indices were used to assess diversity for each site. Brazos-Santiago Pass (tidal inlet) had a diversity index of 0.91 (salinity = 37). The brown shrimp (*Farfantepenaeus aztecus*) was in greatest abundance. Northward, the cross-channel current (CCC) had the highest diversity index of all sites (D = 5.25; salinity = 38) with nearly even abundance of nine species. Farther northward, Cullen Point (CP) had a diversity index of 2.50 (salinity = 40) with nearly even abundance. At the confluence of the LM and AC (AC Mouth; salinity = 32), species diversity declined to 0.14 with the brown shrimp the most abundant species. Upstream in the AC (salinity = 17) diversity was 0.14 and dominated by fish. These results indicate that the low salinity of the AC Upstream site may be a limiting factor to achieving high faunal diversity. Overall, diversity indices in this study did not correlate with elevated diversity indices along the south to north axis of the LM.

**Frequency and Disease Prevalence in Boulder Corals in Association with Burrowing Annelids in Roatan, Honduras.** *Terri Cox, Texas Tech University Waco*

With increased decline of coral ecosystems, it is of vital importance to monitor diseases and possible vectors that affect such corals. Yellow band disease (YBD) and white

plague disease (WP) are known diseases common in boulder type corals. However, the exact vector and causative agent of these diseases are unknown. This research was carried out on the coral reef surrounding Roatán, Honduras focusing on boulder coral and their associated annelids, Spirobranchus giganteus and Sabellidae. We implemented a 2meter by 15meter belt transect survey method at randomly selected depths at each site. *Orbicella annularis* presented with a high frequency of disease and low frequency of annelids with *S. giganteus* being the most prominent. Coral species with a high frequency of *S. giganteus* exhibited a low frequency of disease. Contrarily, corals with a low frequency of *S. giganteus* demonstrated an increased rate of YBD and WP. This research found that 33% of the total coral observed are diseased and no Sabellidae were observed during this research. There was no association between *S. giganteus* and diseased corals ( $p=0.625$ ). However, it was found that there was a strong correlation between depth and disease ( $p=0.00186$ ).

**Genetic and morphological characterization of internal parasites of the Gulf pipefish, *Syngnathus scovelli*** *Samuel Alexander Cornelius, St. Edwards university; Daniel A Gold, St. Edwards university; Sunny Scobell, St. Edward's University*

Syngnathids (seahorses, sea dragons, and pipefish) are commonly kept in aquariums, are used for educational purposes, and are growing in importance as they become a model organism for sexual selection studies. As the quantity of syngnathids in captivity has increased, husbandry continues to pose a problem. Despite much advancement in knowledge of care required for Syngnathids in recent years, inexplicable mass die-offs remain common. Parasites are a possible cause of morbidity and mortality in captive populations. However, there is little known about the species of parasites infecting syngnathids, their virulence, or the routes of transmission between hosts. In order for husbandry to improve it is vital that these parasites are better understood. We aim to characterize parasites found in *Syngnathus scovelli* genetically and morphologically. During the investigation of the inexplicable deaths of several test subjects, white parasitic cysts, roughly 0.1 mm in diameter, were found embedded in connective tissues surrounding the liver, heart, and lateral fat deposits of the body cavities in both males and females, and in the brood pouches of males. The number and distribution of the cysts varied between subjects, however morphology of the cysts remained constant. Cysts were isolated and lysed in order to isolate DNA samples, which were then amplified via PCR and sequenced. Identification and characterization of these parasites will contribute to knowledge of aquaculture and improve quality of care for Syngnathids in captivity.

**Prevalence and Frequency of Encrusting *Millepora* on Octocorals on the Mesoamerican Barrier Reef in Roatán, Honduras** *Shirley Rose Stewart, McLennan Community College*

*Millepora* spp. (fire coral) and octocorals make-up an abundant part of the Mesoamerican Barrier Reef system in Roatán, Honduras. Recent studies suggest that fire coral tend to parasitize octocorals and over take a vast majority of the reef. This study was conducted to assess the parasitism of *Millepora* spp. on various octocorals (sea fans, sea whips and sea rods) found off the Mesoamerican Barrier Reef in comparison to other studies in the Caribbean. This study was conducted off the coast of Roatán, Honduras from May 15, 2018 through May 18, 2018. Through observation and data collection, *Millepora* were found to be more frequently associated with common sea fan, wide-mesh sea fan, slimy sea plume and rough sea plume. Of the four, sea fans had the

## Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University Program Schedule

highest frequency of encrustation. In total, fifty seven samples were taken of *Millepora* encrusting various octocorals. Of the fifty seven, only ten octocorals showed signs of disease. Research suggest that *Millepora* parasitized healthy octocorals compared to octocorals with lesions, purpling, or necrosis. *Millepora alcicornis* was most commonly associated with encrusted octocorals, although *Millepora cervicornis* and *Millepora squarrosa* were also found in close proximity to infected octocorals. There were twelve samples recorded where no *Millepora* spp. colony was present. Research also suggests that there is no correlation between distance and encrustation of *Millepora*. Affected octocorals were found to be touching *Millepora* or up to one hundred centimeters away from the nearest *Millepora* species.

### **Territoriality and aggressive behavior of dusky damselfish, *Stegastes adustus*, in Roatán, Honduras** *Maria Lozada, McLennan Community College*

The dusky damselfish, *Stegastes adustus*, is a Caribbean fish that inhabits shallow waters. Damselfish are well documented as aggressive and territorial towards fish that intrude on to their territories. Territories provide food and clutch space for damselfish to lay their eggs. Aggressive behaviors, depending on the intruder, can include chasing, biting, and charging. This study was conducted to assess territorial behaviors of the dusky damselfish, *Stegastes adustus*, on the Mesoamerican Reef in Roatán, Honduras. Data was collected from May 15-18, 2018, at four dive sites in Roatán, Honduras. "Swimming" was the behavior that was most frequently observed. The least frequently observed behavior was "attacking". "Attacking", "chasing", and "charging" were categorized as aggressive behaviors. "Disregarding", "swimming", "feeding", and "cautiously watching" were categorized as non-aggressive behaviors. From the 111 intruders identified in this study, *Stegastes adustus* had the most interactions with the *Canthigaster rostrata* (sharpnose puffer) and the second most interactions with *Thalassoma bifasciatum* (bluehead wrasse). *Stegastes adustus* had the least amount of interactions with *Scarus guacamaia* (rainbow parrotfish), *Haemulon plumieri* (white grunt), *Bodianus rufus* (Spanish hogfish), *Chromis multilineata* (brown chromis), and *Chaetodon striatus* (banded butterflyfish), with only one aggressive encounter with each of these species. *Stegastes adustus* had more aggressive interactions with carnivorous fish species and more non-aggressive interactions with herbivorous fish species. Future research should compare behavior differences between juvenile and terminal phase among damselfish species.

**The use of optical brighteners to track water quality in the Arroyo Colorado (Texas) drain** *Sara Maldonado, The International Baccalaureate Program at Lamar Academy; Alexa Dezena, The International Baccalaureate Program at Lamar Academy; Alfredo Salas, Classical Conversations of Edinburg, TX; Itzel Salas, Classical Conversations of Edinburg, TX; Fathima Elizondo, The International Baccalaureate Program at Lamar Academy; Daniel Santos, The International Baccalaureate Program at Lamar Academy; Estefania Andrade, The International Baccalaureate Program at Lamar Academy; Josiah Cabeza, Classical Conversations of Edinburg, TX; Julian Cabeza, Classical Conversations of Edinburg, TX; Destiny Garcia, The International Baccalaureate Program at Lamar Academy; Joseph Kowalski, The University of Texas Rio Grande Valley*

Fluorometry can be used to identify the presence and

abundance of human fecal contamination in wastewater by tracing the presence and concentrations of optical brighteners (OB), which are extensively used in laundry detergents as whiteners. They act as an indicator in that their detection and quantification can parallel the concentrations of other pollutants, such as nitrogen and phosphorous compounds. The Arroyo Colorado (AC) is a stormwater, agricultural and municipal drain and is one of the most impaired waterways in the state of Texas. Septic systems are the primary means of handling wastewater discharge along the AC. As part of other studies of the Laguna Madre and AC, the integrity of these septic systems were assessed by sampling the waters of the AC from the LM and into the AC and upstream. There was a clear and significant gradient of OB fluorescence from the LM (ca. 100 ppb) to the LM-AC confluence (500 ppb) that increased substantially farther upstream (>2000 ppb).

### **Community respiration and primary productivity patterns along a salinity and nutrient gradient in the Lower Laguna Madre of Texas** *Fathima Elizondo, The International Baccalaureate Program at Lamar Academy*

Salinity can have a substantial influence on the distribution and abundance of plankton in estuaries. The Laguna Madre (LM) of Texas is an historically hypersaline lagoon that receives stormwater, agricultural and municipal discharge from the Arroyo Colorado (AC). We examined the effect of salinity on primary productivity rates at 5 sites in the LM along a north-south transect during June 2018. There was a clear south to north trend in primary productivity rates and salinity. Primary productivity was inversely related to salinity. Respiration rates were more than one order of magnitude greater in the AC (40.03 nmol hr<sup>-1</sup>) compared to rates in the Brazos-Santiago Pass tidal inlet, with intermediate rates between these end-points. Community net primary productivity (NPP) rates were also proportionally greater (>40 times) in the AC (654.98 nmol hr<sup>-1</sup>), compared to rates at the Pass (15.34 nmol hr<sup>-1</sup>). Underwater light attenuation in the top meter decreased from south (0.69 m<sup>-1</sup>) to north (3.25 m<sup>-1</sup>) at the AC. Water column nitrogen was low (< 1 ppm for NH<sub>4</sub><sup>+</sup> and < 5 ppm for NO<sub>3</sub><sup>-</sup>), even in the AC, while phosphorus was 2 to 5 times more concentrated. NPP and respiration rates around the AC Upstream and mouth sites reflect the dual influences of salinity and water clarity (nutrients). The AC, as a municipal drain, may carry a substantial bacterial load with correspondingly high respiration rates.

### **025-6. Systematics and Evolutionary Biology Poster Session**

Systematics and Evolutionary Biology  
Poster Session

Participants:

**Codon Bias: Do turtles show a preference?** *Vivian Nguyen, University of the Incarnate Word; Brittany Muller, University of the Incarnate Word; David Starkey, University of the Incarnate Word*

After the genetic code was deciphered it was determined that many amino acids (AA) were degenerate i.e., coded for by multiple codons. With the advent of DNA sequencing technology it became apparent that all codons were not utilized with equal frequency and there is codon bias. A variety of hypotheses have attempted to explain this disparity including variable rates of mutation or selection for increased translational efficiency. A variety of studies have investigated codon bias. However many groups are still unstudied. Turtles were chosen for this study based on their unique physiology and life history. Three diverse turtle

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

lineages (softshell, pond, and sea) were utilized. Initially, 3rd codon positions were examined across all lineages. This analysis suggested a preference towards codons ending in A or C ( $p < 0.01$ ). If lineages are examined individually, only soft shells show a similar pattern. Next, the 6-fold degenerate AA, Leucine and Serine, were examined. Each AA shows a similar patterns of codon usage across groups ( $p = 0.899$ ). If Leucine codons are analyzed separately, all lineages preferentially utilize CTA ( $p < 0.01$ ). A similar result is observed in Serine with TCA utilized preferentially ( $p < 0.01$ ). If all codons are examined, 3 codons (GAC, GGA, CTA) are utilized preferentially in sea turtles ( $p < 0.01$ ). Four additional codons (ATC, ACT, CTT, ATT) are utilized preferentially in sea turtles and softshells ( $p < 0.01$ ). Overall, these results suggest a bias in codon usage exists in turtles. Investigations are currently underway to determine whether this bias reflects genomic rates of mutation or selection regarding translational efficiency.

**Cytochrome B Sequences to Determine Clade Assemblages of *Lonchophylla* Species (Phyllostomidae: Lonchophyllinae).** Austin Biddy, Texas Tech University

The order Chiroptera is comprised of 20 families, and the Phyllostomidae are New World leaf-nosed bats. Of the various subfamilies within Phyllostomidae, Lonchophyllinae are nectarivorous bats, endemic to Peru, Bolivia, and Brazil north to Nicaragua. Lonchophylla was the first genus described of Lonchophyllinae, with *L. mordax* as the type species. Lonchophyllinae are characterized by the absence of a zygomatic arch and inner upper incisors that are large and forwardly projecting. *Lonchophylla orienticollina* was first described in 2008, and is distributed from eastern Venezuela to northern Colombia and to eastern Ecuador. *Lonchophylla orienticollina* is sympatric with the morphologically similar *L. robusta*, which may indicate a close relationship between the two taxa. *Lonchophylla orienticollina* is also genetically similar but morphologically distinct when compared to *L. handleyi*. Bayesian analyses support divergence between *L. orienticollina* and *L. robusta*, based on CytB sequences, which was not recovered in previously published analyses. After increasing the sample size of *L. orienticollina*, these data suggest a stronger support of *L. orienticollina* as a separate species, and reinvestigation of the evolutionary relationships between *L. robusta* and *L. orienticollina* should be evaluated.

***Estigmene acrea* Crossing Dunes with “Island Hopping” Technique** Alexander G Martinez, Sul Ross State University

Alexander G. Martinez, Leticia Martinez, Dr. Christopher M. Ritzi Abstract *Estigmene acrea* is a commonly recognized fuzzy black caterpillar that occurs over a broad distributional range. Due its broad range, it can utilize a variety of habitats during its quest for ideal conditions. For this reason, it has a broad diet, being capable of consuming and sequestering pyrrolizidine alkaloids from numerous Asteraceae for protection. It is well documented how these caterpillars distribute themselves through vegetated areas, however, it is poorly understood how they distribute themselves in a poorly vegetated, arid habitats. The behavior to adjust for this condition appears to function as an “island hopping” technique. This was recently observed in that the caterpillars would be found to aggregate on a few plants in an area of available varied plants, while moving southernly toward its preferred food source, *Senecio flaccidus*. The observations took place in November of 2018, in which three individual caterpillars were found crossing the dunes in this manner. Each caterpillar was moving at a different pace due to the cool temperatures, but all were moving south. Further

explanation of this behavior will be presented.

**Range extension of *Ashmunella carlsbadensis*, the Guadalupe Woodlandsnail, and its relationship with other *Ashmunella*** Alison Schofield, University of Texas Rio Grande Valley; Ben Hutchins, Texas Parks and Wildlife; Jeff Nekola, University of New Mexico; Kathryn Perez, University of Texas Rio Grande Valley

*Ashmunella*, a genus of land snails in the Polygyridae, consists of 39 species commonly found living or as fossils in the mountains of New Mexico and Texas. This genus lives on talus slopes and deciduous forests with diverse flora at high elevation. *Ashmunella carlsbadensis* is characterized by its angled, pointed aperture and is a critically imperiled species. *Ashmunella carlsbadensis* was previously known from the Guadalupe Mountains in Texas along the escarpment to near Carlsbad Caverns National Park in New Mexico. During a recent survey, we found individuals matching the description of this species alive in the Sierra Diablo Mountains - a range extension of ~70 km south for this species in Texas. Using the cytochrome oxidase 1 gene, we found this species to be most closely related to a group of *Ashmunella* from the southeastern mountains of New Mexico. Some members of this clade have very round shells and minimal teeth, indicating that these traits have been gained and lost multiple times in the *Ashmunella*.

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

**026. Graduate Competition Oral Session**

Graduate Student Paper Competition

Paper Session

10:00 to 11:40 am

*Mims Theater Hall: Mims Theater Hall*

Participants:

10:00 **Assessing species-specific responses to forest restoration interventions in the Lower Rio Grande Valley** *Faeqa Mohsin, The University of Texas Rio Grande Valley; Kimberly Wahl-Villarreal, US Fish and Wildlife Services; Willemijn Stoffels, Land Life Company; Gautham Ramachandra, Land Life Company; Tom Janmaat, Land Life Company; Bradley Christoffersen, The University of Texas Rio Grande Valley*

Agriculture and urbanization activities have wiped out over 95% of the original vegetation of the Lower Rio Grande Valley (LRGV) including 99% of the native brush in riparian areas. Since the 1990s, various initiatives have been taken to restore the original vegetation of the LRGV. However, over the next few decades an increase in the incidence of prolonged droughts is expected, creating unprecedented challenges for restoration initiatives. Research that elucidates species-specific responses to restoration interventions (RIs) aimed at minimizing seedling mortality post-planting is scarce, particularly among the native species of the LRGV. Therefore, in August 2018, we initiated a study to evaluate seedling survivorship of 24 native species in response to RIs incorporating some combination of physical seedling shelters, 5 gallons of slow-release moisture, and mycorrhizae in a semi-factorial design. Seedlings were planted in October – November of 2018. Preliminary assessments indicate large treatment differences in survivorship due to mammalian herbivory, with large species differences in survivorship as well. A comprehensive understanding obtained through studying the plant traits associated with higher seedling survivorship would facilitate the modification and implementation of sustainable restoration strategies in the future.

10:20 **Comparison of snail communities of the lower Rio Grande Valley of Texas in urban and wild areas** *Briante Najev, University of Texas Rio Grande Valley; Alison Schofield, University of Texas Rio Grande Valley; Jeff Nekola, University of New Mexico; Ben Hutchins, Texas Parks and Wildlife; Kathryn Perez, University of Texas Rio Grande Valley*

The lower Rio Grande Valley (LRGV) of Texas and Mexico has one of the highest rates of urbanization in the world and the last remaining Tamaulipan Thornforest of Texas. In LRGV, most faunal urban ecology research focuses on vertebrates. We used snails as an example of an invertebrate fauna that resides in wild Tamaulipan Thornforest and one major type of urbanized habitat (urbab yards) to determine if urbanized habitats can provide a refugia for native invertebrate fauna. We found that diversity measures for urban snail communities (n=84; mean species richness = 4.8; mean species evenness = 0.6; mean Shannon-Wiener diversity index = 0.8) were not significantly different compared to wild sites (n=26; mean species richness = 5.03; mean species evenness = 0.6; mean Shannon-Wiener diversity index = 0.7). However, while urban yards are a safe haven for many introduced and synanthropic species, they contained fewer native species compared to native habitats. The urban habitats in this study were traditional lawn-style yards dominated by non-native grass and characterized by low plant diversity. However, additional research is needed

to determine whether “natural yards”, which are usually designed to benefit butterflies and birds, can also sustain viable populations of native snail fauna in the LRGV and other ecoregions experiencing rapid urbanization.

10:40 **Data collection methods and species traits influence species distribution model predictions**

*Elizabeth Roesler, Texas Tech University; Timothy B. Grabowski, University of Hawai'i at Hilo; Matthew A. Barnes, Texas Tech University*

For effective conservation, managers first must understand where species occur. A useful tool for understanding ranges are species distribution models (SDMs), which predict potential ranges by relating known occurrences with environmental factors. SDMs assume that occurrence data provide an accurate representation of a species range; however, SDMs commonly use museum specimens or self-reported data, which may not meet this assumption. Therefore, we assessed the influence of data collection methods on SDM performance and further evaluated whether performance differed between taxa with different life history and physical traits. We used a suite of fish species found in the Texas Gulf representing a variety of characteristics that could influence SDM performance. We compared the systematic and random sampling data provided by the Coastal Fisheries Division of Texas Parks and Wildlife (TPWD) and the opportunistic sampling data provided by the Fishes of Texas Database (FoTx). SDMs of the Gulf fishes demonstrated that both data source and species traits affected model predictions. The AUC values (indicators of model strength) for FoTx were higher than TPWD for all fish species, indicating strong predictive performance. However, these data were more haphazardly collected than TPWD, likely causing model overfitting. Model performance was highest for species with longer lifespans, lower dispersal ability, and ones that were less common. Overall, our research demonstrated the impact of data collection method and species traits on SDM performance. Thus, consideration of these factors will improve the effectiveness of predictions from SDMs for conservation, management, and research.

11:00 **Miocene modernization of North American lizard fauna** *Simon Scarpetta, University of Texas at Austin*

Previously reported fossil evidence suggests that extant North American lizard genera first appeared during the Miocene, concurrent with modernization of global climate and ecosystems. However, the identifications of those fossils were not supported by evolutionarily-derived (apomorphic) features, and many extant taxa are poorly represented in pre-Pleistocene sediments. Here, I report on the first-known fossils of some lizards (*Uma*) and augment the known fossil record of others (*Crotaphytus*, *Gambelia*, *Sceloporus*). I use rigorous apomorphy-based diagnoses to support my identifications. I performed integrated divergence-time analyses of fossil data and molecular data, and confirmed that many extant lizard lineages currently inhabiting North America did evolve during the Miocene. I also found important ecological and biogeographic differences between the modern lizard biota and the Miocene lizard biota. For example, while extant *Uma* are sand-dune specialists, the clade was not restricted to that habitus during the Miocene. Modern *Gambelia* are largely found in the American southwest, but inhabited the Great Plains as recently as 16 Ma. Additionally, representatives of iguanian lizard clades that are now largely confined to the tropics (e.g. *Dactyloidae*, *Iguanidae*) were found far north of their extant distribution at least until the middle Miocene. Based on those findings, I encourage caution when using the modern

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule

biota to make direct inferences about past environments and biogeography.

**11:20 Using diceCT as a novel approach to the comparative anatomy of degenerate neural structures**  
*Ruben Tovar, The University of Texas; Paul Gignac, Oklahoma State University Center for Health Sciences*

The paedomorphic *Eurycea* salamander clade of Central Texas exemplifies a continuum of morphological characteristics associated with aquatic-subterranean living: the surface-dwelling Texas salamander (*E. neotenes*) exhibits typical optic anatomy and acuity; the intermediate Comal blind salamander (*E. tridentifera*) maintains reduced but non-functional eyes; and the obligate subterranean Texas blind salamander (*E. rathbuni*) has an incompletely developed optic system. Together this genus represents a transformation series of karst phenotypes and a potentially exemplar system for using comparative approaches to understanding vertebrate ocular evolution in the face of relaxed selective pressures. More than a century ago Eigenman described ocular histology in *E. rathbuni* adults as a focal stygobite; yet, neither the extent of optic-nerve persistence in this taxon nor among its congeners has since been documented. In this study we employed gross and micro-scale imaging techniques to elucidate features of *Eurycea* optic anatomy with a particular interest in the central nervous system. Specimens from aforementioned taxa were fixed with 100% EtOH, contrast-enhanced with alcoholic iodine (I2E), micro-CT scanned, and digital reconstructed using 3D rendering software for comparison to histological sections. Here we report on the 3D, internal soft-tissue systems of the eye in each taxon, documenting habitat-specific configurations of optic musculature and neuroanatomy for the first time—including for *E. rathbuni*, which surprisingly appears to retain complete bilateral optic nerves even though it lacks the mid-line decussations associated with an optic chiasm.

**027. Lunch**

Texas Academy of Science Annual Meeting  
Special Event  
12:00 to 1:30 pm  
*Mabee Center: Cafeteria Area*

**028. Section Chairs post Session Meeting**

Texas Academy of Science Annual Meeting  
All Section Meeting  
1:30 to 2:00 pm  
*Winebrenner Science Building: Floor first - 121*

**029. Science Jeopardy**

Texas Academy of Science Annual Meeting  
Special Event  
1:30 to 2:30 pm  
*Mims Theater Hall: Mims Theater Hall*

**030. TAS Business Meeting**

Texas Academy of Science Annual Meeting  
Business Meeting  
2:30 to 3:00 pm  
*Mims Theater Hall: Mims Theater Hall*

**031. Texas Outstanding Educator Award and Lecture**

Texas Academy of Science Annual Meeting  
Plenary Session  
3:00 to 3:30 pm  
*Mims Theater Hall: Mims Theater Hall*

**032. Distinguished Texas Scientist Award and Lecture**

Texas Academy of Science Annual Meeting  
Plenary Session  
3:30 to 4:00 pm  
*Mims Theater Hall: Mims Theater Hall*

**033. Reception**

Texas Academy of Science Annual Meeting  
Special Event  
6:00 to 7:00 pm  
*Brownwood Regional Airport Hanger*

**034. Awards Banquet**

Texas Academy of Science Annual Meeting  
Special Event  
7:00 to 9:30 pm  
*Brownwood Regional Airport Hanger*

Texas Academy of Science: 122<sup>nd</sup> Annual Meeting @ Howard Payne University  
Program Schedule