

113th Annual Meeting of the Texas Academy of Science



Program and Abstracts



**March 4-6, 2010
Tarleton State University
Stephenville, Texas**

Schedule of Events

Thursday, March 4, 2010

1:00 – 4:00 pm	TAS Board of Directors	Science 134
4:00 – 7:00 pm	Registration	Science 1 st Floor Foyer
7:00 – 9:00 pm	Welcome Reception	Thompson Student Center
7:30 – 8:15 pm	Planetarium Show	Science Lobby
7:45 – 8:30 pm	Roundtable Discussion: Teaching Tips	Science 122
7:45 – 8:30 pm	Roundtable Discussion: Connecting Academic and Nonacademic Professionals	Science 134
7:45 – 8:30 pm	Roundtable Session: TAS Student Research Grant Writing 101	Science 136
8:30 – 9:15 pm	Roundtable Discussion: How to Write and Publish with Students	Science 122
8:30 – 9:15 pm	Roundtable Discussion: Connecting Academic and Nonacademic Professionals	Science 134
8:30 – 9:15 pm	Roundtable Session: The Ins and Outs of Graduate School	Science 136
8:30 – 8:50 pm	Planetarium Show	Science Lobby

Friday, March 5, 2010

7:30 am	Registration	Science 1 st Floor Foyer
8:00 – 9:40 am	Early Morning Oral Presentations and Symposia	Science Building
9:40 – 10:20 am	Poster Session and Break	Science Hallways
10:20 – 12:00 pm	Late Morning Oral Presentations and Symposia	Science Building
12:00 – 12:40 pm	Lunch	Thompson Student Center
12:40 – 1:20 pm	Poster Session II	Science Hallways
1:20 – 4:00 pm	Afternoon Oral Presentations, Symposia, and Section Meetings	Science Building
4:00 – 4:30 pm	Section Chairs Meeting	Science 109
5:00 – 5:30 pm	TAS Business Meeting	City Limits
5:30 – 6:00 pm	Outstanding Texas Educator Presentation	City Limits
6:00 – 6:45 pm	Texas Distinguished Scientist Presentation	City Limits
6:45 – 7:30 pm	Social Time	City Limits
7:30 – 9:00 pm	Awards Banquet	City Limits

Saturday, March 6

8:00 am–2:00 pm	Geology Field Trip	Parking lot, Science Building
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Future Meetings

2011 St. Edward's University, Austin
 2012 Sul Ross State University, Alpine
 2013 Schreiner University, Kerrville

**113th Annual Meeting
of the
Texas Academy of Science**

March 4-6, 2010

Tarleton State University
Stephenville, Texas

President
William Quinn

Program Chair
Benjamin Pierce

Awards Chair
Romi Burks

Local Host
Carol Thompson

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Letter from the President of the Texas Academy of Science

Not too long ago, I was working at a summer orientation session at St. Edward's University, visiting with some parents about the transition into college. One parent was surprised to learn that I had originally come to St. Edward's on an appointment in computer science, not seeing much of a relationship between what I do as an ecologist and CS. I explained that, way back when computer memory and CPU capacity cost outrageous amounts of money, people like me had to take great care that our programs were translated into machine code that ran as efficiently as possible. As a consequence, all of us coming out of graduate school paid a lot of attention to the details of computer programming. I am certain that our experiences as ecologists were not unique, and we regularly worked alongside of people with a wide array of backgrounds.

That conversation reminds me that people outside of science probably fail to see much connection between such things as ecology and computer science, or among all the sub-disciplines in which we immerse ourselves. It might seem strange to us, but I think most people see very little connection between physics and biology, between mathematics and chemistry. Specialization tends to project science as a large set of unrelated fields, and our culture reinforces some independence of thought. Take a quick look at journal titles if you don't think so.

The Texas Academy of Science represents an alternative view. This weekend, several hundred of us gather as scientists and/or science educators to learn about research across a broad spectrum. We will attend presentations in Geosciences, Systematics and Evolutionary Biology, and Biomedical Sciences among many, many areas. We can move from a presentation in one room to a presentation in an adjoining room and learn about completely different topics. One reason this is my favorite weekend of the year is that this meeting provides us with a rare opportunity to integrate across sub-disciplines in a way that is almost unparalleled. Thank you to all authors, presenters, organizers and hosts for making this unique and gratifying event possible.

We are especially indebted to the Program Chair, Dr. Ben Pierce, the Local Host, Dr. Carol Thompson, the Executive Secretary, Dr. Fred Stevens, our Web Administrator, Dr. Pati Milligan, and all of our section chairs for seeing to so many of the details that have not only made it possible, but downright great. Thanks also to Dr. Romi Burks, Dr. Don Harper, Dr. David Marsh, Dr. Lynn McCutchen and Dr. Jim Collins for organizing many of the award events.

Throughout its history, the Academy has played an important role in research, service and education. More than any other organization of which I am a member, the Academy is its members. Thank you for your service to the state, the nation and the world. Your contributions have been and will continue to be important to the social and intellectual good. Have a great weekend.

Sincerely,
William J. Quinn
President, Texas Academy of Science





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January 18, 2010

Dear Members of the Texas Academy of Science:

Welcome to Stephenville, Texas! It is our pleasure to serve as host city for the 113th Annual Meeting of the Texas Academy of Science.

Our citizens are proud of our Texas heritage and stand behind our State Motto—Friendship. Therefore, you will find our citizens friendly and helpful.

Please take the time to visit our local attractions centered around our Western Heritage. Our Cowboy Walk of Fame is located downtown adjacent to City Hall, and features rodeo celebrities, who, throughout the years have called Stephenville “home”. Ty Murray, Tuff Hedeman, and Cody Ohl are just three of the many rodeo professionals honored.

The City of Stephenville is fortunate to be home to Tarleton State University. Tarleton has enjoyed consistently steady growth with progressive leaders at the helm. Currently five major construction projects are underway totaling \$66.5 million. Included in these projects are a state-of-the-art nursing facility, regional dairy center, three-story residence hall, and utility infrastructure improvements. City officials are pleased to partner with Tarleton in order to provide the best possible home to its citizens and students.

I hope you enjoy your stay and invite you to come back soon.

Sincerely,

Nancy A. Hunter
Mayor





Office of the President
TARLETON STATE UNIVERSITY

January 13, 2010

Dear Members of the Texas Academy of Science:

On behalf of our faculty, staff and students, I would like to welcome you to the campus of Tarleton State University. My colleagues and I are eager to host the 113th Annual Meeting of the Texas Academy of Science. We are appreciative of the involvement of TAS in the promotion of science education and research in Texas.

Founded in 1899, Tarleton State University is now one of the state's fastest growing institutions with an enrollment exceeding 9500 students. A member of The Texas A&M University System since 1917, Tarleton now serves as the educational and cultural flagship of the Cross Timbers Region.

I am especially delighted that you will be holding your sessions in the Tarleton Science Building, which houses the Department of Chemistry, Geosciences and Environmental Sciences, and the Department of Biological Sciences. In addition to state-of-the-art classroom and laboratory facilities, our Science Building houses the only planetarium in the area, serving approximately 15,000 visitors each year.

A hub of scientific activity, the Science Building was designed to create a connection between traditional science departments, encourage an interactive science community and to support multidisciplinary collaborations in research and teaching, essentially paralleling the mission of the Texas Academy of Science.

Tarleton State University is pleased to extend a Texas-sized welcome and hopes your conference is an enriching experience.

Sincerely,

F. Dominic Dottavio, Ph.D.
President

2010 Texas Distinguished Scientist

Dr. James R. Dixon
Professor Emeritus, Texas A&M University
Curator Emeritus of Amphibians and Reptiles
Texas Cooperative Wildlife Collection

“A Teacher's Toys and Tools”



Dr. James “Jim” Dixon can best be described as the grandfather of Texas herpetology. Without a doubt, he has done more to promote the study of amphibians and reptiles within the state of Texas than any other single individual. His books, *Amphibians and Reptiles of Texas* and *Texas Snakes*, have been **the** resources on Texas amphibians and reptiles for both scholars and amateurs alike. These books have reached a wide audience and been highly influential to both scientists and the lay public.

Dixon comes from a pioneering family that entered Texas from Arkansas in the early 1830's. A product of El Campo public schools, he spent much of his early years on the Shanghi Pierce estate along the west side of the Colorado River in Wharton County. According to his mother (now deceased), Dixon's interest in cold-blooded critters began before he could walk. Throughout high school and his undergraduate years, he kept many of his critters at home, much to the interest of his neighbors. Dixon earned his Bachelor's degree from Howard Payne University in 1950. Immediately after graduation, Dixon entered the Korean conflict by joining the U.S. Marine Corps and spent the next three years between stateside and the Korean Peninsula. One of his first published herpetological papers described the herpetological material he managed to collect while in Korea.

After discharge from the Marines, he worked as a lecturer for Ross Allen in Florida, received a MS degree from Texas A&M University in Wildlife Science (1957) and a Ph.D. in Zoology, from the same institution in 1960. For the next 40 years, Dixon has spent much of his university research time in the state of Texas, Mexico, Central and South America. He made his last trip to Brazil in 2004. He has published only about 350 science articles in Herpetology (a few

in Ichthyology, ornithology, and mammalogy), produced some 7 books, and currently fills his time working on two more.

None of the above would have been possible without substantial financial support, which included NSF, Sigma Xi, FUNDINA, The Venezuelan government, State of Texas, and many small grants. He has led scholarly societies, such as Texas Academy of Science (1973), Herpetologists League (1988-89), Society for the Study of Amphibians and reptiles 1974), Southwestern Association of Naturalists (1970), Sigma Xi Chapter, Texas A&M University (1973), Texas Herpetological Society (1961, 1971), and remains an active member in most of them. For many years Dixon served as chairperson of the Region II, Fish and Wildlife Service, Herpetological Advisory Team, and the Chihuahuan Desert Research Institute. In between his field work, Dixon has personally reached out to help out a number of Texas herpetologists at several points in their careers, with or without formal associations or collaborations with him. Most often when seen at meetings, Dixon can be found always hanging out with the students and young scientists.

2010 Outstanding Texas Educator

Ms. Mila Bersabal
11th and 12th Grade Physics Teacher
Lee High School
Houston Independent School District

“Harnessing Curiosity for Scientific Discovery:
Tapping the Inner Child in the Bored Teenager”



Mila A. Bersabal hails from Bohol in the Philippines. Ever since she was a child, she has always been fascinated with science. She graduated as class valedictorian in her high school, received seven special awards, including the Scientist of the Year. She graduated *magna cum laude* with a Bachelor of Science in Physics Education from Philippine Normal University where she excelled as a Department of Science and Technology scholar. She also obtained a Master of Science degree in Physics Education as a Presidential scholar at the University of the Philippines, and received the Best in Thesis award.

At age 20, Mila started her career as a physics teacher in Cebu City Science High School, and served as coach and judge in many science bowls and science fairs in her country. After obtaining her Master's degree, she then took on the role of physics instructor to medical students in the University of the Philippines. In 2001, Mila came to Houston as a physics teacher in Houston ISD. She currently teaches Physics, Pre-AP Physics and AP Physics at Lee High School.

Co-workers describe her as possessing not only the confidence and expertise of her discipline but also the ability to inspire young minds. Her deeply held conviction that all children deserve equitable and adequate resources and opportunities to excel, as well as her unwavering commitment to ensuring student success, drives her to levels of consistently exemplary performance. She pushes children to learn and achieve beyond their own perceived limits and demonstrates that all children can learn to high standards when given appropriate and thoughtful instruction.

Her passion for science teaching has earned her several awards and recognitions such as the 2006 Wilhelmina P. Robertson's Excellence in Science and Mathematics Teaching, 2007 Teacher of the Year in Lee High School, 2007

NOCChe Teacher of the Year - Gulf Coast Chapter, 2009 HISD West Region KBR Science Teacher of the Year, and currently, a Texas Finalist for the Presidential Awards for Excellence in Mathematics and Science Teaching.

2010 Fellow of the Texas Academy of Sciences

Dr. Matthew M. Chumchal
Assistant Professor of Biology
Texas Christian University



Dr. Matt Chumchal earned a B.S. with Honors in Biology from Southwestern University in 1997. In 2003, he earned an M.S. in Biology from Texas Christian University where his thesis research focused on the effects of common carp on macrophyte and plankton communities and water quality. He went on to complete a Ph.D. in Zoology from the University of Oklahoma (2007) where his dissertation research focused on ecological factors affecting mercury contamination in fish from Caddo Lake. As a student, Chumchal actively participated in Texas Academy of Science meetings and served as one of the first recipients of a student research grant.

In Fall of 2007, Chumchal returned to Texas as an Assistant Professor of Biology at Texas Christian University. At TCU, his research focuses on mercury contamination of aquatic food webs in locations throughout Texas and surrounding states. Since coming to TCU, Chumchal has acquired \$130,000 in external support, published 6 peer-reviewed articles (with 2 currently in revision), authored or coauthored 41 presentations at scientific meetings (including several at the Texas Academy of Sciences), and mentored one TCU MS student (with five others in progress) and numerous undergraduate students. Together with current TAS Vice-President Dr. Romi Burks, Chumchal recently co-authored a publication (2009) in *Science Signaling* about how to write, publish and negotiate issues of authorship with undergraduate students. Chumchal has served as the Chair of the Freshwater Science section since 2008.

2010 Fellow of the Texas Academy of Sciences

Dr. Peter J. King
Assistant Professor of Biology
St. Edward's University

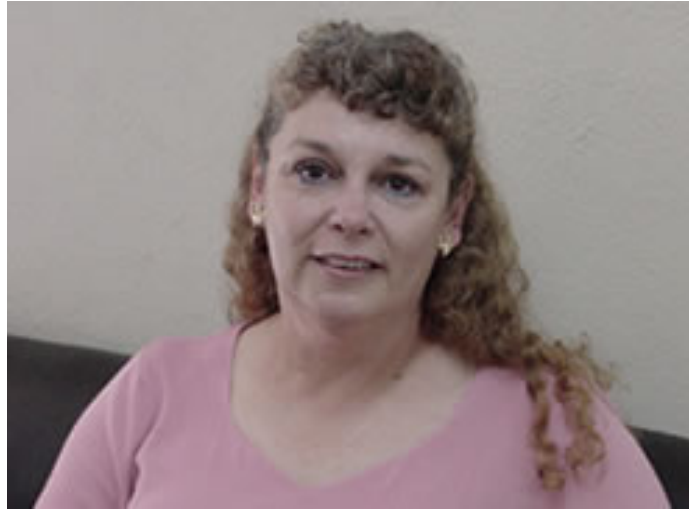


Dr. Peter King earned a B.S. in Biology from San Diego State University and went on to complete a Ph.D. in Biological Sciences from the University of California, Irvine. He then worked as a postdoctoral researcher at the Centers for Disease Control and Prevention in Atlanta where he developed a patent for an "immunological assay for detection of latent tuberculosis in a subject", before joining the faculty at Stephen F. Austin State University. He joined the St. Edward's University's Department of Biological Sciences in 2004 where he continues to study the structure and function of HIV retroviral integrase. In 2007, King and two colleagues received a WM Keck Foundation Research and Undergraduate Programs Grant. In addition, they just submitted an NIH grant to study the reactivation of *Mycobacterium tuberculosis* infection.

King joined the Texas Academy of Sciences in 2004 and has since attended every annual meeting. At St. Edward's University, he serves as an advisor for the Collegiate Academy. In 2009, King served as Vice-Chair for the Cell & Molecular Biology Section and takes over as Chair of the Section in 2010. King maintains a very active program of research with undergraduates and his students have presented their research at our annual meetings. King maintains an active publication record and has just been nominated by the School of Natural Sciences as a candidate for the university's outstanding teaching award.

2010 Fellow of the Texas Academy of Sciences

Dr. María de Lourdes Lozano Vilano
Facultad de Ciencias Biológicas
Universidad Autónoma de Nuevo León in Monterrey, México



Dr. Lozano-Vilano frequently receives national recognition in México for her research contributions focused on native and introduced fish species of the northeastern region of her country. Furthermore, she has demonstrated consistent dedication and commitment to having her student researchers participate in the activities of the Texas Academy of Science. Lozano-Vilano recognizes the importance of international participation. The Academy feels fortunate to have such an active and recognized researcher from México among our current active membership. She and her students have traveled from Mexico to give research presentations during our Annual Meetings in 2005 (UT-Pan American), 2007 (Baylor University), 2008 (Corpus Christi) and 2009 (Texas Tech Campus at Junction). She also played an instrumental in the planning and organization of the participants from México in the TAS Gulf of México Symposium which took place in Corpus Christi in 2008. Most recently, she served as the local host for the SWAN meeting in Monterrey, México in April of this year.

2010 Fellow of the Texas Academy of Sciences

Dr. Allan D. Nelson
Associate Professor of Biology
Tarleton State University



Dr. Allan Nelson received a B.S. and a M.S.T. from Tarleton State University. He received a Ph.D. from the University of Oklahoma in Botany. He is currently an Associate Professor of Biological Sciences at Tarleton State University. His research specialty consists of systematics in *Chelone* and *Nothochelone* (Scrophulariaceae) as well as floristics of the West Cross Timbers and Coastal Plain of Texas. Nelson's broader research interests focus on rare and endangered plants of Texas and Oklahoma and in using vegetative ecology to examine habitat of rare animals. He has served as Chair and Vice Chair of the Botany Section of the Texas Academy of Science.

Nelson and his students have given numerous research presentations and posters at the annual meetings of the Academy. He regularly reviews papers and publishes research findings in *The Texas Journal of Science*. Recently, he took over as Manuscript Editor for the journal. A colleague of his wrote that Allan "helps lead the way in Science Education for the Biology Department at Tarleton State University. By doing so, he helps prepare Texas' next generation of scientists. Nelson completes the triangle of education, research, and service supported by the Texas Academy of Science."

2010 Fellow of the Texas Academy of Sciences

Dr. John T. Sieben
Professor of Mathematics
Texas Lutheran University



Dr. John T. Sieben holds a position as a professor of mathematics at Texas Lutheran University, Seguin, TX. He received his Ph.D. in Mathematics from the University of Missouri, Kansas City. Sieben formerly chaired the department currently serves as Dean of the College of Arts and Sciences at TLU. He has held this position for the last ten years and looks forward to completing his career in administration this year as he finishes with an appointment as Interim Associate Provost. As of May 2010, he will again be a full time faculty member in the TLU Department of Mathematics.

Sieben's early research interests focused on complex function theory. Now, in the latter part of his career, he plans to turn his attention toward strategies for dealing with innumeracy at the elementary, secondary and college levels. Sieben holds a particular interest in the uses of technology in the teaching of mathematics. His training in computer science (MS Computer Science, Texas State University) will be particularly useful in this pursuit.

Sieben has served as the President of the Texas Academy of Science and currently serves on the Board as Director of Development. He also remains active in the Texas Section of the MAA (Mathematics Association of America) where he currently is the Section Chair. He has been the recipient of the Texas Section Distinguished Service Award. Besides an interest in mathematics and computers, Dr. Sieben also enjoys life as a SCUBA instructor and underwater photographer. He enjoys bicycle riding, boating, and reading mystery novels.

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Vice-Chair: Vacant

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Chair: Patricia Ritschel-Trifilo
Hardin Simmons University
2200 Hickory St, Box 16165
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Vice-Chair: Roberto Gonzales
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SYSTEMATICS AND EVOLUTIONARY BIOLOGY:

Chair: Tara Maginnis
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Phone: 512-471-5163
E-Mail: taramaginnis@austin.rr.com

Vice-Chair: Andrea B. Jensen
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Abilene, Texas 79698
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TERRESTRIAL ECOLOGY & MANAGEMENT:

Chair: Richard Patrock
St. Edward's University
Austin, Texas 78704-6487
Phone: 432-837-8420
E-mail: rpatrock@gmail.com

Vice-Chair: Michael Janis
Matador Wildlife Management Area
3036 FM 3256
Paducah, Texas 79248
806-492-3405
mjanis@caprock-spur.com

Texas Academy of Science 113th Annual Meeting

Symposia

The Texas Evolution Controversy

Organizer: Benjamin Pierce, Department of Biology, Southwestern University

Room: Science 102

Time: 10:20 am – 3:00 pm

The Edwards Plateau Stream Diversity

Organizer: David Pendergrass, Texas Institute for Applied Environmental Research, Tarleton State University

Room: Science 105

Time: 8:00 am – 12 noon

Bionanotechnology and Environmental Research

Organizer: Olufisayo Jejelowo, TSU NASA URC Center for Bio-Nanotechnology and Environmental Research, Texas Southern University

Room: Science 110

Time: 1:20 pm – 3:40 pm

Planetarium Shows and Field Trips

Thursday, March 4

7:30 PM **Planetarium Show** - Ringworld - The story of the international Cassini/Huygens mission to Saturn and Titan, produced by a team led by NASA's Jet Propulsion Laboratory. The Cassini-Huygens mission is an ambitious one-with its sophisticated instruments and sheer size, it is difficult to visualize, and even more difficult to study. **1st Floor Science Building**

8:30 PM **Planetarium Show** - Journey to the Edge of Space and Time - This dynamic 20-minute show, produced by the Charles Hayden Planetarium in Boston, and the NASA-Smithsonian Education Forum, takes the audience on a journey to super massive black holes, giant galaxy clusters, the universe's earliest moments, and even to parallel universes that challenge the imagination **1st Floor Science Building**

Saturday, March 6

8:00 AM **Geology Field Trip** - Erath and Palo Pinto counties - discover Pennsylvanian deltaic deposits and collect fossils plus a stop in Thurber to consider Industrial History and Coal mining in Texas. Car caravan. Return 1:00-2:00 pm. **Meet in parking lot on north side of Science Building**

2010 Program Agenda

Codes indicate the following:

- NS Non-student
- U Undergraduate student
- G Graduate student
- P Poster
- * Presenting author

Attention Poster Authors

All poster authors should be beside their posters during the poster sessions from 9:40-10:20 am and 12:40-1:20 pm.

All undergraduate and graduate poster presenters must be present next to their posters during the entire time of both posters sessions in order to meet with judges and be eligible for student awards.

4:00 PM	THURSDAY REGISTRATION	Science 1st Floor Foyer
7:00 PM	WELCOME RECEPTION	Thompson Student Center

SPECIAL ROUNDTABLE DISCUSSIONS

Session I

7:45 PM	Professional Session: Teaching Tips	Science 122
7:45 PM	Professional Session: Connecting Academic and Nonacademic Professionals	Science 134
7:45 PM	Student Session: TAS Student Research Grant Writing 101	Science 136

Session II

8:30 PM	Professional Session: How to Write and Publish with Students	Science 122
8:30 PM	Professional Session: Connecting Academic and Nonacademic Professionals	Science 134
8:30 PM	Student Session: The Ins and Outs of Graduate School	Science 136

PLANETARIUM SHOWS

7:30 PM	Ringworld	Science Lobby
8:30 PM	Journey to the Edge of Space and Time	Science Lobby

7:30 AM

FRIDAY REGISTRATION

**Science 1st
Floor Foyer**

SYMPOSIUM ON THE TEXAS EVOLUTION CONTROVERSY

10:20 AM

Friday, March 5

Science 102

10:20 AM NS 649 INTRODUCTION TO THE TEXAS EVOLUTION
CONTROVERSY SYMPOSIUM

Benjamin A. Pierce, Southwestern University, Georgetown, TX

10:30 AM NS 384 THE EVOLUTIONISTS AND THE SBOE: A VIEW FROM
THE TRENCHES

Ronald K. Wetherington, Southern Methodist University,
Dallas, TX

11:00 AM NS 631 STAND UP FOR SCIENCE: THE POLITICS OF SCIENCE
EDUCATION AT THE TEXAS STATE BOARD OF
EDUCATION

Katherine Miller, Texas Freedom Network, Austin, TX

11:30 AM NS 381 EVOLUTION AND THE TEXAS SBOE: RESULTS &
IMPLICATIONS

Sandra West, Texas State University, San Marcos, TX

12:00 PM

Lunch

**Thompson
Student
Center**

12:40 PM

Poster Session II

**Science
Hallways**

1:30 PM NS 382 EVOLUTION AND INTELLIGENT DESIGN: LESSONS
FROM HISTORY

Elizabeth Green Musselman, Southwestern University,
Georgetown, TX

2:00 PM NS 613 SURVEY OF FACULTY WHO TEACH EVOLUTION AND
SOME PEDAGOGICAL IMPLICATIONS

Raymond A. Eve and Shawn M Christensen, University of
Texas at Arlington , Arlington, TX

2:30 PM NS 476 EVOLUTION AND CREATIONISM AT A CHRISTIAN
UNIVERSITY

R. E. Duhrkopf, Baylor University, Waco, TX

SYMPOSIUM ON EDWARDS PLATEAU STREAM DIVERSITY

8:00 AM	Friday, March 5		Science 105
8:00 AM	NS	383	<p>AQUIFER DEPENDENT FISHES OF THE EDWARDS PLATEAU</p> <p>Robert J. Edwards, University of Texas-Pan American, Edinburg, TX, Gary P. Garrett, Texas Parks and Wildlife Department, Mountain Home, TX and Nathan Allan, U.S. Fish and Wildlife Service, Austin, TX</p>
8:20 AM	NS	520	<p>EDWARDS PLATEAU AQUATIC MACROINVERTEBRATE RICHNESS AND ENDEMICITY IN A REGIONAL AND GLOBAL CONTEXT</p> <p>David Pendergrass, Texas Institute for Applied Environmental Research, Stephenville, Texas</p>
8:40 AM	NS	512	<p>ENVIRONMENTAL FLOWS IN THE EDWARDS PLATEAU REGION OF TEXAS</p> <p>Ryan Smith, The Nature Conservancy, San Antonio, TX</p>
9:00 AM	NS	505	<p>INVASIVE SPECIES AS FACTORS IN THE STRUCTURE, ECOLOGY, WATER PLANNING AND POLICY OF EDWARDS PLATEAU AQUATIC ECOSYSTEMS</p> <p>T.L. Arsuffi, Llano River Field Station, Texas Tech University, Junction, TX 76849 and R.G. Howells, Biostudies, Kerrville, TX 78028</p>
9:20 AM	G	474	<p>PATTERNS OF ENDEMISM AND SPECIES RICHNESS OF FISHES OF THE WESTERN GULF SLOPE</p> <p>Robert J. Maxwell* and Timothy H. Bonner, Texas State University, San Marcos, TX</p>
9:40 AM	Poster Session I and Break		Science Hallways
10:20 AM	G	604	<p>RECREATION AND EDUCATION ON THE SAN MARCOS RIVER: A RESPONSE TO GROWING POPULATION PRESSURE</p> <p>Jenna McKnight Winters, National Park Service/Texas State University, San Marcos; Julie Hulbert King, San Marcos Nature Center, City of San Marcos Parks and Recreation; Melani Howard, Watershed Protection Division, City of San Marcos Parks and Recreation</p>

10:40 NS RECENT RECORDS OF EPIGEAN SALAMANDERS
(GENUS EURYCEA) FROM CENTRAL TEXAS SPRINGS,
WITH NOTES ON THEIR OCCURRENCE AND
THOUGHTS ON THEIR CONSERVATION
Chad W. Norris, Water Resources Branch, Texas Parks and
Wildlife Department, Austin, Tx

SYMPOSIUM ON BIONANOTECHNOLOGY AND ENVIRONMENTAL RESEARCH

1:20 PM **Friday, March 5** **Science 110**

1:20 PM NS 648 ASTROBIOLOGY, MOLECULAR PHYLOGENETICS AND EVOLUTIONARY STUDIES AT TEXAS SOUTHERN UNIVERSITY

Hector C. Miranda, JR. and Olufisayo Jejelowo TSU NASA URC Center for Bio-Nanotechnology and Environmental Research, and Department of Biology. Texas Southern University, Houston, TX 77004.

1:40 PM NS 645 BIOLOGICAL EFFECTS OF HIGH ENERGY RADIATION ON MICE

Olufisayo A Jejelowo*, Nader Pourmand+, Govindarajan Ramesh#, Ayodotun* Sodipe, Honglu Wu++ and Shishir Shishodia*, *Department of Biology, Texas Southern University, 3100 Cleburne Street, Houston, Texas 77004, USA; + Biomolecular Engineering, University of California Santa Cruz, Santa Cruz, CA 95064; # Department of Biology, Norfolk State University, Norfolk, VA 23504; ++ NASA Johnson Space Center, Houston, TX.

2:00 PM NS 643 DESTRUCTION OF A QUORUM SIGNAL BY *BACILLUS THURINGIENSIS* LACTONASE

Marc Charendoff, Department of Biology and Biochemistry, University of Houston

2:20 PM NS 646 IMPORTANCE OF SOCIAL NETWORKING AND WEBSITE IN CBER OUTREACH

Cherita Thomas, Hector Miranda and Olufisayo Jejelowo *, Texas Southern University, Houston, TX

2:40 PM G 583 MECHANISM OF HIGH ENERGY RADIATION INDUCED INFLAMMATION

Georgette Rolle*, Sarah Munyu, Olufisayo A Jejelowo, Ayodotun Sodipe, Shishir Shishodia, Department of Biology, Texas Southern University, 3100 Cleburne Street, Houston, Texas 77004, USA

3:00 PM NS 647 URC MICROBIAL 1: AS STUDENT SPACE FLIGHT EXPERIMENT ON NASA SPACE SHUTTLE ATLANTIS

Olufisayo Jejelowo*, Jason Rosenzweig*, Ayodotun Sodipe*, Hector Miranda*, Shishir Shishodia*, Govindarajan Ramesh+, James Briggs#, George Fox#, Claudette Ligons*, Marguerite Butler*, *Texas Southern University, Houston, TX, +Norfolk State University, Norfolk, VA; #University of Houston

3:20 PM NS 644 YEAR ONE OF THE CENTER FOR
BIONANOTECHNOLOGY AND ENVIRONMENTAL
RESEARCH

Olufisayo Jejelowo*, Jason Rosenzweig*, Ayodotun Sodipe*,
Hector Miranda*, Shishir Shishodia*, Govindarajan Ramesh+,
James Briggs#, George Fox#, Claudette Ligons*, Marguerite
Butler*, *Texas Southern University, Houston, TX, +Norfolk
State University, Norfolk, VA; #University of Houston,
Houston, TX.

SYMPOSIUM ON BIONANOTECHNOLOGY AND ENVIRONMENTAL RESEARCH POSTERS

G P584 NATURAL PRODUCTS AGAINST THE NEGATIVE
EFFECTS OF MICROGRAVITY

Anita Lewis*, Philys Johnson, Olufisayo A Jejelowo, Ayodotun
Sodipe, Shishir Shishodia, Department of Biology, Texas
Southern University, 3100 Cleburne Street, Houston, Texas
77004, USA

ANTHROPOLOGY

8:00 AM Friday, March 5 Science 136

8:00 AM G 495 EVIDENCE FOR THE USE OF *BUFO MARINUS* IN THE
OLMCE SHAMANIC TOOL KIT

Whitney Lytle, Texas State University, San Marcos, Tx

8:20 AM G 406 MAYA SCRIBES WHO WOULD BE BECOME KINGS:
SHAMANISM, THE UNDERWORLD, AND ARTISTIC
PRODUCTION DURING THE LATE CLASSIC PERIOD

Barry Kidder Texas State University-San Marcos

8:40 AM NS 479 IDENTIFYING THE EXTENT OF ANCIENT MAYA
DITCHED FIELD SYSTEMS IN THE RIO HONDO
VALLEY OF BELIZE AND MEXICO.

Thomas Guderjan, University of Texas at Tyler

9:00 AM G 551 HIGHLAND MAYA SACRED SITES: PRE-COLUMBIAN
ASSOCIATIONS AND CONTEMPORARY RITUAL

Michael P Saunders, Texas State University

9:20 AM NS 483 MIDDLE AND LATER STONE AGE OCCUPATIONS DATING TO MARINE ISOTOPE STATE 3-4 AT ERFRKON, SOUTH AFRICA
 Britt Bousman (Texas State University-San Marcos), James Brink (Florisbad Quaternary Research Department), Stephen Tooth (Geography, Aberystwyth University, UK), Rainer Grun (Research School of Earth Sciences, The Australian National University, Australia), Senna Barnett (Texas State University) and Marisol Espino (Texas State University)

9:40 AM Poster Session I and Break

Science Hallways

10:20 AM NS 494 IDENTIFYING ALTERATIONS IN BONE COLLAGEN: AN EXPERIMENTAL STUDY OF COLOR, MICROSCOPIC MORPHOLOGY, AND CARBON ISOTOPIC SIGNATURES OF MODERN FAUNAL BONE HEATED AT CONTROLLED TEMPERATURES.

Cynthia Munoz*, Raymond Mauldin, Lynn Wack, Stephen Smith, Kevin Daiber, Center for Archaeological Research, Department of Anthropology, University of Texas at San Antonio (UTSA), TX, Robert Hard, Department of Anthropology UTSA, TX, and Patrick Villanueva, Department of Geological Sciences, UTSA, TX.

10:40 AM G 596 A SYNTHESIS OF GEOARCHAEOLOGY IN TEXAS
 Ken Lawrence, Texas State University

11:00 AM G 469 AN ANALYSIS OF QUARRYING BEHAVIOR AT ALIBATES FLINT QUARRIES NATIONAL MONUMENT, FRITCH, TEXAS

I. Robert Wishoff, Texas State University-San Marcos, TX

11:20 AM U 499 A GIS ANALYSIS OF QUARRY PITS AT ALIBATES NATIONAL MONUMENT

Chris R. L. Davis, Texas State University, San Marcos, TX

11:40 AM G 388 ANALYZING TERMINAL LATE PREHISTORIC PATTERNS OF ANIMAL USAGE

Lynn Wack, University of Texas At San Antonio

12:00 PM Lunch

Thompson Student Center

12:40 PM Poster Session II

Science Hallways

- 1:20 PM NS 485 ARCHAEOLOGY JUST WEST OF THE PECOS:
EXPLORING PLANT INTENSIFICATION THROUGH
PATTERNS IN BURNED ROCK MIDDEN RADIOCARBON
DATES
Cynthia Munoz, Raymond Mauldin*, and Stephen Smith Center
for Archaeological Research, Department of Anthropology,
University of Texas at San Antonio (UTSA), TX.
- 1:40 PM G 529 INVESTIGATING THE PERIMORTEM INTERVAL IN
CENTRAL TEXAS: A PRELIMINARY STUDY
Becca Shattuck, Texas State University-San Marcos
- 2:00 PM G 537 DIFFERENTIAL DECOMPOSITION IN TERRESTRIAL,
SALTWATER, AND FRESHWATER ENVIRONMENTS: A
PILOT STUDY
Laura Ayers, Texas State University - San Marcos
- 2:20 PM G 540 A METRIC ANALYSIS OF THE POSTCRANIAL
SKELETON OF HISPANIC INDIVIDUALS TO IMPROVE
THE ESTIMATION OF SEX
Meredith Tise and Kate Spradley, Texas State University-San
Marcos

2:40 PM Section Meeting

Science 136

ANTHROPOLOGY POSTERS

- G P598 UNDERSTANDING THE MECHANICAL EFFECTS OF
HEAT TREATMENT ON EDWARDS PLATEAU CHERT
Charles A. Speer; University of Texas at San Antonio

BIOMEDICAL SCIENCES AND CELL AND MOLECULAR BIOLOGY

8:00 AM Friday, March 6

Science 321

- 8:00 AM NS 430 THE EFFECTS OF LOW SHEAR MECHANICAL STRESS
ON *YERSINIA PESTIS* VIRULENCE
Abidat Lawal *, Ohunene Abogunde, Olufisayo Jejelowo, and
Jason A. Rosenzweig Texas Southern University Center for
Bionanotechnology and Environmental Research Houston,
Texas
- 8:20 AM U 571 IMMUNOMODULATION OF MACROPHAGES BY A
LATENCY-SPECIFIC FACTOR FROM *MYCOBACTERIUM
TUBERCULOSIS*
Shawn Terryah, Michael Phan, Julie Le*, Griffin Sadovsky,
Charles Hauser, Eamonn Healy and Peter J. King, St. Edward's
University, Austin, TX

- 8:40 AM U 565 TRANSCRIPTIONAL RESPONSE OF MACROPHAGES TO A HEAT-SHOCK PROTEIN FROM *MYCOBACTERIUM TUBERCULOSIS*
Anna Unruh*, Zane Goodwin, John Kiley, Eamonn Healy, Peter J. King and Charles Hauser, St. Edward's University, Austin, TX
- 9:00 AM G 602 AFFECT OF SEASONAL CHANGES IN ARBUSCULAR MYCORRHIZAL COMMUNITIES BY DENATURING GRADIENT GEL ELECTROPHORESIS
Sikta Patnaik*, James Van kley, Armen Nalian, Alexandra Martynova Van Kley, Stephen F Austin State University, Nacogdoches, TX.
- 9:20 AM NS 627 CDNA IDENTIFICATION, COMPARISON AND PHYLOGENETIC ASPECTS OF LOMBRICINE KINASE FROM TWO OLIGOCHAETA SPECIES
Chris Doumen, Dept. Mathematics and Natural Sciences, Collin College, Plano, Texas
- 9:40 AM Poster Session and Break**
- 10:20 AM U 439 CLONING OF *PYROCYSTIS FUSIFORMIS* LUCIFERASE GENES FOR THE PURPOSES OF PLASMID INSERTION AND HETEROLOGOUS EXPRESSION IN *ESCHERICHIA COLI*
Phong Ngo*, Paul Loeffler, Donovan Haines, Sam Houston State University, Huntsville, TX.
- 10:40 AM U 435 COMPARING PHENOTYPIC VARIATION IN ORTHODENTICLE EXPRESSION IN *D. SIMULANS* AND *D. MELANOGASTER* EMBRYOS
Andrea Pavia-Jimenez and Lisa Goering. St. Edward's University, Austin Texas
- 11:00 AM G 393 EFFECT OF FOOD ADDITIVES ON INTESTINAL MICROFLORA OF VACCINATED BROILERS CHALLENGED WITH *EIMERIA* SPECIES ANALYZED USING 16S PYROSEQUENCING
Muthu Saravanan Manoharan*, Alexandra-Martynova Van Kley, Joey Bray and Armen Nalian. Stephen F Austin State University, Nacogdoches, TX.
- 11:20 AM U 414 INVESTIGATING PHENOTYPIC VARIATION FOR ANTERIOR-POSTERIOR PATTERNING IN *DROSOPHILA MELANOGASTER*
Leon A. Venegas*, Lisa M. Goering, St. Edward's University, Austin, TX

**Science
Hallways**

11:40 AM U 470 KRUPPEL GAP GENE EXPRESSION VARIATION AND THE POSITION OF THE CEPHALIC FURROW IN *DROSOPHILA MELANOGASTER*

Lisa Goering and Lauren Stewart

12:00 PM

Lunch

**Thompson
Student
Center**

12:40 PM

Poster Session II

1:20 PM U 389 ORTHODENTICLE EXPRESSION AND ANTERIOR-POSTERIOR PATTERNING IN *DROSOPHILA MELANOGASTER*

Veronica Gaffney*, Lisa Goering, St. Edward's University

1:40 PM G 552 STRUCTURE AND ACTIVITY OF NOVEL CATIONIC ANTIMICROBIAL PEPTIDES (CAPS) ISOLATED FROM WESTERN COTTONMOUTH VENOM (*AGKISTRODON PISCIVORUS LEUCOSTOMA*)

Joseph J. Pleen, Angelo State University, San Angelo, TX

2:00 PM G 447 TAXONOMIC ASSIGNMENT FOR HIGH THROUGHPUT AND MASSIVELY PARALLEL PYROSEQUENCING DATA

Srihari Babu Gogineni*, Armen Nalian, Alexandra Martynova-Van Kley, Stephen F. Austin State University, Nacogdoches, TX

2:20 PM G 636 NANOPARTICLE INFLUENCE ON BACTERIAL MUTAGENESIS

Alicia Taylor*, Gary Beall, Yixin Zhang, Nihal Dharmasiri and Robert JC McLean, Texas State University-San Marcos, Texas.

2:40 PM G 641 TRANSMISSION EFFICIENCIES OF TWO STRAINS OF *XYLELLA FASTIDIOSA* FROM CULTURE BY GLASSY-WINGED SHARPSHOOTERS AND THE EVALUATION OF A NOVEL XYLEM VESSEL INOCULATION SYSTEM.

Piexin Jiang*, Blake R. Bextine, University of Texas at Tyler, Tyler, TX

3:00 PM

Section Meetings

Science 321

BIOMEDICAL SCIENCES POSTERS

NS P634 GENETIC IMMUNIZATION OF GOAT AND HORSE AGAINST RED FLUORESCENT PROTEIN

Nicy Thomas, Grant Richards, Matt Slaven, Collin Thomas and Bridgette Kirkpatrick, Collin College, Plano, Texas

U P372 INVESTIGATIONS INTO THE MODE OF ACTION OF
LOW-DOSE METHOTREXATE IN THE TREATMENT OF
INFLAMMATORY DISEASES

Beverly Pappas *1,2 , Kimberly Garcia 1,3, Lillian Waldbeser
PhD 1, Kenneth Ihenetu PhD 1 1Texas A&M University-
Corpus Christi, TX, 2St. Edward's University-Austin, TX,
3Southwestern University, Georgetown, TX

NS P459 LABEL-FREE ELECTRICAL BIOSENSING USING
FUNCTIONALIZED NANOPIPETTES

Paolo Actis* UC Santa Cruz, Santa Cruz CA, Olufisayo
Jejelowo Texas Southern University, Houston, TX, Nader
Pourmand UC Santa Cruz, Santa Cruz CA

NS P545 MOLECULAR ANALYSIS OF *CLOSTRIDIUM DIFFICILE*
AND VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE)
ASSOCIATION IN PSEUDOMEMBRANOUS COLITIS

Gregory Frederick* ¹, Cary Chisholm ², Daniel Smith ²,
Kimberly Hocker ², Arundhati Rao ² ; ¹ University of Mary
Hardin-Baylor, Belton, TX; ² Scott and White Hospital and
Texas A&M University Health Science Center, Temple, TX

U P377 PHENOTYPIC CHARACTERIZATION OF *PSEUDOMONAS*
AERUGINOSA ISOLATES FROM CYSTIC FIBROSIS
PATIENTS

Sunil Rathore, Patricia J. Baynham, St. Edward's University

U P473 RECOMBINANT DNA CLONING OF A HER2/NEU
THERAPEUTIC MONOCLONAL ANTIBODY

Tyler Manning*Hardin-Simmons University, Abilene, TX,
Pryianka Gupta, Receptor Logic, Abilene, TX, Ben Johnson,
Hardin-Simmons University, Abilene TX, Andy Duty, Capra
Consulting, Jon Weidanz, Texas Tech University Health
Sciences Center School of Pharmacy at Abilene, Abilene, TX.

CELL AND MOLECULAR BIOLOGY POSTERS

U P615 AGD1 PROTEIN LINKS MANY SIGNALING PATHWAYS
RESPONSIBLE FOR TIP GROWTH IN ROOT HAIRS

Ashley Gravelle*, Midwestern State University, Wichita Falls,
TX, Elison B. Blancaflor and Cheol-Min Yoo, Plant Biology
Division, Samuel Roberts Noble Foundation, Ardmore,
Oklahoma

- U P452 ANALYSIS OF BETA-LACTAM RESISTANCE MEDIATED BY THE AMPC/AMPR REGION IN *PSEUDOMONAS AERUGINOSA* CLINICAL ISOLATES THROUGH A COMPARISON OF DNA-BASED TYPING METHODS
- Kelly N. Hurlless*¹, Robert A. Bonomo, M.D.², Patricia Baynham, Ph.D.¹, Kristine M. Hujer³. ¹St. Edward's University, Austin, TX, USA, ²Research Service, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Department of Pharmacology, Molecular Biology and Microbiology, Case School of Medicine, Cleveland, OH, USA, ³Research Service, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Cleveland, OH, USA
- U P487 CHARACTERIZATION OF THE HUMAN C-KIT PROMOTER
- Emily Dominguez*, Ricardo Gutierrez, Jonathan H. Lieman
- U P457 DETECTING OSMOTIC STRESS IN MARINE AND FRESHWATER PLANKTON.
- Oliver Ostorga*, Hudson DeYoe and Michael Persans. Dept. of Biology and Center for Subtropical Studies, University of Texas - Pan American, Edinburg, TX.
- U P621 EFFECTS OF CLAUDIN-2 KNOCKDOWN IN CULTURED KERATINOCYTES
- Dale Telgenhoff, Sarah Grote*, Kamana Manandhar, Susan McCain, Wendy Watson, Tarleton State University, Fort Worth, TX
- G P581 EFFECTS OF MICROGRAVITY ON THE GROWTH KINETICS OF *ASPERGILLUS NIDULANS*
- Robbyn Barnett, Olufisayo Jejelowo, Shishir Shishodia, Jason Rosenzweig
- G P630 GENOTYPING *XYLELLA FASTIDIOSA* SUBSPECIES USING MULTIPLEX PCR
- Blake A. Myers*, Harold Rathburn, Tarleton State University, Stephenville, TX, and Forrest Mitchell, Jeff Brady, Texas AgriLife Research, Stephenville, TX
- U P626 IDENTIFICATION OF A SUPEROXIDE DISMUTASE ENZYMES IN THE CALIFORNIA BLACKWORM THROUGH PCR AND CDNA ANALYSIS.
- T.A. Stockton* and C. Doumen, Dept. Mathematics and Natural Sciences, Collin College, Plano, TX 75074, USA

- U P587 IDENTIFYING TARGET GENES OF THE TRANSCRIPTION FACTOR SOXNEURO IN THE DEVELOPMENT OF A *DROSOPHILA* DOPAMINERGIC NEURON, THE H-CELL
Dara C. White* and Amaris R. Guardiola, Angelo State University, San Angelo, TX
- NS P534 LOW SHEAR STRESS EFFECTS ON MICROBIAL ADAPTABILITY TO MICROGRAVITY
MR Tirumalai, GE Fox, University of Houston Houston, TX 772040-5001
- U P570 MODULATION OF MACROPHAGE PHAGOCYTOSIS AND EXPRESSION OF INFLAMMATORY MEDIATORS BY RESVERATROL, A PHYTOALEXIN OF RED WINE
Shawn Terryah, Beau Grantier, Elizabeth Chen, Griffin Sadovsky* and Peter J. King, St. Edward's University, Austin, TX
- U P607 P66SHC PROTEIN EXPRESSION VARIES WITH AGE AND BRAIN REGION IN C57BL/6 MICE
Allred J, Bui T, Wilson C, Taylor S
- U P467 POLYMICROBIAL REGULATION OF GROWTH AND GENE EXPRESSION IN *PSEUDOMONAS AERUGINOSA*
Carolina Corkill*, St. Edward's University, Megan L. Boulette, Marvin Whiteley, University of Texas at Austin, Austin, TX
- U P527 STEM CELL RECRUITMENT AND INDUCTIVE SIGNALING DURING NEURAL REGENERATION IN THE CALIFORNIA BLACKWORM, *LUMBRICULUS VARIEGATUS*.
Gabriel J. Leal, Maheen F. Ceizar*, and Veronica G. Martinez Acosta. Biology Dept, University of the Incarnate Word, San Antonio, TX 78209
- NS P468 THE EFFECTS OF ACUTE DOSE CHARGE PARTICLE RADIATION ON EXPRESSION OF DNA REPAIR GENES
M. Akram Tariq^{1, 2}, Shishir Shishodia², Govindarajan T Ramesh³, Ayodotum Sodipe² Olufisayo Jejelowo², Nader Pourmand^{1, 4} ¹ Department of Biomolecular Engineering, University of California, Santa Cruz, CA 95064. ² Department of Biology, Texas Southern University, Houston, TX, 77004. ³ Department of Biology, Molecular Toxicology Laboratory, Center for Biotechnology & Biomedical Sciences, Norfolk State University, Norfolk, VA 23504. ⁴ Stanford Genome Technology Centre, Stanford University, Palo Alto, CA, 94304.

- U P444 THE EVOLUTION OF OTD EXPRESSION BETWEEN *D. MELANOGASTER* AND *D. SIMULANS*
Korre Fairman*, Mina Jalali, Lisa M. Goering, St. Edwards University, Austin, TX
- U P576 THE GENOMICS EDUCATION PARTNERSHIP: A COMPARATIVE GENOMICS STUDY OF *DROSOPHILA* DOT CHROMOSOMES
Tariq Abusheikh, Pedro Benitez, Megan Bourland, Samantha Cruz, Sarah Flohr*, John Kiley, Monal Naik, Sunil Rathore, Evangelina Reza1, Charles Hauser, St. Edward's University, Austin TX
- G P640 NON-CULTURE DEPENDENT SURVEY OF THE MICROBIOTA OF THE GLASSY-WINGED SHARPSHOOTER USING 454 PYROSEQUENCING.
Daymon A. Hail*, Blake R. Bextine, University of Texas at Tyler, Tyler, TX, Isabelle Lauziere, Texas Agricultural Experiment Station-Texas A&M Univervisty, Fredricksburg, TX, Scot E. Dowd, Research and Testing Laboratory, Lubbock, TX
- U P642 AGE DETERMINATION OF THE GLASSY-WINGED SHARPSHOOTER BY RED WING PIGMENTATION
Chris Timmons*, Pexin Jiang, Blake R. Bextine, University of Texas at Tyler, Tyler, TX

BOTANY

- | | | | | |
|----------------|----|------------------------|--|-------------------------|
| 9:00 AM | | Friday, March 5 | | Science 104 |
| 9:00 AM | U | 390 | A QTL ANALYSIS OF FERRIC REDUCTASE AND IRON CHLOROSIS IN <i>LOTUS JAPONICUS</i> (FABACEAE)
C. A. Garza*, W. J. Quinn, St. Edward's University and M. A. Grusak, M. A. Klein, Agricultural Research Service and Baylor College of Medicine, Houston, TX. | |
| 9:20 AM | NS | 376 | THE EFFECTS OF GRAZING ON TEXAS KANGAROO RATS (<i>DIPODOMYS ELATOR</i>) IN WICHITA COUNTY, TEXAS
Allan D. Nelson*, Jim R. Goetze, Elizabeth Watson, and Mark Nelson, Tarleton State University, Stephenville, TX. | |
| 9:40 AM | | | Poster Session I and Break | Science Hallways |

10:20 AM NS 624 FERN SPORE VIABILITY IN *ANEMIA MEXICANA* AND
ANEMIA PHYLLITIDIS (PTERIDOPHYTA, ANEMIACEAE)
Joan E. Nester-Hudson, Sam Houston State University,
Huntsville, TX.

10:40 AM G 549 COMPARATIVE ANATOMY AND MORPHOLOGY OF
THE STEM IN THE CARRION FLOWERS
(APOCYNACEAE-ASCLEPIADOIDEAE)
Florence Kajoina* and David E. Lemke, Texas State
University, San Marcos, TX.

11:00 AM NS 553 SCENT PRODUCTION IN THE CARRION FLOWERS
(APOCYNACEAE-ASCLEPIADOIDEAE)
David E. Lemke* and George A. Russell, Texas State
University, San Marcos, TX.

11:20 AM G 618 THE GENETIC ARCHITECTURE OF HOMOPLOID
HYBRID SPECIATION IN LOUISIANA IRIS (IRIDACEAE)
Sunni Taylor* and Noland Martin, Texas State University, San
Marcos, TX.

11:40 AM Section Meeting

Science 104

BOTANY POSTERS

U P370 COAL BALL ANALYSIS: VARIATIONS IN THE PEEL
TECHNIQUE

Victoria A. Mancha* and James Zech, Sul Ross State
University, Alpine, TX.

G P488 PRELIMINARY FLORA OF HUNEWELL RANCH, ERATH
COUNTY, TEXAS

L. Paige Cowley,* Sarah Harsley and A. D. Nelson, Tarleton
State University, Stephenville, TX.

U P514 THE VASCULAR PLANTS OF INDIAN SPRINGS AND
CIENEGA OF CHINATI MOUNTAINS STATE NATURAL
AREA, PRESIDIO COUNTY, TEXAS, BASED ON
SAMPLING FROM LATE FEBRUARY 2009 THROUGH
APRIL 2009

Patsy Roberts* and James Zech, Sul Ross State University,
Alpine, TX.

U P622 THE GENETIC ARCHITECTURE OF ANTHOCYANIN
CONCENTRATION IN LOUISIANA IRIS (IRIDACEAE)

Luis Rojas*, Sunni J. Taylor, and Noland H. Martin, Texas
State University, San Marcos, TX.

U P623 LINKAGE MAPPING IN LOUISIANA IRIS (IRIDACEAE)

Joshua Matlock*, Sunni J. Taylor, and Noland H. Martin, Texas State University, San Marcos, TX.

CHEMISTRY AND BIOCHEMISTRY

8:00 AM Friday, March 5 Science 402

8:00 AM NS 498 COMPLETE ACTIVE SPACE SELF-CONSISTENT FIELD (CASSCF) CALCULATIONS: SET-UP AND EXAMPLES OF APPLICATIONS.

Benny E. Arney, Jr.*, Department of Chemistry, Sam Houston State University, Huntsville, TX.

8:20 AM U 492 DETERMINATION OF CAFFEINE AND PYRIDOXINE IN RED BULL

Dr. Julian Davis, Rachel Leacock Favila*, Dr. John Stankus, University of the Incarnate Word, San Antonio TX

8:40 AM NS 422 DEUTERIUM LABELING RESULTS IN THE PHOTOCHEMISTRY OF STYRENE OXIDE

Benny E. Arney, Jr.*, Rick C. White, and Emilie Rascher, Department of Chemistry, SamHouston State University, Huntsville, TX.

9:00 AM U 456 DIRECT ROUTE SYNTHESIS OF POTENT ANTI-HIV CHALCONES

Steven Griffith*, Danette Vines, Schreiner University, Kerrville TX, Welch Foundation

9:20 AM U 418 DUAL PATHWAYS IN THE PHOTOCHEMISTRY OF CYCLIC SULFITE ESTERS

Rick C. White, David Leggett, Jeremy Mitchell, Sam Houston State University

9:40 AM Poster Session I and Break Science Hallways

10:20 AM U 519 EFFECTIVENESS OF CLAY PURIFICATION BY CEC DETERMINATION

Joshua Perry*, Alyx Frantzen, Stephen F. Austin State University, Nacogdoches, Texas

10:40 AM U 462 EFFECTS OF QUORUM QUENCHING ON AHLs USING HUMAN LIVER MICROSOMES P450 AND UGT-A

Amy Davis*, Dr. Donovan Haines, Sam Houston State University, Huntsville, Tx

- 11:00 AM G 518 ENANTIOMERIC SEPARATION USING MODIFIED CLAYS
Jennifer Perry*, Alyx S. Frantzen, Stephen F. Austin State University, Nacogdoches, TX
- 11:20 AM U 609 HANSEN SOLUBILITY PARAMETER DETERMINATION METHOD DEVELOPMENT
Bryan Crom*, Trisha O'Bryon, Kyle Lesko, Blake Howard, Darren Williams, Sam Houston State University, Huntsville, TX
- 11:40 AM U 531 INFRARED STUDY OF INTERMOLECULAR HYDROGEN BONDING BETWEEN CATECHOL AND SUBSTITUTED BENZENES
Adriana Pavia* and J.D. Lewis, Department of Chemistry, St. Edwards's University, Austin, TX 78704
- 12:00 PM Lunch**
- 12:40 PM Poster Session II**
- 1:20 PM U 538 MODULATION OF PRODUCTION METHODS OF COPPER OXIDE CRYSTALLINE ARRAYS CREATED BY CHEMICAL BATH DEPOSITION
Melissa Chan*, M. Jiang, L. Spears, University of Houston - Downtown, Houston, TX, I. Bobowska and P. Wojciechowski, Technical University of Łódź, Łódź, Poland
- 1:40 PM U 535 NOVEL APPLICATION OF HOMOGENEOUS ELECTROCATALYSIS WITH CONVENTIONAL DYES
Preeti Choudhary, Dr. Jiang Mian, Dr. Larry Spears, University of Houston- Downtown
- 2:00 PM NS 528 PHOTOCATALYTIC ACTIVITY AND CHARACTERIZATION OF TiO₂ DOPED WITH GOLD AND SILVER
Julio E. Valladares*, Aide Ponce, Diane Nguyen and Vianney Flores, Midland College, Midland, TX
- 2:20 PM U 419 PHOTOCHEMISTRY OF PHENYLCYCLOALKENE OXIDES
Rick C. White and Jacob W. Broadway Sam Houston State University

**Thompson
Student
Center
Science
Hallways**

- 2:40 PM NS 455 RESONANCE CONTRIBUTION DETERMINATION VIA HUCKEL MO METHODS
Benny E. Arney, Jr.*, Department of Chemistry, Sam Houston State University, Huntsville, TX.
- 3:00 PM NS 532 STRUCTURAL INFORMATION FROM INFRARED STUDIES OF OH STRETCHING IN ALCOHOLS AND DIOLS
J.D. Lewis, Department of Chemistry, St. Edwards's University, Austin, TX 78704
- 3:20 PM NS 428 SYNTHESIS AND CHARACTERIZATION OF FATTY ACID ALKYL ESTER MIXTURES
Russell J. Franks*, Department of Chemistry, Stephen F. Austin State University
- 3:40 PM G 592 THE EFFECT OF WATER TREATMENT ON THE ESSENTIAL OIL QUALITY AND COMPOSITION OF *THYMUS VULGARIS* (ENGLISH THYME)
Sigmund Courtney, Midwestern State University, Wichita Falls, TX

4:00 PM Section Meeting

Science 402

CHEMISTRY AND BIOCHEMISTRY POSTERS

- U P539 A FACILE AND COST-EFFECTIVE METHOD FOR NITROGEN-CONTAINING COMPOUNDS
Teena Thomas, University of Houston-Downtown, Houston, TX
- U P484 ANALYSIS OF OMEGA-3 FATTY ACIDS FROM COMMERCIALY AVAILABLE FISH OIL, FARM RAISED & WILD CAUGHT FISH, AND OTHER SOURCES
Junior Swanston* and Michael Shipley, Department of Biology, Midwestern State University, Wichita Falls, TX, 76308.
- U P516 CHEMICAL ANALYSIS OF SILK FIBROIN PROTEINS: A SET OF LABORATORY EXERCISES FOR EXPLORING PROTEIN SCIENCE SUITABLE FOR UNDERGRADUATE COURSES IN BIOLOGICAL AND ORGANIC CHEMISTRY
Elena Davila*, Nickolas Lemley, Rick Peigler, David Coleman, University of the Incarnate Word, San Antonio, TX
- G P427 COMBUSTION ANALYSIS OF FATTY ACID ALKYL ESTER MIXTURES
Roberto J. Molina, Alyx S. Frantzen, and Russell J. Franks*

- U P445 EFFECT OF AMINO ACIDS AND AQUEOUS SOURCE POLYPHENOLS ON ACRYLAMIDE PRODUCTION IN FRENCH FRIED POTATOES
Kaci Pruser*, Nick Flynn
- U P542 EXPLORATION OF DIFFERENT ANCHORING TECHNIQUES FOR FABRICATING EFFECTIVE SENSORS
Nameera Baig* (University of Houston Downtown), Tomasz Marszalek (Technical University of Łódź-Poland), Mian Jiang and Larry Spears (University of Houston-Downtown)
- U P625 FISHER ESTERIFICATION
Bob Holloway , Schreiner University
- U P438 NOVEL AND RAPID DETERMINATION OF THREAT AGENTS BY VOLTAMMETRY
Christine Varghese*, Nirmal John, Charles Varghese, University of Houston - Downtown, Houston, TX.
- U P441 SAMPLE PREPARATION METHOD DEVELOPMENT FOR DETERMINING THE BIOMARKER, 2-AMINOTHIAZOLINE-4-CARBOXYLIC ACID (ATCA), FROM MICE LIVER AFTER CYANIDE EXPOSURE
Katelyn Stafford*, Jorn C.C. Yu, Bat-erdene Myagmarjaya, Ilona Petrikovics, Sam Houston State University, Huntsville, TX.
- U P407 STUDY OF EFFECTIVENESS OF RHODANASE ENCAPSULATION INTO STEALTH LIPOSOMES
Sarah Martin*, Galina Kuzmicheva and Illona Petrikovics, Sam Houston State University, Huntsville, TX
- U P541 STUDY OF POLYPYRROLE-CARBON NANOTUBE COMPOSITES AND OVEROXIDIZED POLYPYRROLE NETWORK
Department of Natural Sciences, University of Houston - Downtown, Houston, TX 77002
- U P460 SYNTHESIS OF A DIAMINO PHENOL LIGAND AND ITS DERIVATIVES FOR USE IN A MIXED-METAL ASSEMBLY
Elizabeth Walther* and Julian Davis
- U P590 TAILORING A SURFACE ENHANCED RAMAN SENSOR FOR THE DETECTION OF THE CYANIDE METABOLITE, 2-AMINOTHIAZOLINE-4-CARBOXYLIC ACID
Ashley Pipken*, Ilona Petrikovics, David E. Thompson, Sam Houston State University, Huntsville TX

- U P448 THIN LAYER CHROMATOGRAPHY SOLVENT SYSTEM FOR SEPARATION OF SECONDARY METABOLITES OF *CANDIDA* SPECIES
 YuYu Chu*, Julian Davis, Ana Vallor, University of the Incarnate Word, San Antonio, TX
- U P426 VISCOMETRIC STUDIES OF FATTY ACID ALKYL ESTER MIXTURES
 Jeffery D. Briggs and Russell J. Franks*, Department of Chemistry, Stephen F. Austin State University
- G P635 ISOLATING CHEMICAL CONSTITUENTS IN CANID URINE TO DEVELOP ANTI-PREDATION TOOL
 SRX Dall, MR Evans, DJ Hosken University of Exeter, UK

COMPUTER SCIENCE, MATHEMATICS, AND PHYSICS

1:20 PM		Friday, March 5	Science 235
1:20 PM	U	564 MODELING CHAPERONE INTERACTION NETWORK OF <i>MYCOBACTERIUM TUBERCULOSIS</i> : PROTEIN NETWORKS AS GRAPHS Zane Goodwin*, Eamonn Healy, Peter J. King and Charles Hauser, St. Edward's University, Austin, TX	
1:40 PM	NS	451 A SPREADSHEET ALGORITHM FOR FITTING A MATHEMATICAL MODEL OF HYSTERESIS TO PHYSIOLOGICAL CAUSES AND EFFECTS John A. Ward, Department of Clinical Investigation, Brooke Army Medical Center	
2:00 PM	U	421 DISCOVERY & MEASUREMENT OF MAIN BELT ASTEROIDS Matthew Davis, Hardin-Simmons University	
2:20 PM	NS	411 METHODS OF APPROXIMATING SQUARE ROOTS Elsie M. Campbell*, Angelo State University, and Dionne T. Bailey*, Angelo State University, jointly	
2:40 PM	U	572 FIBONACCI CYCLES MOD P Stacy Lee*, James Kelly, Seth Chomout, Valentin Torres, Trey Smith, Angelo State University, San Angelo, TX	
3:00 PM	G	617 PATH PLANNING USING PARTICLE SWARM OPTIMIZATION Lewis Nichols*, Michael Frye, University of the Incarnate Word, San Antonio, TX	
3:20 PM		Section Meetings	Science 235

COMPUTER SCIENCE POSTERS

- U P594 VIDEO- BASED SURVEILLANCE IN DISTRIBUTED ENVIRONMENTS
Marvin Weatherspoon, Jerry Garcia, and John Shoboiki, Texas Southern University, Houston, TX
- U P461 WEBSITE EVALUATION USING THE RAPID CONTEXTUAL DESIGN
B. Nsekpong*, M. Holiday*, L. Rocha*, D. Blazek*, S. Allen*, and R. Alvarado*, Concordia University Texas
- G P410 WII-HABILITATION: THE PRELIMINARY FINDINGS OF THE UTILIZATION OF THE NINTENDO WII™ AS A THERAPEUTIC INTERVENTION DEVICE BY SURVEY.
Steven Miller*, Carol Luckhradt Redfield, St Mary's University, San Antonio, TX.

PHYSICS POSTERS

- U P504 DIFFRACTION OF ELECTRONIC WAVE PACKETS BY CRYSTALS
Robert Nicholas Lanning, Robert Holman, Christopher Grover Lee, Cristian Bahrim
- U P614 NEURAL NETWORKS AND FOURIER SHAPE DESCRIPTORS FOR AUTOMATED CLASSIFICATION OF LIGHT CURVES OF ECLIPSING BINARY STARS
Katherine Leaveck*, Shaukat Goderya, Bert Little, Tarleton State University, Stephenville, TX

CONSERVATION ECOLOGY

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|----------------|---|---|--------------------|
| 8:00 AM | | Friday, March 5 | Science 111 |
| 8:00 AM | G | 374 ASSESSING AVIAN MORTALITY RATES AND POPULATION IMPACTS ASSOCIATED WITH AN ELECTRICAL TRANSMISSION LINE IN JEFFERSON COUNTY, TX
Andrea J. Ayers*, James W. Armacost, Jr, Lamar University, Beaumont, TX | |
| 8:20 AM | G | 508 EFFECT OF PRESCRIBED BURNING ON THE AVIAN COMMUNITY IN THE SAM HOUSTON NATIONAL FOREST.
Mallory J. Brodrick & Diane L. H. Neudorf | |

8:40 AM G 503 DEVELOPMENT OF THE FIRST NEWELL'S SHEARWATER BREEDING HABITAT SUITABILITY MODEL USING A GEOGRAPHIC INFORMATION SYSTEM

Jeff R. Troy (1), Nick D. Holmes (2,3), M. Clay Green (1) 1- Department of Biology, Texas State University, 601 University Drive, San Marcos, TX 78666, USA 2-Kauai Endangered Seabird Recovery Project, Pacific Cooperative Studies Unit, University of Hawaii, P.O. Box 458, Waimea, Hawaii 96796, USA 3-Division of Forestry and Wildlife, State of Hawaii Department of Land and Natural Resources, P.O. Box 458, Waimea, Hawaii 96796, USA

9:00 AM G 446 DISTRIBUTION AND GIS-BASED HABITAT MODELING OF RED PANDA (*AILURUS FULGENS*) IN NEPAL

Naveen K. Mahato* & Michael R. J. Forstner - Dept of Biology, Texas State University

9:20 AM G 432 SEASONAL VARIATION IN THE DAILY ACTIVITIES AND TIME BUDGETS OF THE AMERICAN BLACK BEAR (*URSUS AMERICANUS*) IN BIG BEND NATIONAL PARK, TEXAS

Alisa Lanning* and Steven Platt, Sul Ross State University, Alpine, TX

9:40 AM Poster Session I and Break

Science Hallways

10:20 AM G 425 CHANGE OF THE HERPETOFAUNA FROM CERRO EL POTOSI, GALEANA, NUEVO LEON, MEXICO.

Jorge A. Contreras- Lozano, David Lazcano, and Armando J. Contreras- Balderas. Laboratorio de Herpetología and Laboratorio de Ornitología, Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León. Apartado Postal 425. San Nicolás de los Garza, Nuevo León, México. 66460

10:40 AM U 417 DIVERSITY ? AND ? OF THE AVIFAUNA IN LAGUNA MADRE, TAMAULIPAS, MÉXICO, FROM 1964 TO 2007

Ana L. Domínguez-Orozco, Juan A. García-Salas*, Armando J. Contreras-Balderas and Gerardo G. Morales-Garza. Universidad Autónoma de Nuevo León. Ciudad Universitaria. A.P. 425. San Nicolás de los Garza, Nuevo León, México. C.P. 66451

- 11:00 AM U 526 TWO-YEAR POPULATION SURVEY AT TWO SITES OF THE GEORGETOWN SALAMANDER *EURYCEA NAUFRAGIA*
Alexis L. Ritzer*, Taylor A. Jones, and Benjamin A. Pierce.
Southwestern University, Georgetown, TX, 78626
- 11:20 AM U 412 POPULATION AND COMMUNITY ECOLOGY OF FISHES AT SAN SOLOMON CIENEGA AND REFUGE CANAL AT BALMORHEA STATE PARK, TEXAS.
Ivy McClellan, University of Mary Hardin Baylor. Chad Hargrave & Raelynn Deaton, Sam Houston State University.
- 11:40 AM U 606 PRELIMINARY ANALYSIS OF CRITICAL CURRENT SPEED BETWEEN TWO CONGENERS (*GAMBUSIA NOBILIS* AND *G. GEISERI*) AT BALMORHEA STATE PARK, TX
Travis Kocurek*, Raelynn Deaton, Sarah Sendelbach, Ivy McClellan, Jessica Sanchez, and Chad Hargrave, Sam Houston State University, Huntsville, TX
- 12:00 PM Lunch** **Thompson Student Center**
- 12:40 PM Poster Session II** **Science Hallways**
- 1:20 PM G 573 BITTERSWEET SUCCESS STORY OF HEADSTARTING IN THE HOUSTON TOAD (*BUFO HOUSTONENSIS*)
Diana J. McHenry*, University of Missouri-Columbia, MO, and Michael R. J. Forstner, Texas State University-San Marcos, TX
- 1:40 PM G 547 POTENTIAL COMPONENT ALLEE EFFECTS AND THEIR CONSEQUENCES IN HOUSTON TOAD (*BUFO HOUSTONENSIS*) STEWARDSHIP
Michele A. Gaston*, Akiko Fuji, Floyd W. Weckerly, Michael R. J. Forstner, Texas State University - San Marcos
- 2:00 PM G 600 RED-EARED SLIDER (*TRACHEMYS SCRIPTA ELEGANS*) HOOP NET ESCAPES: SIZE VERSUS SEX
Donald J. Brown*, Bei DeVolld, Michael R. J. Forstner, Texas State University-San Marcos, San Marcos, TX

2:20 PM G 415 A FUTURE WITHOUT BOX TURTLES? INVESTIGATING THE IMPACT OF URBANIZATION ON WESTERN BOX TURTLES, *TERRAPENE ORNATA*

James C. Cureton II*, Christopher P. Randle, William I. Lutterschmidt, and Raelynn Deaton, Sam Houston State University, Huntsville, TX and Donald Ruthven and Michael Janis, Texas Parks and Wildlife

2:40 PM

Section Meeting

Science 111

CONSERVATION ECOLOGY POSTERS

U P555 ARE BEACHES' SUITABILITY AS SAND CRAB HABITAT AFFECTED BY HUMAN RECREATION?

Jessica Hope Murph*, Zen Faulkes, Department of Biology, The University of Texas-Pan American

G P416 ASSESING THE CAUSES AND IMPACT OF ROAD MORTALITY ON TURTLE POPULATIONS IN AN URBAN-PRONE AREA

James C. Cureton II*, Christopher P. Randle, William I. Lutterschmidt, and Raelynn Deaton, Sam Houston State University, Huntsville, TX

U P471 FEEL FREE TO HIT THE SNOOZE BUTTON: TIME OF DAY DOES NOT INFLUENCE SURFACE COUNTS OF THE GEORGETOWN SALAMANDER (*EURYCEA NAUFRAGIA*)

Tiffany D. Biagas*, Alexander S. Hall, Alexis L. Ritzer, and Benjamin A. Pierce, Southwestern University, Georgetown, TX

NS P413 PRELIMINARY NOTES ON CLARION BURROWING OWL, A FORGOTTEN SUBSPECIES OF NORTH AMERICAN CONTINENT

Héctor E. Valdez-Gómez, Armando J. Contreras-Balderas, Universidad Autónoma de Nuevo León. Ciudad Universitaria CP 66451, A.P. 425 San Nicolas de los Garza, Nuevo León, México. Geoffrey L. Holroyd, and Helen E. Trefry, Canadian Wildlife Service, Environment Canada, Edmonton, AB, T6B 2X3, Canada.

ENVIRONMENTAL SCIENCE

1:20 PM **Friday, March 5** **Science 104**

1:20 PM U 373 EXAMINATION OF SEVERAL METHODS FOR CONTROLLING GIANT RIVER CANE, *ARUNDO DONAX*
Nelly Hays*AA, Jim Earhart Ph.D., Jim Goetze Ph.D., Laredo Community College, Laredo, TX.

1:40 PM G 568 ISOLATION AND CHARACTERIZATION OF BACTERIA TOLERANT TO ATRAZINE AND OXAMYL AS POTENTIAL BIOREMEDIATION TOOLS FOR PERSISTENT PESTICIDES
IbDanelo Cortez*, Sandra Aguirre, Kristine L Lowe, University of Texas - Pan American, Edinburg, TX.

2:00 PM NS 375 MONITORING OF PESTICIDE RESIDUES IN RIYADH CULTURED FISH
Mohamed H. EL-Saeid*, Department of Soil science, College of Food & Agricultural Sciences, King Saud University, POB 2460, Riyadh 11451, Kingdom of Saudi Arabia

2:20 PM U 593 THE RELATIONS BETWEEN SIZE AND GROWTH PARAMETERS IN *ARUNDO DONAX* AND INFESTATION BY THE WASP *TETRAMESA ROMANA*
Merrit Mckelvy, Megan Brown, Sarah Crouchet, Rahim Naghaviani, and Earl Chilton II

2:40 PM **Section Meeting** **Science 104**

ENVIRONMENTAL SCIENCE POSTERS

G P392 CHARACTERIZATION OF HEAVY METAL INDUCED OXIDATIVE STRESS IN SEVERAL BRASSICACEAE PLANT SPECIES
Fritzie J. Into*, Amery Yang, Michelle Lo and Michael W. Persans, Department of Biology, The University of Texas-Pan American, Edinburg TX 78539

U P575 CULTURE AND MOLECULAR CHARACTERIZATION OF SULFATE REDUCING BACTERIA POPULATIONS FROM THE LAGUNA MADRE OF SOUTH TEXAS
Kenneth Rodriguez, German Riojas, Kristine L Lowe, University of Texas - Pan American, Edinburg, TX.

U P521 DETECTING THE PRESENCE OF ENVIRONMENTALLY ADAPTED *ESCHERICHIA COLI*
Emilie Welker*, Trisharna Thompson, Katherine Eikenberg, and Donna Janes, Concordia University Texas, Austin, TX.

NS P433 EVALUATION OF *E. COLI* AND *B. SUBTILIS* AFTER SPACE FLIGHT ON BOARD ATLANTIS STS-129

Ohunene Abogunde* Abidat Lawal Kelsey Parks Chelsea McCoy Y-Uyen Nguyen Ayodotun Sodipe Olufisayo Jejelowo and Jason A. Rosenzweig Texas Southern University Center for Bionanotechnology and Environmental Research Houston, Texas

G P567 SPECTRAL REFLECTANCE BY FOLIAGE OF COMMON SUNFLOWER AS AN INDICATOR OF ARSENIC CONTAMINATION OF SOIL

Patricia Gandy, Angelina Villarreal, Juan Rodriguez, Ashish Mamachen, Adarsh Mamachen, Elamin Ibrahim, Michael Persans and K. Rod Summy, The University of Texas - Pan American, Edinburg, TX.

U P523 THE EFFECT OF PERIODIC SEDIMENT DISTURBANCE ON *ESCHERICHIA COLI* SUSPENSION AND SURVIVAL

Rebekka Carter*, Courtnee Shelton, Jennifer Wu, and Donna Janes, Concordia University Texas, Austin, TX.

FRESHWATER SCIENCE

8:00 AM

Friday, March 5

Science 109

8:00 AM NS 391 NUTRIENT IMPACTS ON AQUATIC COMMUNITIES IN SIX WADEABLE BRAZOS-BASIN STREAMS

Cindy Contreras*, Patricia Radloff, Jennifer Bronson and Adam Whisenant, Texas Parks and Wildlife Department, Austin, TX.

8:20 AM G 463 OPTIMAL MALE MATING STRATEGIES IN COERCIVE LIVEBEARING FISHES: A TEST OF THE PATERNITY ASSURANCE HYPOTHESIS

Rachel Martin*, James Cureton, Raelynn Deaton, Sam Houston State University, Huntsville, TX

8:40 AM G 404 GREGARINE PARASITISM IN THE DRAGONFLY *ERYTHEMIS SIMPLICICOLLIS* (ODONATA: LIBELLULIDAE) AT A CONSTRUCTED CENTRAL TEXAS WETLAND

Jason L. Locklin* and Darrell S. Vodopich, Baylor University, Waco, TX.

9:00 AM U 443 TEMPORAL AND SPATIAL VARIABILITY IN THE ABUNDANCE OF *ESCHERICHIA COLI*, ENTEROBACTERIACEAE, AND OTHER BACTERIA IN THE LOWER RIO GRANDE, TEXAS
 Jessica M. Montemayor* and Hudson DeYoe, Department of Biology and Center for Subtropical Studies, University of Texas - Pan American, Edinburg, TX.

9:20 AM G 475 EFFECTS OF DENSITY, TIME AND FEMALE PRESENCE ON MALE SAME-SEX MATING IN THE WESTERN MOSQUITOFISH, *GAMBUSIA AFFINIS*
 Jessica Sanchez*, Raelynn Deaton, Sam Houston State University, Huntsville, TX

9:40 AM Poster Session I and Break

Science Hallways

10:20 AM U 466 THE PERSISTENCE OF PINK: PERIVITELLIN FLUID FAILS TO PROTECT *POMACEA INSULARUM* EGGS FROM PREDATION
 Olivia Stanzer*, Romi L Burks, Southwestern University, Georgetown, TX.

10:40 AM G 554 A DESCRIPTIVE STUDY OF POTENTIAL DIVERGENCE OF GONOPODIAL MORPHOLOGY IN TWO SPECIES OF LIVEBEARING MOSQUITOFISHES
 Stacy B Stoops*, Raelynn Deaton, Sam Houston State University, Huntsville, TX

11:00 AM NS 472 NEW SPECIES OF HETERANDRIA FROM COAHUILA STATE, MEXICO
 Ma de Lourdes Lozano Vilano*, Universidad Autónoma de Nuevo León, Nuevo León, México and Justin C. Bagley Brigham Young University, Provo, UT.

11:20 AM G 586 A COMPARATIVE FIELD STUDY ON MATING BEHAVIOR ACROSS THREE ISOLATED POPULATIONS OF THE SPRING DWELLING *GAMBUSIA*, *GAMBUSIA GEISERI*
 Chris Kroll*, Rick Lewis, Samir Rosado, Janalyn West, Raelynn Deaton, Sam Houston State University, Huntsville, TX

11:40 AM G 491 SEASONAL DYNAMICS OF PARASITIC HELMINTHS OF BLUEGLL SUNFISH, *LEPOMIS MACROCHIRUS* (CENTRARCHIDAE) AND CERTAIN PHYSIOCHEMICAL FACTORS IN A EUTROPHIC MEANDER SCAR LAKE IN SOUTHEAST TEXAS
 Jan S. Callarman* and H. Randall Yoder, Lamar University, Beaumont, TX.

12:00 PM		Lunch		Thompson Student Center
12:40 PM		Poster Session II		Science Hallways
1:20 PM	U	524	WATERLOGGED: EGG MATURITY MITIGATES EFFECTS OF WATER STRESS ON REPRODUCTIVE EFFORTS OF A FRESHWATER INVASIVE APPLE SNAIL (<i>POMACEA INSULARUM</i>) Matthew K. Trawick* and Romi L. Burks, Southwestern University, Georgetown, TX.	
1:40 PM	G	588	EFFECTS OF BLACK SPOT DISEASE ON THE <i>GAMBUSIA AFFINIS</i> MATING SYSTEM Richard Lewis, James Cureton, Rachel Martin, Stacy Stoops, Raelynn Deaton, and Sam Houston State University, Huntsville, TX	
2:00 PM	G	536	MERCURY CONCENTRATION IN MACROINVERTEBRATES FROM GRASSLAND PONDS WITH AND WITHOUT FISH COMMUNITIES Byron L. Henderson*, Matthew M. Chumchal, Ray W. Drenner, Yanci Deng, Texas Christian University, Fort Worth, TX and Pete Diaz, Weston H. Nowlin, Texas State University, San Marcos, TX.	
2:20 PM	U	578	PARASITES AND HOST ENERGETICS: EFFECTS OF A PARASITIC CASTRATOR ON THE CONSUMPTION AND METABOLISM IN AN AQUATIC SNAIL HOST Kristen Alayne Hopperstad*, Brian Lund Fredensborg, The University of Texas-Pan American, Edinburg, TX	
2:40 PM	NS	603	DIVERSITY AND ABUNDANCE OF UNIONID MUSSELS IN THREE SANCTUARIES ON THE SABINE RIVER IN NORTHEAST TEXAS Neil B. Ford, Jessica Gullett, University of Texas at Tyler, Tyler, TX and Marsha E. May*, Texas Parks and Wildlife Department, Austin, TX.	
3:00 PM	G	610	EFFECTS OF MALE HARASSMENT AND GONOPODIAL STRUCTURE ON FEMALE FITNESS IN COERCIVE LIVEBEARING FISHES OF THE GENUS <i>GAMBUSIA</i> Janalyn West, James Cureton, Rick Lewis, Rachel Martin, Jessica Sanchez, Stacy Stoops, and Raelynn Deaton, Sam Houston State University, Huntsville, TX	
3:20 PM		Section Meeting		Science 109

FRESHWATER SCIENCE POSTERS

- NS P574 ASSESSMENT OF STREAM CONTINUUM CONCEPTS FOR A NEOTROPICAL WATERSHED OF THE MAYA MOUNTAINS, BELIZE, CENTRAL AMERICA
Matthew P. Hoch*, Hunter E. Keeney, Lamar University, Beaumont, TX and Ed Boles, University of Belize, Belmopan, Belize, CA
- U P599 EFFECT OF BLACK SPOT DISEASE ON FEMALE FECUNDITY AND BODY CONDITION IN THE WESTERN MOSQUITOFISH
Vincent Horrillo, Stacy Stoops, James Cureton, Rachel Martin, Rick Lewis, Jessica Sanchez, Raelynn Deaton, Sam Houston State University, Huntsville, TX
- U P595 EFFECT OF MALE GONOPODIAL LENGTH ON MALE AND FEMALE REPRODUCTIVE SUCCESS IN THE WESTERN MOSQUITOFISH
Emily Amenta*, Raelynn Deaton, Sam Houston State University, Huntsville, TX
- NS P605 EFFECTS OF BLACK SPOT DISEASE ON THE *GAMBUSIA* MATING SYSTEM: PART II
James Cureton, Rick Lewis, Rachel Martin, Stacy Stoops, Sam Houston State University, Huntsville, TX
- G P557 EFFECTS OF MALE GONOPODIAL LENGTH ON FEMALE MATE CHOICE IN LIVEBEARING COERCIVE MOSQUITOFISH, *GAMBUSIA AFFINIS*
Stacy Stoops *, Sarah Sendlebach, Elizabeth Lamb, Raelynn Deaton, Sam Houston State University, Huntsville, TX
- U P522 EFFECTS OF NUTRIENT-TYPE AND CLIMATE ON THE OVERALL GROWTH AND DEVELOPMENT OF *LUMBRICULUS VARIEGATUS* IN THE LABORATORY
Stephen H. Lucke*, Anna K. Murr, and Veronica G. Martinez Acosta, Biology Department, University of the Incarnate Word, San Antonio, TX.
- U P546 FLUOXETINE AND ITS EFFECTS ON MALE BETTA COURTSHIP
Catherine Canales*, Joanna Castro*, Vivian Cerritos, Victoria Hill*, Monique Perez*, Sara Tallarovic, University of the Incarnate Word, San Antonio, TX.

- U P409 FOREWING ASYMMETRY IN DRAGONFLIES
(ODONATA: ANISOPTERA) OF CENTRAL TEXAS
Joshua S. Huckabee* and Jason L. Locklin, Temple College,
Temple, TX.
- U P608 INVESTIGATING POPULATION-LEVEL IMPACTS OF
FEMALE MASCULINIZATION IN *GAMBUSIA AFFINIS*
WITHIN THE BRAZOS RIVER DRAINAGE, TEXAS
Ashley Ansley, James Cureton, Raelynn Deaton, Sam Houston
State University, Huntsville, TX
- NS P517 PHOSPHORUS SORPTION CHARACTERISTICS OF
STREAM SEDIMENTS OF THE NORTH BOSQUE RIVER
Anne McFarland* and Larry Hauck, Texas Institute for Applied
Environmental Research, Tarleton State University,
Stephenville, TX.
- NS P502 PLAYA LAKES: ENVIRONMENTAL FACTORS
INFLUENCING SURVIVAL SUCCESS OF SEVERAL
PHYLLOPODS AND OSTRACODS
Francis Horne, Biology Department, Texas State University,
San Marcos, TX.
- U P556 SPATIAL VARIATION OF HG, 15N, AND 13C IN
SEDIMENT AND MACROINVERTEBRATES IN CADDO
LAKE
Alden Park*, Michael Sawey, Matthew Chumchal, Ray
Drenner, Yanci Deng, Jacob Wadlington, Biology Department,
Texas Christian University and Weston Nowlin, Biology
Department, Texas State University
- NS P500 UNUSUAL MACROINVERTEBRATE ASSEMBLAGE OF A
SMALL SPRING-FED STREAM
Mark Gustafson* and Emmanuel Asahene, Texas Lutheran
University, Seguin TX.

GEOSCIENCES

8:40 AM

Friday, March 5

Science 122

- 8:40 AM U 478 GULF COAST STORM SURGE DEPTHS IN CHAMBERS
AND JEFFERSONS COUNTIES GENERATED BY
HURRICANE IKE
Kristopher B. Farmer*, Joseph M. Kruger, Lonnie W. Murphy,
Lamar University, Beaumont, TX

9:00 AM G 449 SPECTRAL ANALYSIS AND PRINCIPAL COMPONENT ANALYSIS OF THE BUCK HILL VOLCANIC GROUP, TRANS-PECOS TEXAS

Jonathan Dyess, Sul Ross State University

9:20 AM G 464 A GEOCHEMICAL STUDY OF THE IGNEOUS AQUIFERS OF WEST TEXAS

Amy Brown*, Kevin Urbanczyk, Sul Ross State University, Alpine, Texas

9:40 AM Posters Session I and Break

Science Hallways

10:20 AM G 577 DIGITAL TOOLS FOR MAPPING GEOLOGY AND PALEONTOLOGY COLLECTIONS

Katharine Criswell* The University of Texas at Austin, Austin, TX, Ann Molineux and Louis Zachos, Texas Natural Science Center, Austin, TX

10:40 AM G 453 LATE ORDOVICIAN THROUGH MIDDLE SILURIAN GASTROPODA OF THE EASTERN GREAT BASIN

Phil Frederick Sul Ross State University

11:00 AM G 561 REPORT OF NEW LUNGFISH (CERATODONTIDAE) FROM THE CRETACEOUS (CENOMANIAN) WOODBINE FORMATION AT THE ARLINGTON ARCHOSAUR SITE, NORTH TEXAS.

Derek J. Main*, Scotese Museum of Paleontology, University of Texas at Arlington; David Parris, New Jersey State Museum; and Barbara Grandstaff, University of Pennsylvania

11:20 AM NS 582 MAPPING AND EXCAVATING A NEW CRETACEOUS CROCODILE (ARCHOSAURIA: GONIOPHOLIDAE) AT A LARGE SCALE URBAN DIG: THE ARLINGTON ARCHOSAUR SITE, NORTH CENTRAL TEXAS.

Roger Fry* and Derek J. Main, Scotese Museum of Paleontology, University of Texas at Arlington

11:40 AM U 533 THE STRATIGRAPHIC POSITION OF THE FIRST UNITA C MICRO-MAMMAL COMMUNITY IN THE UINTA FORMATION, UINTA BASIN, NORTHEASTERN UTAH

Burnes, James M.,* Jordan Mika and James W. Westgate; Department of Earth and Space Sciences, Lamar University, Texas State University System

12:00 PM Lunch

Thompson Student Center

12:40 PM Poster Session II

Science

Hallways

1:20 PM NS 497 ORIGIN OF INTRACLASTS FROM MUD CURLS ON THE ALGAL FLATS OF GALVESTON ISLAND STATE PARK, TEXAS

Nielson, R. LaRell*, and Barker, Chris A., Department of Geology, Stephen F. Austin State University

1:40 PM NS 585 PROTEROZOIC SHEAR ZONE IN BURRO MOUNTAINS, NM, HINTS AT MAZATZAL KINEMATICS

Barker,* Chris A., Cegon, A., Dillingham, M., and Nielson, R. L., Department of Geology, Stephen F. Austin State University, Nacogdoches, TX

2:00 PM

Section Meeting

Science 122

8:00 AM

Saturday, March 6

Geology Field Trip – meet parking lot N side of Science Bld

GEOSCIENCES POSTERS

U P450 A PRELIMINARY ANALYSIS OF LUNGFISH (DIPNOI) TOOTH PLATES FROM DRIEFONTEIN, SOUTH AFRICA

Daniela Ortiz*, Patrick J. Lewis, Alicia M. Kennedy, Sam Houston State University, Huntsville, TX, and John Hancox, University of the Witwatersrand, Johannesburg, South Africa

G P515 PALEOENVIRONMENTAL RECONSTRUCTION OF THE OLIGOCENE RIVERSIDE QUARRIES (BLUE LAGOON) CATAHOULA FORMATION, TEXAS

Timothy L. Campbell* and Richard S. Tutalo, Sam Houston State University

U P357 HURRICANE IKE DAMAGE PATTERNS ALONG THE UPPER TEXAS GULF COAST

Amalia Villarreal, Lamar University - Geology Department

NS P589 POLYPHASE STRUCTURES AND PASSIVELY EMPLACED PLUTONS IN NORTHERN SIERRA DEL CARMEN, BIG BEND REGION, TEXAS

Joseph I. Satterfield*, Henry F. Schreiner III, Mason Brownlee, Dominick Percoco, Amanda Williams, and Travis Barnett, Angelo State University, San Angelo, TX

U P434 VIRTUAL FIELD TRIP OF THE WESTERN APPALACHIAN MOUNTAINS

Todd R. Webb*, Joseph M. Kruger, Lamar University, Beaumont, TX

MARINE SCIENCE

10:20 AM

Friday, March 5

Science 134

10:20 AM U 619 DETERMINATION OF PROGRAMMED CELL DEATH IN
ALEXANDRIUM TAMARENSE THROUGH CASPASE
ACTIVITY AND ANNEXIN V LABELING

Rogers Brown, Texas Lutheran University, Seguin TX

10:40 AM U 558 EFFECTS OF BUCKMINSTERFULLERENE
NANOPARTICLES ON THE BACTERIA OF GALVESTON
BAY

Nick K. Kubelka*, Texas Lutheran University, Seguin, TX and
Robin Brinkmeyer, Ph.D., Texas A&M University-Galveston,
TX

11:00 AM NS 399 SALINITY RECOVERY IN THE LOWER LAGUNA
MADRE OF TEXAS FOLLOWING HURRICANE DOLLY

Joseph L. Kowalski*, Hudson R. DeYoe, Department of
Biology and the Center for Subtropical Studies, The University
of Texas - Pan American, 1201 West University Drive,
Edinburg, Texas 78541, Gilbert H. Boza, Jr., and Donald L.
Hockaday, Coastal Studies Laboratory and the Center for
Subtropical Studies, The University of Texas - Pan American,
South Padre Island, Texas 78597

11:20 AM

Section Meeting

Science 134

MARINE SCIENCE POSTERS

U P436 A SURVEY OF BRITTLE STAR SPECIES AND
INCIDENCE OF PREDATION ON TOBACCO CAYE,
BELIZE

Cody Conway*, Michael Zarzosa*, and Ana Christensen,
Lamar University, Beaumont, TX

U P458 A TECHNIQUE TO MORE ACCURATELY MEASURE
METABOLIC RATES OF SEAGRASSES.

Analicia Solis* and Hudson DeYoe, Biology Dept and Center
for Subtropical Studies, University of Texas - Pan American,
Edinburg, TX.

- U P480 NUTRIENT LIMITATION OF PHYTOPLANKTON IN THE BRAZOS-SANTIAGO PASS, SOUTH PADRE ISLAND, TEXAS.

Sebastian Garcia*, Daniella Diaz, Chloe Veron, Nicolas Jones, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, Hudson DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas, and Joseph Kowalski. The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas and Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas

- U P482 POTENTIAL COMPETITIVE INTERACTIONS BETWEEN THE SEAGRASS *THALASSIA TESTUDIUM* AND THE ALGA *PENICILLUS CAPITATUS* IN A SUBTROPICAL TEXAS LAGOON.

Nicholas R. Jones*, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, Hudson R. DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas, and Joseph L. Kowalski, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, and Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas.

- U P481 PRIMARY PRODUCTIVITY IN THE LOWER LAGUNA MADRE, TEXAS, FROM PORT MANSFIELD TO THE GULF OF MEXICO

Daniella Diaz*, Sebastian Garcia, Chloe Veron, Nicolas Jones, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, Hudson DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas 78539, and Joseph Kowalski, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, and Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas 78539

- U P437 THE EFFECTS OF PH AND HYPERCAPNIA ON THE RESPIRATION AND REGENERATION RATES OF *HEMIPHOLIS ELONGATA* (ECHINODERMATA: OPHIUROIDEA)

Bonnie Smith*, Lisa Stegall*, and Ana Christensen, Lamar University, Beaumont, TX

U P486 TRAWLING VERTEBRATES AND INVERTEBRATES: A DIVERSITY COMPARISON WITHIN THE LOWER LAGUNA MADRE, TEXAS.

Chloe Veron*, Daniella Diaz, Sebastian Garcia, Nicolas Jones, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, Hudson DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas, and Joseph Kowalski, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, and Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas

SCIENCE EDUCATION

1:20 PM		Friday, March 5	Science 134
1:20 PM	NS	385 DIFFERENTIATED INSTRUCTION IN MIDDLE SCHOOL SCIENCE CLASSROOMS	
		Diane L. Taylor and James Gentry, Tarleton State University	
1:40 PM	NS	566 USING THE JASON PROJECT’S “OPERATION INFINITE POTENTIAL” TO ENERGIZE SCIENCE STUDENTS	
		Westgate, James W.*1 D’Ann Douglas,2 Larry Elliott3 and O’Brien Stanley.3 1-Department of Earth and Space Sciences, 2- JASON Alliance for Southeast Texas, 3- Department of Communication, Lamar University, Texas State University System, Beaumont, TX USA 77710	
2:00 PM	NS	423 ON-LINE STUDENT BASED DISCOVERY PROGRAMS IN ASTRONOMY	
		J. Patrick Miller, Hardin-Simmons University	
2:20 PM	NS	493 INTRODUCING EPIDEMIOLOGY: THE FIELD, PRIMARY LITERATURE AND GLOBAL IMPACT	
		Patricia J. Baynham, St. Edward’s University, Austin, TX	
2:40 PM	NS	511 IMPLEMENTING A STUDENT-LED RESEARCH PROGRAM	
		Roberto B. Gonzales, Northwest Vista College, San Antonio, TX	

3:00 PM NS 579 THE ATTRACTION OF POOR-QUALITY COLLEGE STUDENTS TO ONLINE, “LAB”-BASED FRESHMAN GEOLOGY COURSES: IT’S ABILITY TO DETERIORATE THE VIRTUAL CLASSROOM ENVIRONMENT AND BROADER PROFICIENCY AT UNDERMINING THE QUALITY OF HIGHER EDUCATION
Richard A. Ashmore* and Donald E. Owen, Lamar University, Beaumont, TX, and Stephanie Austin, Parsons Infrastructure and Technology, Honolulu, HI

3:20 PM NS 591 ANALYTICAL AND GEOMETRICAL SYNERGY IN PROBLEM SOLVING
John T. Sieben, Texas Lutheran University

3:40 PM Section Meeting Science 134

SYSTEMATICS AND EVOLUTIONARY BIOLOGY

8:20 AM Friday, March 5 Science 308

8:20 AM NS 530 DYNAMIC CAMOUFLAGE IN FISH
T.L. Maginnis and M.E. Cummings, The University of Texas at Austin

8:40 AM G 629 SEXUAL VS. ASEXUAL REPRODUCTION IN A STICK INSECT: EVIDENCE FOR A COST OF MALES?
Christopher Redmond University of Texas, Section of Integrative Biology, College of Natural Sciences

9:00 AM G 501 ARE THE COLOR FORMS IN THE MOTTLED ROCK RATTLESNAKE (*CROTALUS L. LEPIDUS*) CONSEQUENT OF PREDATION?
Vincent R. Farallo* and Michael R. J. Forstner, Texas State University-San Marcos, Biology Department, San Marcos, TX

9:20 AM G 560 A PHLYOGENETIC STUDY OF *ASPERGILLUS* AND OTHER RELATED FUNGI BASED ON MITOCHONDRIAL CYTOCHROME OXIDASE 1
Shaunte Abdin*, Olufisayo Jejelowo, and Hector C. Miranda, Jr.

9:40 AM Poster Session I and Break Science Hallways

10:20 AM U 490 DEVELOPMENT OF MICROSATELLITE MARKERS FOR STUDYING POPULATION GENETICS OF THE COTTON RAT (*SIGMODON HISPIDUS*)
Jordan Sparkman* and Russell Pfau, Department of Biological Sciences, Tarleton State University, Stephenville, TX

10:40 AM	G	550	THE HYBRID ZONE BETWEEN THE TEXAS RAT SNAKE AND BAIRD'S RAT SNAKE INFERRED FROM MICROSATELLITE AND MITOCHONDRIAL DNA DATA David Rodriguez, Jeremy P. Weaver, Troy D. Hibbitts, Michael R.J. Forstner and Llewellyn D. Densmore III	
11:00 AM	G	597	A PCR BASED STUDY OF A DYNAMIC HYBRID ZONE BETWEEN CHROMOSOMAL CYTOTYPES OF <i>PEROMYSCUS LEUCOPUS</i> IN NORTH TEXAS Jodie Lovejoy, Midwestern State University	
11:20 AM	G	544	EXAMINING POPULATION GENETIC EVIDENCE OF REPRODUCTIVE ISOLATION BASED ON HOST PLANT USE FOR THE JUNIPER HAIRSTREAK BUTTERFLY, <i>MITOURA GRYNEUS</i> , WITHIN TEXAS Michelle Downey and Chris Nice, Texas State University-San Marcos	
12:00 PM			Lunch	Thompson Student Center
12:40 PM			Poster Session II	Science Hallways
1:20 PM	G	562	MOLECULAR IDENTIFICATION AND PHYLOGENETIC SYSTEMATICS OF <i>ASPERGILLUS</i> AND RELATED FUNGI BASED ON ITS GENES Tiarra Spencer1*, Olufisayo Jejelowo and Hector C. Miranda, Jr.	
1:40 PM	G	507	MORPHOMETRIC AND LAMELLAR VARIATION IN THE MEXICAN LAND SNAIL <i>HOLOSPIRA ORCUTTI</i> (GASTROPODA: PULMONATA: UROCOPTIDAE) Rigel Rilling* and Ned Strenth, Angelo State University, San Angelo, Texas 76909	
2:00 PM	G	525	MORPHOLOGICAL VARIATION BETWEEN WESTERN SLIMY SALAMANDERS, <i>PLETHODON ALBAGULA</i> , OF THE INTERIOR HIGHLANDS AND EDWARDS PLATEAU. Drew R. Davis*, The University of Texas at Austin, Austin, TX, Greg B. Pauly, University of California, Davis, CA, and Travis J. LaDuc, The University of Texas at Austin, Austin, TX	
2:20 PM	G	620	SPERM STORAGE AND METAPOPOPULATION DYNAMICS MAY EXPLAIN THE MAINTENANCE OF A VERTEBRATE GYNOGENETIC SPECIES Gompert, Zach; Aspbury, Andrea; Gabor, Caitlin; Nice, Chris	
2:40 PM			Section Meeting	Science 308

SYSTEMATICS AND EVOLUTIONARY BIOLOGY POSTERS

- U P465 ANALYSIS OF A SUB-FOSSIL LEOPARD SKELETON FROM THE KOANAKA HILLS, BOTSWANA
Jacqueline Knight, Timothy L. Campbell, Patrick J. Lewis, and Montie L. Thies, Sam Houston State University, Huntsville, TX.
- U P496 CHALLENGES OF CURATING SMALL FOSSIL ANIMALS
Micky Labbe*, Patrick J. Lewis, Sam Houston State University, Huntsville, TX, and Eileen Johnson, Museum of Texas Tech University, Lubbock, TX
- U P369 NESTING BEHAVIOR OF THE SAND WASP, *MICROBEMBEX MONODONTA* (HYMENOPTERA: BEMBECEINAE) IN CENTRAL TEXAS
Veronica Lopez*, Allan Hook, St. Edward's University, Austin, TX
- G P638 PHYLOGENETIC ANALYSIS OF HEAT SHOCK PROTEINS IN GLASSY-WINGED SHARPSHOOTER (*HOMALODISCA VITRIPENNIS*)
Henry L. Schreiber IV*, Daymon A. Hail, Blake R. Bextine, University of Texas at Tyler, Tyler, TX, Wayne G. Hunter, USDA-ARD Fort Pierce, Fort Pierce, FL
- U P639 PHYLOGENETIC RELATIONSHIPS OF GLASSY-WINGED SHARPSHOOTER (*HOMALODISCA VITRIPENNIS*) POPULATIONS
Adam L. Booth, Sharon A. Andreason, Blake R. Bextine, University of Texas at Tyler, Tyler, TX
- G P637 ZOT GENE AS A NOVEL TARGET FOR POPULATION PHYLOGENY OF *X. FASTIDIOSA*
Henry L. Schreiber IV*, Blake R. Bextine, University of Texas at Tyler, Tyler, TX, Lisa D. Morano, University of Houston-Downtown, Houston, TX
- U P387 NESTING BIOLOGY OF *TACHYSPHEX TERMINATUS* (HYMENOPTERA: CRABRONIDAE) AT PEDERNALES FALLS STATE PARK, TEXAS
Madeline Orf* and Allan Hook, St. Edward's University
- U P559 MOLECULAR CHARACTERIZATION OF A FUNGAL COMMUNITY USING ITS AND COI
Sherrin Raju* Shaunte Abdin, Tierra Spencer, Ayodotun Sudipe, O. Jejelowo and H. C. Miranda, Jr, Texas Southern University

TERRESTRIAL ECOLOGY AND MANAGEMENT

8:00 AM	Friday, March 5		Science 112
8:00 AM	NS	509 THE INFLUENCE OF SIZE ON THE INSECT COMMUNITY OF GIANT RAGWEED STEMS Richard J. W. Patrock, St. Edward's University, Austin, TX	
8:20 AM	G	513 INSECT SURVEY OF THREE ARTIFICIAL ECOLOGICAL ZONE GARDENS Karin L. Nilsen* and Christopher M. Ritzi, Department of Biology, Sul Ross State University	
8:40 AM	U	398 DARK V PALE: HOW BODY COLOR AND TEMPERATURE MAY IMPACT MALE <i>BEMBEVINUS NEGLECTUS</i> WASP BEHAVIOR ON SOIL SURFACES Laura Auchterlonie*, Allan Hook, Richard Patrock, St. Edward's University, Austin, TX	
9:00 AM	NS	378 THE TEXAS ECOLOGICAL SYSTEMS MAPPING PROJECT Amie Treuer-Kuehn, Texas Parks & Wildlife Department	
9:20 AM	G	454 TOWARDS A NEW METHOD FOR QUANTIFYING PHYSICAL CLUTTER IN FOREST EDGES Thomas W. Pettit* and Kenneth T. Wilkins, Baylor University, Waco, TX	
9:40 AM	Poster Session I and Break		Science Hallways
10:20 AM	NS	371 DEMOGRAPHICS OF AN URBAN WATER SNAKE POPULATION: MARK-RECAPTURE OF <i>NERODIA ERYTHROGASTER</i> ON THE UNIVERSITY OF TEXAS AT AUSTIN CAMPUS Travis J. LaDuc*, Christopher J. Bell, The University of Texas at Austin, Austin, TX and Greg B. Pauly, University of California, Davis, CA	
10:40 AM	G	424 DIETARY AND HABITAT NICHE OVERLAP AMONG FOUR SNAKE SPECIES IN EASTERN TEXAS Matthew D. Broxson* and Richard T. Kazmaier, West Texas A&M University, Canyon, TX	
11:00 AM	U	405 A DEMOGRAPHIC STUDY OF THE <i>KINOSTERNON FLAVESCENS</i> IN WEST TEXAS Lucia DeLaRosa, Steven Platt, Sul Ross State University	

11:20 AM U 440 ARTIFICIAL LIGHT AND NOCTURNAL ANURAN CALLING BEHAVIOR IN NORTHERN MICHIGAN VERNAL POOLS

Alexander S. Hall, Southwestern University, Georgetown, TX

11:40 AM G 431 COMPARATIVE STUDY OF THE STRUCTURE OF AVIFAUNA EAST AND WEST SIDES OF CERRO

Blanca Lizeth Gaspar-Rodríguez*, Armando J. Contreras-Balderas and Juan A. García-Salas, Laboratorio de Ornitología, Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León. Apartado Postal 425. San Nicolas de los Garza, Nuevo Leon, Mexico 66450

12:00 PM Lunch

**Thompson
Student
Center**

12:40 PM Poster Session II

**Science
Hallways**

1:20 PM G 510 PRELIMINARY ANALYSES OF POPULATION STRUCTURE AND REPRODUCTIVE SUCCESS OF URBAN GREAT-TAILED GRACKLES

Beverly L. Cochran*, Texas A&M University, College Station, TX and Jeffrey G. Kopachena, Texas A&M University-Commerce, TX

1:40 PM G 386 ECOLOGY OF BAT COMMUNITY IN PINEY FORESTS OF SOUTHEASTERN TEXAS

Anica Debelica* and Kenneth Wilkins, Baylor University, Waco, Texas

2:00 PM G 548 USE OF ANTHROPOGENIC FOOD SOURCES BY WHITE-WINGED DOVES

Alayne Fronimos*, John Baccus, Michael Small, Joseph Veech, Texas State University, San Marcos, TX.

2:20 PM G 580 DEN SITE SELECTION OF RINGTAILS (*BASSARISCUS ASTUTUS*) IN WEST CENTRAL TEXAS.

Andrew R. Tiedt and Robert C. Dowler, Angelo State University, Department of Biology

2:40 PM NS 633 ECOLOGY OF POCKET GOPHERS (*GEOMYS*) IN ARKANSAS

Matthew B. Connior*, South Arkansas Community College, El Dorado, AR and Thomas S. Risch, Arkansas State University, Jonesboro, AR

- 3:00 PM NS 442 RESPONSES OF SMALL MAMMALS TO FIRE IN A TALLGRASS BLACKLAND PRAIRIE
Kenneth T. Wilkins*, Brianna N. Kirchner, David A. Sergeant, and Nicholas S. Green, Department of Biology, Baylor University, Waco, TX

3:20 PM Section Meeting

Science 112

TERRESTRIAL ECOLOGY AND MANAGEMENT POSTERS

- U P380 ECTOPARASITES OF *MUS MUSCULUS* AROUND ALPINE, TX, WITH NOTES ON THE ECTOPARASITES ASSOCIATED WITH OTHER RODENT SPECIES
Sheryl Bitner and Christopher M. Ritzi, Biology, SRSU
- G P611 EFFECTS OF CLIMATOLOGICAL VARIABLES ON EMERGENCE TIME OF BATS AT OLD TUNNEL WILDLIFE MANAGEMENT AREA, TEXAS
Margaret Collins, Dana Spontak, Michael Small, John Baccus, Texas State University-San Marcos
- U P477 EFFECTS OF TEMPERATURE AND VEGETATIVE GROWTH ON RESPIRATION FROM AN ALKALINE CLAY SOIL IN CENTRAL TEXAS
James McCann* and William Quinn, St. Edward's University, Austin, Texas
- U P569 EFFECTS OF THE INVASIVE SHRUB *LIGUSTRUM JAPONICUM* (OLEACEAE) UPON PLANT SPECIES DIVERSITY WITHIN AUSTIN, TEXAS, USA
Scott D. Catone*, and William J. Quinn, St. Edward's University, Austin, Tx
- U P408 MOLECULAR IDENTIFICATION OF COYOTE SCAT
Jessica Lyon* and David L. McCulloch, Department of Biology, Collin College, Plano, TX

LATE BREAKING RESEARCH

8:00 AM Friday, March 5

Science 235

- 8:00 AM** ASSESSMENT OF ENVIRONMENTAL ESTROGENS IN THE GALVESTON BAY WATERSHED
U Zuri Dale*^a, Katoria R. Tatum-Gibbs^a, Bobby L. Wilson^a and Renard L. Thomas^{b, a}, Department of Chemistry/Environmental Toxicology Program, Texas Southern University, Houston Texas 77004, ^b College of Pharmacy and Health Sciences, Texas Southern University, Houston, Texas 77004

8:20 AM U REPEATED DOSE RESPONSE IN PROSTATE CANCER CELLS SHOWS RESISTANCE TOWARDS DASATINIB
Shamail Allen*¹, Dr. Timothy J. McDonnell², Dr. Gary Gallick²
¹Department of Biology, Texas Southern University, Houston, TX, ²The University of Texas Graduate School of Biomedical Sciences at Houston, M.D. Anderson Cancer Center, Houston, TX

8:40 AM G EFFECTS OF METAL EXPOSURE ON NORMAL OSTEOBLAST CELL DEVELOPMENT USING PRIMARY TEETH AS A BIO-INDICATOR OF EXPOSURE
Terrell Gibson*¹, Bobby Wilson², Renard L. Thomas³
¹Environmental Toxicology Program, Texas Southern University, Houston, Texas ²Chemistry, Texas Southern University, Houston, Texas 77004 ³Health Sciences, Texas Southern University, Houston, Texas

9:00 AM G PROSPECTING FOR HYBRIDS: MOLECULAR AND MORPHOLOGICAL EVIDENCE OF HYBRIDIZATION IN THE GRASS SUBSPECIES COMPLEX *DICHANTHELIUM ACUMINATUM*

Rick Hammer*, Hardin-Simmons University, Abilene, TX

LATE BREAKING RESEARCH POSTERS

U SHIFT IN BACTERIAL COMMUNITIES OF SEDIMENT FROM A SOUTHEAST TEXAS BRACKISH MARSH DUE TO SEAWATER INUNDATION: A SIMULATION OF HURRICANE IKE STORM SURGE IMPACTS

Christina C. Rainey*, Hunter E. Keeney, and Matthew P. Hoch, Lamar University, Beaumont, TX

U DEFYING THE RED QUEEN HYPOTHESIS? ASEXUAL MOLLIES ARE NOT MORE SUSCEPTIBLE TO PARASITE INFECTION THAN SEXUALLY REPRODUCING MOLLIES

Adrian Silva*, Leopoldo Garza* and Brian L. Fredensborg, UTPA

WHAT DO PINES PREFER: SAND OR CLAY?

Nikolaas Van Kley*, Christ Episcopal School, Nacogdoches, TX, James Van Kley, Stephen F Austin State University, Nacogdoches, TX

4:00 PM	SECTION CHAIRS MEETING	Science 109
5:00 PM	TEXAS ACADEMY OF SCIENCE BUSINESS MEETING (all members)	City Limits
5:30 PM	OUTSTANDING TEXAS EDUCATOR (all members)	City Limits
6:00 PM	TEXAS DISTINGUISHED SCIENTIST (all members)	City Limits
6:45 PM	SOCIAL HOUR (all members)	City Limits
7:30 PM	AWARDS BANQUET (all members)	City Limits
8:00 AM	Saturday, March 6	
	Geology Field Trip – Meet in the parking lot on the north side of the science building.	

Abstracts

649 Symposium on the Texas Evolution Controversy

INTRODUCTION TO THE TEXAS EVOLUTION CONTROVERSY SYMPOSIUM

Benjamin A. Pierce, Southwestern University, Georgetown, TX 78626

Evolution is a foundational principle of modern biology and yet over 40 percent of Americans reject evolution as an explanation for the origin and diversity of life. In 2009, the subject of evolution was particularly contentious in the state of Texas, as the State Board of Education debated science standards, including how evolution will be taught in Texas public schools. This symposium reviews the evolution controversy in Texas, its origins and consequences, and what it means for Texas scientists and science educators.

384 Symposium on the Texas Evolution Controversy

THE EVOLUTIONISTS AND THE SBOE: A VIEW FROM THE TRENCHES

Ronald K. Wetherington, Southern Methodist University, Dallas, TX

In September of 2008 I was appointed as one of six science experts to review the upcoming drafts of the science standards (TEKS) for the Texas State Board of Education. These adopted standards would guide both teachers and textbook writers for the Texas market for the coming decade. Three of us were science professionals and were appointed by six of the eight moderate members of the board. The other three were creationists, two of them not in Texas, appointed by six of the seven far-right fundamentalists on the board. From the beginning the stage was set and the intent was clear: fundamentalist board members and their creationist experts wanted to weaken the teaching of evolution in Texas. In the entire range of sciences, from physics and chemistry to aquatic and space science, only evolution mattered. The ensuing six months involved more mean-spirited and deceptive behavior from the far-right members, their citizen constituents, and the conservative and evangelical organizations in Texas than I could have imagined. What I took from this was both a sobering view of the strength of anti-science ideology in the state, and an unexpected and counter-intuitive lesson in what the real source of the opposition is.

631 Symposium on the Texas Evolution Controversy

STAND UP FOR SCIENCE: THE POLITICS OF SCIENCE EDUCATION AT THE TEXAS STATE BOARD OF EDUCATION

Katherine Miller, Texas Freedom Network

Over the past decade the Texas State Board of Education has become embroiled in debates over teaching evolution in public school science classrooms. Because Texas curriculum and textbook decisions have an impact on textbooks used in virtually every other state in the country, these debates have received widespread national media coverage. This talk will detail the history of these debates at the SBOE, the political landscape that shapes these debates and the current status of teaching evolution in Texas public schools.

381 Symposium on the Texas Evolution Controversy

EVOLUTION AND THE TEXAS SBOE: RESULTS & IMPLICATIONS

Sandra West, Texas State University, San Marcos, TX

Learn how Intelligent Design (ID) was inserted into the Texas science standards (TEKS) and into which TEKS. The ID insertions caused a range of impact from the classroom to TAKS. The new ID TEKS opened an opportunity for both ID supportive teachers and Evolution focused teachers to discuss ID in Texas classrooms.

382 Symposium on the Texas Evolution Controversy

EVOLUTION AND INTELLIGENT DESIGN: LESSONS FROM HISTORY

Elizabeth Green Musselman, Southwestern University, Georgetown, TX

This paper will examine some common, but incorrect and imprecise beliefs about the history behind the evolution-intelligent design controversy: (1) that this controversy grew out of a science-religion conflict that goes back to at least the Galileo trial; (2) that ID advocates have a bizarre interpretation the Establishment Clause that has little to no historical precedent; (3) that belief in ID is primarily an outcome of ignorance and can best be combatted with scientific literacy campaigns.

613 Symposium on the Texas Evolution Controversy

SURVEY OF FACULTY WHO TEACH EVOLUTION AND SOME PEDAGOGICAL IMPLICATIONS

Raymond A. Eve and Shawn M Christensen, University of Texas at Arlington , Arlington, TX

This presentation will cover the main findings of a recent survey that polled all faculty in the State of Texas who either currently teach human evolution or have done so recently. The main focus of the recent survey was to examine two areas of investigation. The first of these was intended to assess what pedagogical practices faculty actually follow at present when teaching human evolution, and to assess what difficulties they encounter in such a pursuit. The second main area of investigation was to assess their sentiments about appropriate content for the Texas high school biology TEKS (Texas Essential Knowledge and Skills guidelines). These guidelines have been the source of intense controversy at the statewide level in the past few years. The presentation will then utilize the findings regarding the above topics in order to consider their implications for how evolution is best taught by high school instructors and college and university faculty within Texas. Several different approaches for teaching evolution will be examined, and some tentative suggestions put forward for new interdisciplinary approaches that might be more successful than traditional methods for success in teaching human evolution.

476 Symposium on the Texas Evolution Controversy

EVOLUTION AND CREATIONISM AT A CHRISTIAN UNIVERSITY

R. E. Duhrkopf, Baylor University, Waco, TX

Teaching science at a university associated with an evangelical Christian denomination carries with it certain responsibilities and expectations that are not encountered in secular universities.

Expectations and preconceptions of students and parents require those teaching in the sciences to be more aware of the implications of what they teach. Although these can be difficult to deal with, sometimes, the more demanding task is dealing with non-science faculty and administrators who believe our faith obligates us to teach creationism.

383 Symposium on the Edwards Plateau Stream Diversity

AQUIFER DEPENDENT FISHES OF THE EDWARDS PLATEAU

Robert J. Edwards, University of Texas-Pan American, Edinburg, TX, Gary P. Garrett, Texas Parks and Wildlife Department, Mountain Home, TX and Nathan Allan, U.S. Fish and Wildlife Service, Austin, TX

Wide varieties of fishes are dependent upon the aquifers of the Edwards Plateau, occurring both in the springs and their outflows as well as further downstream in waters that are dependent upon continual spring flows. We report on the status of selected aquifer dependent fishes of the Edwards Plateau region. We have put the fishes into conservation groupings and assess each of these. Several species at the periphery of the Edwards Plateau have been extirpated or have gone extinct. Others are of conservation concern while still others serve as biological indicator species of the health of the aquatic ecosystems of the region. Without careful water planning and wise conservation, these species face an uncertain future.

520 Symposium on the Edwards Plateau Stream Diversity

EDWARDS PLATEAU AQUATIC MACROINVERTEBRATE RICHNESS AND ENDEMICITY IN A REGIONAL AND GLOBAL CONTEXT

David Pendergrass, Texas Institute for Applied Environmental Research, Stephenville, Texas
The taxonomic richness and endemism of Edwards Plateau aquatic invertebrates is among the highest in North America. In the Blanco River alone, a hydrologically disturbed stream, over 180 total taxa have been identified—most only to genus—a number 50 – 100% higher than any other stream in the Texas Gulf Slope. Approximately 65 endemic aquatic invertebrates have been identified in Edwards Plateau habitats and with several dozen troglobitic species, including many endemics, the Edwards Aquifer ranks among the most diverse groundwater ecosystems in the world. In spite of this diversity, research into the environmental factors that support taxonomic richness in the region is severely lacking. Pumping currently threatens the aquifers, springs, and the natural flow regime of many streams upon which many Edwards Plateau invertebrates depend. Sound water policy must be informed by sound science but there is currently a paucity of research to inform the conservation of aquatic habitats and biodiversity in the Edwards Plateau.

512 Symposium on the Edwards Plateau Stream Diversity

ENVIRONMENTAL FLOWS IN THE EDWARDS PLATEAU REGION OF TEXAS

Ryan Smith, The Nature Conservancy, San Antonio, TX

The rivers and streams of the Edwards Plateau of Texas support a unique and diverse aquatic biodiversity. Because of the climate and geology, many small streams are intermittent while most of the perennial streams are primarily groundwater fed through headwater and in-channel springs. The hydrologic regime is often characterized by stable, though seasonally variable

baseflow and periodic extreme overbank flow events. Biota are highly adapted to this variable environment and maintaining a hydrologic regime within the natural range of variation is vital to the function of Edwards Plateau rivers. In this paper, I review the subject of environmental flows in the Edwards Plateau, focusing on instream flows studies and environmental flows management. I discuss how the topic of environmental flows must be framed more broadly in the Edwards Plateau than in other regions of Texas because fewer rivers in the Edwards Plateau are regulated by dam operations. It is also particularly important in this region that instream flow regimes be considered in management of groundwater resources. I review the existing instream flows studies in the Edwards Plateau and available physical and biological databases available in the region to inform additional environmental flows work. I then discuss the environmental flows allocation process (Senate bill 3) and comment on how it may proceed in the Edwards Plateau portions of the Brazos, Colorado, Guadalupe/San Antonio, Nueces, and Rio Grande basins. I then present a preliminary analysis to demonstrate some potential approaches to develop environmental flow standards in non-regulated Edwards Plateau rivers.

505 **Symposium on the Edwards Plateau Stream Diversity**

INVASIVE SPECIES AS FACTORS IN THE STRUCTURE, ECOLOGY, WATER PLANNING AND POLICY OF EDWARDS PLATEAU AQUATIC ECOSYSTEMS

T.L. Arsuffi, Llano River Field Station, Texas Tech University, Junction, TX 76849 and R.G. Howells, Biostudies, Kerrville, TX 78028

Invasions by plants, animals, and pathogens, are regarded by biologists as one of the major threats to biological diversity worldwide and can have major economic impacts. Here, we survey harmful fishes, shellfishes, and aquatic plants of Edwards Plateau aquatic ecosystems and describe ecological research and impacts for potential keystone invasives. The research encompasses spatial and temporal dimensions, population dynamics, trophic studies, tracking and migration, abiotic tolerances, biodiversity, community structure, ecosystem function and conservation biology. The applied and policy implications involve interbasin water transfers, instream flows, aquifer management, sports fisheries, endangered species, water quality, restoration, law suits and public education. Economic impacts associated with invasive species effects on water quality and quantity translate into millions of dollars per year for Texas. Ecological impacts show dramatic changes in aquatic communities, increased threats to biodiversity and altered ecological structure and function. Proactive ecological research, public and policy awareness and education are instrumental to preventing and managing exotic species impacts Edwards Plateau aquatic ecosystems and will remain a challenge into the future.

474 **Symposium on the Edwards Plateau Stream Diversity**

PATTERNS OF ENDEMISM AND SPECIES RICHNESS OF FISHES OF THE WESTERN GULF SLOPE

Robert J. Maxwell* and Timothy H. Bonner, Texas State University, San Marcos, TX

Taxa richness and endemism among animals are influenced by precipitation and primary productivity gradients, isolation and colonization rates, and habitat heterogeneity. We tested patterns in taxa richness and endemism among Western Gulf Slope (WGS) fishes along similar gradients to assess conformity of species diversity among Texas drainages. A total of 155

species of native fishes was plotted among 196 sub-basins of the WGS. Taxa richness was highest in eastern WGS and lowest in the western WGS of Texas, closely conforming to the rainfall gradient. Numbers of endemic fishes, however, were highest in the western WGS and lowest in the eastern WGS. Three regions of note are the Brazos Basin, which exhibited a pronounced increase in endemism compared to adjacent Eastern drainages; the Guadalupe Basin, which contained the greatest number of endemic taxa in the Edwards Plateau; and the Rio Grande and Pecos Basins which contained the greatest numbers of endemic taxa in the WGS. This study revises and adds precision to work done by Hubbs (1954) and Conner and Suttkus (1987), and provides a better understanding of patterns of speciation and richness within the WGS.

604 Symposium on the Edwards Plateau Stream Diversity

RECREATION AND EDUCATION ON THE SAN MARCOS RIVER: A RESPONSE TO GROWING POPULATION PRESSURE

Jenna McKnight Winters, National Park Service/Texas State University, San Marcos; Julie Hulbert King, San Marcos Nature Center, City of San Marcos Parks and Recreation; Melani Howard, Watershed Protection Division, City of San Marcos Parks and Recreation

RECREATION AND EDUCATION ON THE SAN MARCOS RIVER: A RESPONSE TO GROWING POPULATION PRESSURE *Jenna McKnight Winters, National Park Service/Texas State University San Marcos *Julie Hulbert King, City of San Marcos, San Marcos Nature Center, Parks & Recreation Melani Howard, City of San Marcos, Watershed Protection Division, Parks & Recreation Like most of Central Texas, the City of San Marcos has experienced tremendous growth which is expected to continue exponentially throughout the coming years. With this population increase has come increased pressure on San Marcos's most valuable natural resource - the San Marcos River. The upper San Marcos River is used year round for recreation but with an intense pressure during the summer months. From May to September, crowds number over 3000 on holiday weekends. In the summer of 2007, a study was undertaken to determine the recreational use and impacts of the upper parks and to profile river users. A particular point of interest was discovering the extent of the river users' knowledge of endangered species within the river and how that knowledge was being obtained. Responses show that 58.8% of users are aware of endangered species and that awareness is coming primarily from school programs (26.7%) and information shared among family and friends (18.2%). While this supports that fact that school programs are an excellent avenue for disseminating information, we recognize there is room for improvement in local environmental education programs. New initiatives are being developed that reach not only the students in the school district, but the actual river users themselves. We hope to expand to local businesses and government facilities with the message of "river protection". This "on-the-ground" approach involves the branding of a new San Marcos River mascot and an on-site education program to supplement existing approaches. The new approach combines marketing and education for a larger audience.

Symposium on the Edwards Plateau Stream Diversity

RECENT RECORDS OF EPIGEAN SALAMANDERS (GENUS EURYCEA) FROM CENTRAL TEXAS SPRINGS, WITH NOTES ON THEIR OCCURRENCE AND

THOUGHTS ON THEIR CONSERVATION

Chad W. Norris, Water Resources Branch, Texas Parks and Wildlife Department, Austin, Tx

Recognizing the lack of extensive data on Texas Springs and their importance to the natural flow regime of our state's streams and rivers and the biota they support, the TPWD Water Resources Branch set out to document the location and setting of previously unreported springs as well as gather information on the biota present, including salamanders of the genus *Eurycea*.

Despite several decades of study, much remains unresolved with the taxonomy of the central Texas *Eurycea*. Recent molecular studies have identified major monophyletic groups and set the basis for more detailed studies of the systematic and taxonomic relationships of the group. Documenting new localities and populations of *Eurycea* is necessary to refine the relationships and species boundaries within and among the currently recognized taxa. A total of 75 Central Texas springs were surveyed for *Eurycea* salamanders between August 2003 and February 2009. The number of salamanders observed was enumerated and the time taken to survey each reach was noted. Field notes were taken on the habitat conditions as well as the geologic setting of the springs. Additionally, spring discharge was estimated and basic water quality parameters (temperature, dissolved oxygen, TDS, specific conductance, and pH) were measured. Many of the springs were sampled on several occasions with salamander occurrence varying.

A total of 35 populations of *Eurycea* sp. were documented from the 65 springs surveyed. Specimens were collected from only 26 of the 35 populations observed, primarily due to landowner concerns, and a majority of the specimens have been deposited at the University of Texas Natural History Collection. To our knowledge, only four of the 26 populations for which specimens were deposited have been previously reported. The populations discovered in Kinney County represent a new county record for *Eurycea* sp. and the population discovered at Lower Pinto Springs is significant given this is only the second locality for *Eurycea* in the Rio Grande Basin of Texas. A majority of the populations documented belong to the *Eurycea troglodytes* complex, in part due to the large geographic area covered by this group. These collections will assist in refining the taxonomy of this complex, as well as other groups within the *Eurycea* genera, and aid in defining the geographic boundaries of particular groups. Specimens collected and notes on their habitat occurrences are provided. We also provide notes on populations that were encountered but from which no individuals were collected

648 **Symposium on Bionanotechnology and Environmental Research**

ASTROBIOLOGY, MOLECULAR PHYLOGENETICS AND EVOLUTIONARY STUDIES AT TEXAS SOUTHERN UNIVERSITY

Hector C. Miranda, JR. and Olufisayo Jejelowo TSU NASA URC Center for Bio-Nanotechnology and Environmental Research, and Department of Biology. Texas Southern University, Houston, TX 77004.

Research on molecular evolution in microbes can help us better understand microevolutionary changes, even in humans, since we share a common molecular origin. Bacteria and fungi are documented to thrive in manned space stations, some of which are closely related to pathogenic forms. Therefore, their accurate identification, sound classification, and better understanding of the pattern of molecular change in their genome are important in their

management and control enclosed environments such as manned space stations. Our current studies involves 1) the assessment of various mitochondrial and nuclear genes, such as cytochrome oxidase 1 and ITS genes, as DNA barcode to accurately identify fungal taxa and track the phylogeographic origins of fungal communities, and 2) estimating the rates and patterns of molecular differences within and among *Aspergillus* and other fungi. Phylogenies based on parsimony analysis, likelihood methods, and Bayesian statistics of datasets based on mitochondrial and nuclear genes will be presented.

645 Symposium on Bionanotechnology and Environmental Research

BIOLOGICAL EFFECTS OF HIGH ENERGY RADIATION ON MICE

Olufisayo A Jejelowo*, Nader Pourmand+, Govindarajan Ramesh#, Ayodotun* Sodipe, Honglu Wu++ and Shishir Shishodia* *Department of Biology, Texas Southern University, 3100 Cleburne Street, Houston, Texas 77004, USA; + Biomolecular Engineering, University of California Santa Cruz, Santa Cruz, CA 95064; # Department of Biology, Norfolk State University, Norfolk, VA 23504; ++ NASA Johnson Space Center, Houston, TX.

The space radiation environment consists of trapped particle radiation, solar particle radiation and galactic cosmic radiation (GCR) in which protons are the most abundant particle type. Humans are protected from the harsh space radiation by the Earth's magnetic field that deflects them. However, during missions to the Moon or to Mars, the constant exposure to GCR and occasional exposure to particles emitted from solar particle events (SPE) are major health concerns for astronauts. In order to determine the health risks during space missions, the effect of high-energy proton exposure in mice was investigated. Various assays were conducted to improve our understanding of the general biological principles that govern the response of mice to radiation. For example, using qPCR analysis, we investigated changes in gene expression induced by high-energy protons in DNA repair genes isolated from the testes of irradiated mice. These genes include ERCC1 (5' incision subunit, DNA strand break repair), ERCC2/NER (opening DNA around the damage, Nucleotide Excision Repair), XRCC1 (5' incision subunit, DNA strand break repair), XRCC3 (DNA break and cross-link repair), XPA (binds damaged DNA in preincision complex), XPC (damage recognition), ATM or ATM (activates checkpoint signaling upon double strand breaks), MLH1 (post-replicative DNA mismatch repair) and PARP1 (base excision repair). We observed that ERCC1, PARP1, XPA, ATM, XRCC3, and XRCC1 genes had remarkable increase in gene expression at 2.0 Gy radiation. No gene expression for XPC, ERCC2 and MLH1 was observed. Second, we observed that high-energy protons induced the activation of NF- κ B and its regulated genes MMP-9 and COX-2 in the skin of radiation exposed mice. Suppression of NF- κ B pathway may provide opportunities to develop countermeasures against high-energy radiation-induced deleterious effects. These and other observations will be integrated and discussed in light of agreement with general biological principles or lack thereof.

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DESTRUCTION OF A QUORUM SIGNAL BY *BACILLUS THURINGIENSIS* LACTONASE

Marc Charendoff, Department of Biology and Biochemistry, University of Houston

Quorum signaling mechanisms have been shown to be important means by which bacteria can

communicate and thus respond as a community to their environments. Biofilms in particular are direct examples of undesirable phenotypic changes that are induced through this mechanism. Effects of biofilms are many including everything from providing a safe harbor for pathogens to fouling of heat transfer surfaces and hydraulic lines. Finding ways to prevent biofilm formation and their deleterious effects suggest that investigation of existing systems that degrade quorum signaling molecules might provide new routes by which to combat them by interfering with the biofilm signaling mechanism. Of the different systems that have been studied to provide clues as to how quorum signals might be degraded, Gram-negative bacteria producing various types of lactone species have provided an excellent model for study. Not surprisingly, Gram-positive bacteria have developed lactone-degrading enzymes to help them compete with these same Gram-negative species thus presenting an excellent platform that might inspire leads to alternate chemistries that may also be effective against quorum signaling. The object of this project is to examine the means by which the lactonase enzyme produced by *Bacillus thuringiensis* interacts with its n-acyl-l-homoserine lactone (AHL) substrates. This enzyme is a dinuclear zinc metalloprotein that has been shown to degrade lactones through a base promoted ring-opening mechanism. While some studies have been performed with regards to enzyme activities, and mechanisms have been proposed, the function of the various length acyl tails remains elusive. To that effect, molecular dynamics simulation studies were employed to investigate potential interactions between the AHL tails and the enzyme. These simulations were performed on lactone species with different tail lengths as a means to compare interactions. Data generated to date exhibit some expected ligand exchange about the zinc atoms and effects of tail length on a hydrogen bond between the AHL amide carbonyl oxygen and PHE107 backbone amide of the enzyme. Also, uncharged lactones without a tail show marked motion with significant stability displayed between the lactone ring oxygens and zinc atoms. These preliminary results suggest that as the AHL tail “grows in” the substrate-enzyme hydrogen bond stabilizes and in turn serves to better orient the head of the lactone toward the zinc atoms thus providing for better binding and higher activity toward lactonolysis. These results are further reinforced by prior activity assays. This research is based upon work supported by NASA under award No NNX08BA47A.

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IMPORTANCE OF SOCIAL NETWORKING AND WEBSITE IN CBER OUTREACH

Cherita Thomas, Hector Miranda and Olufisayo Jejelowo *, Texas Southern University, Houston, TX

The Center for Bionanotechnology and Environmental Research (CBER) at Texas Southern University is interested in Science, Technology, Engineering and Mathematics (STEM) education at all levels (from pre-K to college level). There is a national problem due to production of fewer and fewer STEM professional, especially amongst minorities, less than 20 percent of US first degrees is in STEM field, the number of first time African American and Native American undergraduate students that are declaring STEM majors is declining and the number of minorities obtaining advanced degrees in STEM Fields is less than 10 %. To address the problem, the community at large must be informed and engaged in order to create the passion needed amongst our youth. For the past year and half we have studied the use of website and social networks as a means of connecting with people on our campus and the larger community. The Biology department experienced 400 % increase in graduate student

enrollment. The results are discussed in light of the impact on STEM enrollment, retention and graduation at Texas Southern University.

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MECHANISM OF HIGH ENERGY RADIATION INDUCED INFLAMMATION

Georgette Rolle*, Sarah Munyu, Olufisayo A Jejelowo, Ayodotun Sodipe, Shishir Shishodia, Department of Biology, Texas Southern University, 3100 Cleburne Street, Houston, Texas 77004, USA

Humans are protected from the harsh space radiation environment by the Earth's magnetic field, which deflects high-energy radiation charged particles. These charged particles are ionized and are known to induce carcinogenesis in almost all parts of the body. Astronauts have an increased risk for cancer, mainly due to the space radiation environment and its harmful effects. Based on the current information and lack of knowledge about high-energy radiation, it is important to research possible effects and pathways affected by high-energy radiation exposure. The transcription factor Nuclear Factor-kappaB (NF- κ B) is activated in cancer cells. NF- κ B regulates numerous genes, including cytokines, chemokines, adhesion molecules, acute phase proteins, as well as genes responsible for innate immunity, inflammation, and cell survival. With the knowledge that radiation is a known cause of cancer, and astronauts are exposed to high-energy radiation, NF- κ B is a good target to study high-energy radiation induced carcinogenesis. In this study, we demonstrate that high-energy radiation induced the activation of MMP-9 and COX-2 in mice skin. Suppression of NF- κ B pathway may provide opportunities to develop countermeasures against radiation-induced deleterious effects.

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URC MICROBIAL 1: AS STUDENT SPACE FLIGHT EXPERIMENT ON NASA SPACE SHUTTLE ATLANTIS

Olufisayo Jejelowo*, Jason Rosenzweig*, Ayodotun Sodipe*, Hector Miranda*, Shishir Shishodia*, Govindarajan Ramesh+, James Briggs#, George Fox#, Claudette Ligons*, Marguerite Butler*, *Texas Southern University, Houston, TX, +Norfolk State University, Norfolk, VA; #University of Houston, Houston, TX.

The University Research Centers - Microbial - 1 (URC-Microbial-1) investigation was designed by the Center for Bio-nanotechnology and Environmental Research (CBER) University Research Center (URC) at Texas Southern. The URC Microbial-1, which was launched on the Space Shuttle Atlantis during the STS 129 mission is a proof-of-concept model providing space flight experience to stimulate and excite University Research Center scientists and students. The experiment involved the study of morphological and molecular changes of *Escheria coli* and *Bacillus subtilis* microbes brought about by the space flight environment. Each component of the experiment was designed to be reproduced easily in the classroom providing hands-on experience to students involved. Postflight repeat experiments will be conducted in schools across the nation. Texas Southern University will develop courses incorporating the data into the microbiology curriculum. This experiment has provided a unique and meaningful educational experience for students at Texas Southern University and other educational institutions. The URC-Microbial-1 experiment have also provided a unique

outreach opportunity for the K-12 community to utilize this flight experiment as part of their classroom experience. Microbial samples grown in space are being analyzed. In this paper we report the immediate impact on TSU students and the K-12 community. As a result of URC-Microbial-1, courses will be developed enabling the URC Microbial-1 experimental data to be worked into the curriculum as well as allowing Texas Southern University undergraduate laboratory classes (biology and microbiology) to evaluate slides of fixed specimens brought back from space. The excitement created among TSU students and immediate impact on recruitment and enrollment will be discussed.

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YEAR ONE OF THE CENTER FOR BIONANOTECHNOLOGY AND ENVIRONMENTAL RESEARCH

Olufisayo Jejelowo*, Jason Rosenzweig*, Ayodotun Sodipe*, Hector Miranda*, Shishir Shishodia*, Govindarajan Ramesh+, James Briggs#, George Fox#, Claudette Ligons*, Marguerite Butler*, *Texas Southern University, Houston, TX, +Norfolk State University, Norfolk, VA; #University of Houston, Houston, TX.

The Center for Bionanotechnology and Environmental Research was established October 1, 2008 following a national competition. The multidisciplinary multi-institutional team has four main Thrusts: Radiation and Microgravity Research Thrust, Space Microbiology Research Thrust, Biosensors, Bioinformatics, and Bionanotechnology Research Thrust and Workforce Development Thrust. CBER provides direct financial supports and training to graduate and undergraduate students in the area of life sciences. First year accomplishments include 102 publications (18 in peer reviewed articles, 49 coauthored by students and a disclosure in the works), curriculum revision and development, proposal submission, successful seminar series and outreach to K-12.

P584 Symposium on Bionanotechnology and Environmental Research

NATURAL PRODUCTS AGAINST THE NEGATIVE EFFECTS OF MICROGRAVITY

Anita Lewis*, Philys Johnson, Olufisayo A Jejelowo, Ayodotun Sodipe, Shishir Shishodia, Department of Biology, Texas Southern University, 3100 Cleburne Street, Houston, Texas 77004, USA

Space related stress conditions such as microgravity have several deleterious effects on cells. Once exposed to a space environment cells may exhibit an up-regulation or down-regulation of their gene expression. The microgravity environment experienced during space travel can stimulate the activation of transcription factors that regulate gene expression. Specifically lengthy exposure to microgravity leads to stress and may induce the transcription factors Nuclear Factor (NF) κ B and Activator Protein 1 (AP-1) resulting in altered physiological effects. NF κ B governs over 200 genes controlling the immune system, growth, inflammation, and apoptosis. The activation of these transcription factors have been linked to cancer, atherosclerosis, myocardial infarction, allergy, diabetes, asthma, arthritis, Crohn's disease, multiple sclerosis, Alzheimer's disease, osteoporosis, psoriasis, septic shock, and AIDS. Astronauts on long duration flight demonstrate some of the symptoms that NF κ B activation can produce. Therefore there is a need to develop countermeasures against the

negative effects of microgravity. The phytochemical curcumin (diferuloylmethane) is the yellow pigment from the *Curcuma longa* plant used in traditional southeastern cultures for medicinal purposes. Studies indicate that this compound inhibits the activation of these transcription factors and suppresses its damaging effects. We are investigating the effects of curcumin on microgravity-induced deleterious effects.

495 Anthropology

EVIDENCE FOR THE USE OF *BUFO MARINUS* IN THE OLMCE SHAMANIC TOOL KIT

Whitney Lytle, Texas State University, San Marcos, Tx

This paper explores the use of toad imagery in Olmec iconography. The toad appears as a prominent character in the iconography of regionally and temporally similar cultures. As cultures in Mesoamerica often share like beliefs and symbols, it is likely the toad would also appear in Olmec art. The *Bufo marinus*, secretes a highly toxic poison that, when used with discretion, has hallucinogenic properties. Both archaeological and artistic representations strongly suggest imagery of the *Bufo marinus* was used in Olmec art as a focus of transformation rituals. The majority of interpretation on Olmec transformational images has been supernatural beings, such as the jaguar. I suggest characteristics of these supernatural entities have been misinterpreted and are actually based on the *Bufo marinus*. Furthermore, I propose these characteristics imply the use of bufotinen in order to control the toad's ability to transform. Toad characteristics may be present in conjunction with the characteristics of other animals to exhibit *Bufo marinus* toxin as the shaman's chosen medium for transformation. Through chemical analysis, previous iconographic research, and the use of Erwin Panofsky's method of structural analysis, this paper will demonstrate the expanded presence of toad imagery within the larger corpus of Olmec style art.

406 Anthropology

MAYA SCRIBES WHO WOULD BE BECOME KINGS: SHAMANISM, THE UNDERWORLD, AND ARTISTIC PRODUCTION DURING THE LATE CLASSIC PERIOD

Barry Kidder Texas State University-San Marcos

The Late Classic period of the lowland Maya was characterized by environmental, economic, and sociopolitical turmoil in which civilization was constantly on the brink of collapse. The ever-growing elite class, king and secondary noble alike, attempted to solidify political alliances through warfare, elaborate gift-giving rituals of prestige goods, and/or elite marriages. During this time period elite Maya artists had a direct impact on sociopolitical and economic machinations through the production of finely painted polychrome ceramics. As a result of this Late Classic stress, these elite artists not only painted ideologically-loaded visual and textual narratives to convey hegemonic statements, they also began signing works of art with their name and/or the name of the patron in order to eternally lionize individuals. Moreover, iconographic and epigraphic analyses show these elite artists were envisioned as creator deities and as such, could contact and transform into a specific pantheon of gods through esoteric rituals that were shamanic in nature. These gods associated with the artistic class were denizens of the Underworld and were thought to reside in apertures of sacred

landscapes such as caves and cenotes. To validate their supernatural claims, elite Maya artists depicted themselves on painted ceramic vessels transforming into or receiving blessings from these Underworld gods via the cave. Since these prestige goods were traded over long distances and functioned as focal points of public and private feasts, the agenda of these secondary noble artists would be seen by many elite nobles thereby reinforcing their elite status and supernatural claims.

479 **Anthropology**

IDENTIFYING THE EXTENT OF ANCIENT MAYA DITCHED FIELD SYSTEMS IN THE RIO HONDO VALLEY OF BELIZE AND MEXICO.

Thomas Guderjan, University of Texas at Tyler

For more than two decades, archaeologists have recognized that the ancient Maya (AD 250-850) civilization was economically based upon intensive agricultural systems rather than household level based swidden agriculture. Early studies that identified ditched agricultural field systems along the Rio Hondo, elsewhere in northern Belize, and along the Gulf coast of the Mexican state of Tabasco opened the door to re-examination of Maya political economies. For 18 years, we have been working at the Maya site of Blue Creek at the inland terminus of the Rio Hondo and have been investigating the ditched agricultural fields at the site for a decade. Aerial reconnaissance in 2008 and 2009 revealed that we were not dealing with a nodal situation but that the extent of agricultural intensification in the river valley had been grossly underestimated. These new data will force archaeologists to again reconsider the nature of Maya trade and commerce in agricultural and the role of agribusiness and mercantilism in ancient Maya society.

551 **Anthropology**

HIGHLAND MAYA SACRED SITES: PRE-COLUMBIAN ASSOCIATIONS AND CONTEMPORARY RITUAL

Michael P Saunders, Texas State University

Many Maya communities show evidence of religious continuity extending from Classic Maya to contemporary populations. However, such links are often seen as ‘survivals’ of Classic Maya culture, thus presenting Maya spirituality as a static system. Recent investigations to identify the contemporary sacred sites in San José Chacayá, Guatemala, show that their distribution reflects patterning evident in prehistoric Maya communities. Many altars are also clustered around an archaeological site and ritual performed at these locations is associated with the *antiguos*, or ancients, and their “knowledge”. However, analysis also reveals contemporary ritual to be responding to external change. The specific attributes of the altars being utilized appear linked to changing economic strategies in the community. This interaction between contemporary factors influencing ritual practice and the continued utilization of prehistoric sites illustrates the changing means by which Maya sacred geography is defined and underscores the difficulty of interpreting the intertwined social identities of past and present populations.

483 Anthropology

MIDDLE AND LATER STONE AGE OCCUPATIONS DATING TO MARINE ISOTOPE STATE 3-4 AT ERFRKOON, SOUTH AFRICA

Britt Bousman (Texas State University-San Marcos), James Brink (Florisbad Quaternary Research Department), Stephen Tooth (Geography, Aberystwyth University, UK), Rainer Grun (Research School of Earth Sciences, The Australian National University, Australia), Senna Barnett (Texas State University) and Marisol Espino (Texas State University)

Excavations at Erfkroon, located northwest of Bloemfontein, produced in situ archaeological and faunal remains dating to Marine Isotope Stages (MIS) 3 and 4. Erfkroon is a large (~2.2 x 0.5 km) complex of Modder River terrace deposits extensively eroded by gullies. We discovered and sampled Middle Stone Age (MSA) and Later Stone Age (LSA) occupations and spectacular faunal remains in nine stratigraphic units spanning the last ~165k years. Preliminary age control was established with infrared and optically stimulated luminescence (OSL), and electron spin resonance dating. One excavated MSA occupation dates to the MIS 3-4 boundary and contains stone tools with alternatively beveled retouch and possible fresh water mussel shell exploitation. An Early LSA occupation produced a sample of stone artifacts that include abundant grinding stones and scaled pieces (pièces esquillées). Interestingly, abundant warthog remains are found in late MIS 3 deposits, but not in older sediments, suggesting fluctuations in population density. Surveys located abundant faunal remains, including two partially articulated bovid skeletons, numerous Late MSA and Early LSA occupations, and a historic occupation that may be Griqua. These results suggest that there was a dense occupation of Early LSA groups in the western Free State during MIS 3 times. In the summer of 2010, OSL, radiocarbon, ESR, sediment and paleoenvironmental samples will be collected from excavation profiles. This will provide more precise chronological control and more robust paleoenvironmental interpretations for the occupations at Erfkroon.

494 Anthropology

IDENTIFYING ALTERATIONS IN BONE COLLAGEN: AN EXPERIMENTAL STUDY OF COLOR, MICROSCOPIC MORPHOLOGY, AND CARBON ISOTOPIC SIGNATURES OF MODERN FAUNAL BONE HEATED AT CONTROLLED TEMPERATURES.

Cynthia Munoz*, Raymond Mauldin, Lynn Wack, Stephen Smith, Kevin Daiber, Center for Archaeological Research, Department of Anthropology, University of Texas at San Antonio (UTSA), TX, Robert Hard, Department of Anthropology UTSA, TX, and Patrick Villanueva, Department of Geological Sciences, UTSA, TX.

Archaeologists increasingly use stable carbon isotopes to reconstruct aspects of past environments. Our research has focused on reconstructing changes in paleovegetation using the stable carbon isotopic composition preserved in the bone collagen of leporids (*Sylvilagus* sp. and *Lepus californicus*). These short-lived, small-bodied herbivores allow documentation of paleoclimate patterns and changes in those patterns at short temporal and limited spatial scales. Because leporids are opportunistic feeders and will consume the vegetation (C3 and/or C4 plants) available on the landscape, the stable carbon isotopic composition of these vegetation types is incorporated into their bone collagen. Collagen signatures can be isolated from bone samples allowing vegetation reconstruction. However, archaeological bone

specimens are often associated with hearths and heat alters the organic content of bone. In several cases, most or all of the collagen in our archaeological bone samples is degraded or destroyed, thus affecting the feasibility of our analysis. To more clearly determine the temperatures at which collagen is degraded, we conducted controlled heating experiments on samples of modern deer bone (*Odocoileus virginianus*) from Central Texas. Bone color, microscopic morphology, and carbon isotopic signatures were documented. High power SEM inspection of the bone samples revealed changes in bone morphology and in carbon intensity. While other factors related to burial conditions must be considered, this documentation of color and microscopic morphology of differentially burned bone will potentially allow researchers to determine the maximum temperatures at which archaeological bone samples were heated and, subsequently, the feasibility of carbon isotopic analysis.

596 Anthropology

A SYNTHESIS OF GEOARCHAEOLOGY IN TEXAS

Ken Lawrence, Texas State University

This paper will discuss results of a recent archival study of select geoarchaeological research in Texas. This archival investigation examined previous research in Texas that focused on investigations within drainage systems. As part of this research select radiocarbon analyses were recalibrated thus providing a consistent chronological framework. The end result of these cumulative radiocarbon results was to refine the chronostratigraphy of various drainages basins in Texas. Ultimately, this research hopes to construct a predictive model for the presence or absence of the archaeological record in Texas.

469 Anthropology

AN ANALYSIS OF QUARRYING BEHAVIOR AT ALIBATES FLINT QUARRIES NATIONAL MONUMENT, FRITCH, TEXAS

I. Robert Wishoff, Texas State University-San Marcos, TX

This presentation will summarize my research into prehistoric quarrying behavior that took place at Alibates Flint Quarries National Monument (AFQNM). By geo-referencing locational data for 731 flint quarry pits at AFQNM I have been able to create an interactive system that allows for easy spatial analyses of spatial data. An unpublished dataset collected by Susanna and Paul Katz offered the opportunity to create the first accurate map of archaeological assets within Alibates National Monument. This map, and initial spatial analyses of the dataset will be unveiled within this presentation. In addition, I will discuss how spatial analysis of pit patterning may allow for the inference of certain quarry behaviors practiced by prehistoric miners.

499 Anthropology

A GIS ANALYSIS OF QUARRY PITS AT ALIBATES NATIONAL MONUMENT

Chris R. L. Davis, Texas State University, San Marcos, TX

Alibates Flint Quarries National Monument, north of Amarillo, is one of the largest prehistoric lithic quarries in North America. This was a source of stone for prehistoric tools for over 12,000 years, and was intensively quarried by the Antelope Creek peoples in the Late

Prehistoric Period. In 1996, Susanna and Paul Katz surveyed the 405 hectares (1,000 acres) that make up the National Monument and recorded 731 quarry pits (Katz and Katz 1996). I constructed a 3D model of the quarries based on these data. Using this 3D model, it may be possible to identify where major veins of Alibates flint occur based on the relationship between elevation and the location of the quarry pits. The quarries on hill slopes are smaller because they provide direct access to Alibates veins, whereas the pits on hill crests are larger because alternative methods of excavation were required to obtain the raw material. For this presentation, I analyze the relationship between pit size and degree of slope, and compare this to the petrography of Alibates chert in order to determine where major veins of Alibates occur.

388 Anthropology

ANALYZING TERMINAL LATE PREHISTORIC PATTERNS OF ANIMAL USAGE

Lynn Wack, University of Texas At San Antonio

Bison populations are commonly thought to have made a dramatic resurgence in Texas during the Terminal Late Prehistoric period (dated between ca. A.D. 1250/1300 and 1600/1650). Paleoclimatic conditions, however, were not favorable for maintaining consistently large bison populations during this time (Kemp 2007, Thompson et. al 2007, Mauldin et al. 2008). The Terminal Late Prehistoric diet breadth also did not narrow as would be expected if bison populations were consistently large (Dering 2008). If bison population size was not consistent during this period, there may be differences in the pattern of animal use among Late Prehistoric sites. The purpose of this research is to compare the Late Prehistoric Burris Bison site (41VT66) faunal assemblage with other Late Prehistoric faunal assemblages to assess differences in animal use patterns.

485 Anthropology

ARCHAEOLOGY JUST WEST OF THE PECOS: EXPLORING PLANT INTENSIFICATION THROUGH PATTERNS IN BURNED ROCK MIDDEN RADIOCARBON DATES

Cynthia Munoz, Raymond Mauldin*, and Stephen Smith Center for Archaeological Research, Department of Anthropology, University of Texas at San Antonio (UTSA), TX.

Intensification, the process by which more and more resources are extracted from increasingly smaller portions of the landscape through increased labor or technological investment, usually occurs in response to an imbalance between resource productivity and population demands when mobility is limited. Under conditions with minimal access to aquatic resources, and where large terrestrial game is virtually exhausted, hunters and gatherers will increasingly intensify on plant resources. In Texas, one possible indication of plant intensification is the presence of burned rock middens. Used primarily to process high starch plants that require long-term baking (e.g., camas, sotol), our review of radiocarbon dates from middens show that they occur much earlier in Central Texas than in West Texas. While the suggestion that plant intensification may have started much earlier in the Central Texas region is consistent with recent models of intensification, the pattern may also simply reflect a lack of recent research in the Middle Pecos area. We describe ongoing work designed to generate additional midden radiocarbon dates from this understudied region in West Texas.

529 Anthropology

INVESTIGATING THE PERIMORTEM INTERVAL IN CENTRAL TEXAS: A PRELIMINARY STUDY

Becca Shattuck, Texas State University-San Marcos

Establishing a relationship between skeletal trauma and time since death is one of the most frequent requests made of forensic anthropologists and bioarchaeologists. To this end, skeletal biologists and forensic anthropologists typically distinguish three gross timeframes: antemortem, perimortem and postmortem. The perimortem interval, which occurs around the time of death, is poorly understood (Sauer, 1998). There have been several studies investigating long bone fracture characteristics during the perimortem interval (Weiberg, 2005; Bell et al., 2006; Janjua and Roberts, 2008), but none have been undertaken in the unique climate of southwest Texas. To improve understanding of perimortem bone changes, 50 pig femora were allowed to weather at the Texas State University Forensic Anthropology Research Facility at Freeman Ranch, in San Marcos, TX for up to 18 weeks (PMI=126 days). A portion of the sample was broken at regular 2-week intervals by application of a known dynamic force, and the resulting fracture outlines, angles, and edges, were examined and documented. Analysis showed that there was no statistically significant change in the frequency of fracture patterns or fracture angles between bones broken shortly after death (PMI=0), and those broken in the subsequent trials. There was, however, a statistical trend toward rougher fracture edges. This study demonstrates the difficulty in estimating whether fractures occurred during the perimortem interval or the postmortem interval. Future studies should aim to examine whether these observations hold for different seasons and different environments.

537 Anthropology

DIFFERENTIAL DECOMPOSITION IN TERRESTRIAL, SALTWATER, AND FRESHWATER ENVIRONMENTS: A PILOT STUDY

Laura Ayers, Texas State University - San Marcos

The decomposition of bodies in water has not been well-studied, with most forensic anthropologists relying on the untested generalization that a body decomposing one week on land is equivalent to two weeks in the water (Mann 1990). This study aimed to address three questions: 1) Does submersion in water affect the rate of decomposition compared to terrestrial surface decomposition? 2) Does this effect support the longstanding generalization? 3) Does type of water (salt or fresh) differentially affect the rate of decomposition? Following anecdotal evidence, it was hypothesized that the surface specimens would decompose the fastest, the specimens in freshwater would decompose slower, and specimens in saltwater would decompose the slowest of all. This study took place at the outdoor Forensic Anthropological Research Facility at Texas State University-San Marcos, Texas. Six pigs were used, with specimens placed on the ground (N=2), in saltwater tanks (N=2), and in freshwater tanks (N=2). The specimens placed in freshwater decomposed much faster than those on the surface or in saltwater. Thus, the generalization was not supported. The type of water also differentially affected the rate of decomposition, as specimens in saltwater decomposed slower than those in freshwater, but still faster than those on the surface.

540 **Anthropology**

A METRIC ANALYSIS OF THE POSTCRANIAL SKELETON OF HISPANIC INDIVIDUALS TO IMPROVE THE ESTIMATION OF SEX

Meredith Tise, BA, and Kate Spradley, PhD, Texas State University-San Marcos

Forensic anthropologists are impacted by the growing Hispanic population in the United States. When estimating the sex of Hispanic skeletal remains, initial observations cause male individuals to frequently be misclassified as female. Hispanic individuals have been described as smaller and more gracile than the groups to which they are compared, including American Whites, Blacks, and (sometimes) Native Americans (Spradley et al 2008). To help forensic anthropologists more accurately estimate the sex of individuals considered Hispanic, this study took standard postcranial measurements from border crossing fatalities, from the Mexico-U.S. border, at the Pima County Office of the Medical Examiner in Tucson, Arizona. In addition, Hispanic individuals from the Forensic Anthropology Data Bank were used to increase the sample size, which created a total sample of 97 males and 21 females. Standard postcranial measurements were statistically analyzed, and it was determined that the humerus and radius are the best elements for sex estimation. Sex estimation rates from these elements are higher than when using metric methods derived from American Black and White individuals (Spradley 2008). These results highlight that individuals considered Hispanic exhibit sexual dimorphism differently than American Blacks and Whites and require different methods of sex estimation. Forensic anthropologists are impacted by the growing Hispanic population in the United States, and studies, such as this one, are important to the growing field of forensic anthropology, as well as the changing dynamics of the United States.

P598 **Anthropology**

UNDERSTANDING THE MECHANICAL EFFECTS OF HEAT TREATMENT ON EDWARDS PLATEAU CHERT

Charles A. Speer; University of Texas at San Antonio

This project attempts to explain the effects of heat treatment on Edwards Plateau chert. The use of heat treatment to improve the flaking characteristics of lithic material appears to have been a widespread phenomenon. However, little work has been done to determine the effects thermal alteration has on various types of chert. Experiments were performed to elucidate those physical transformations that result from heat treatment; which included uniform heat treatment of standardized rock samples, color and luster shifts, Vickers Hardness testing to examine flaking potential, and pressure flaking. Lastly, the application of this knowledge to archaeological problems is assessed.

430 **Biomedical**

THE EFFECTS OF LOW SHEAR MECHANICAL STRESS ON *YERSINIA PESTIS* VIRULENCE

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Texas

Manned space exploration has created a need to evaluate the effects of space like stress (SLS) on pathogenic and opportunistic microbes which astronauts could carry with them to the International Space Station and beyond. *Yersinia pestis* (YP), a potential agent of bioterrorism, causes bubonic, septicemic, and pneumonic plague capable of killing infected patients within 3 to 7 days. In this study, microgravity (MG), a SLS, was used to physically stress YP, and its effects on YP proliferation, cold growth, and type three secretion system (T3SS) function were evaluated. YP was grown to saturation in either MG or normal gravity (NG) conditions prior to being used for RAW 246.7 cell infections, HeLa cell infections, and cold growth plate assays. A mutant strain of YP ($\Delta yopB$) lacking the ability to inject Yops into the host cell was used as an internal control in cell infection experiments. Our experimental results showed that YP cultivated under MG had retarded cold growth compared to its NG grown counterpart.

Similarly, NG- grown YP induced more cell rounding in HeLa cells than did the MG-grown YP suggesting that MG somehow impairs T3SS optimum function. Also, MG grown YP used to infect cultured RAW 246.7 cells showed a similar pattern of dysfunction proliferating less than did their NG- grown counterparts during the 8-hour infection period. This study suggests that MG can attenuate bacterial virulence contrary to previously published data demonstrating MG-induced hyper-virulence of other Gram-negative enterics.

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IMMUNOMODULATION OF MACROPHAGES BY A LATENCY-SPECIFIC FACTOR FROM *MYCOBACTERIUM TUBERCULOSIS*

Shawn Terryah, Michael Phan, Julie Le*, Griffin Sadovsky, Charles Hauser, Eamonn Healy and Peter J. King, St. Edward's University, Austin, TX

Mycobacterium tuberculosis (Mtb) is known to induce latent infection in approximately 10% of those who experience primary infection. Additionally, reactivation of latent Mtb infection is thought to represent the bulk of tuberculosis cases worldwide. Mtb latency is characterized by the formation of tuberculous granulomas, an aggregation of immune cells around a central mass containing putatively dormant Mtb bacilli. Although the gross morphology of granulomas is well documented, the molecular events dictating granuloma formation and maintenance are not well understood. The Mtb alpha-crystallin homologue (Acr) is the predominantly-produced protein under conditions mimicking those found within a tuberculous granuloma and may play a role in immunomodulation leading to formation of the granuloma. In order to investigate the immunomodulatory properties of Acr, murine macrophages were incubated with polystyrene beads coated with Acr resulting in phagocytosis. Subsequently, supernatants were subjected to array analysis utilizing murine cytokine/chemokine antibody array. Although expression of a number of macrophage proteins were enhanced or suppressed in the presence of Acr compared to control the induction of the chemokine CXCL16 was most dramatic. Given the role of CXCL16 in recruitment of specific lymphocytic subsets, especially in lung, we propose that expression of Acr under dormancy conditions may trigger granuloma formation by recruitment of necessary immune cell subsets. These results indicate that granuloma formation is beneficial of Mtb survival rather than protective for the infected host and suggest possibilities for chemotherapeutic strategies to combat latent Mtb infection.

565 Cell and Molecular Biology

TRANSCRIPTIONAL RESPONSE OF MACROPHAGES TO A HEAT-SHOCK PROTEIN FROM *MYCOBACTERIUM TUBERCULOSIS*

Anna Unruh*, Zane Goodwin, John Kiley, Eamonn Healy, Peter J. King and Charles Hauser, St. Edward's University, Austin, TX

Numerous bioinformatic studies have sought to identify genes that correlate with the survival of *Mycobacterium tuberculosis* (Mtb) within macrophages, induction of latency and virulence. Examination of genome-wide expression profiles of both Mtb and macrophage transcriptomes following phagocytosis of Mtb by macrophages has implicated a number of host and pathogen pathways that may function in establishing latent infection. The Mtb alpha-crystallin homologue (Acr) is among the most highly induced of these (15.8 fold) and may play a role in immunomodulation leading to formation of the granuloma, an aggregation of immune cells around a central mass containing putatively dormant Mtb bacilli. Acr is a member of the small heat-shock (sHsp) family of proteins characterized by a conserved α -crystallin domain responsible for dimer formation, bordered by variable amino- and carboxy-terminal extensions which modulate oligomerization and chaperone activity, respectively. Proteomic analysis of supernatants from murine macrophages incubated with polystyrene beads coated with Acr utilizing a murine cytokine/chemokine antibody array identified a number of macrophage proteins whose release was enhanced or repressed. The release of the chemokine CXCL16, which recruits subsets of T cells, and natural killer T cells, was most enhanced. CXCL16 was validated as an Acr target by determining its mRNA expression levels and those of the proteases believed to be responsible for its release, ADAM10 and ADAM17 using RT-PCR. Together, these results support a model in which bacterial factors are necessary for induction of granuloma formation and establishment of quiescent mycobacteria infections.

602 Cell and Molecular Biology

AFFECT OF SEASONAL CHANGES IN ARBUSCULAR MYCORRHIZAL COMMUNITIES BY DENATURING GRADIENT GEL ELECTROPHORESIS

Sikta Patnaik*, James Van kley, Armen Nalian, Alexandra Martynova Van Kley, Stephen F Austin State University, Nacogdoches, TX.

Most land plants have root systems that form symbiosis with Arbuscular Mycorrhizal fungi (AMF) belonging to the phylum Glomeromycota. Symbiotic Arbuscular Mycorrhizal fungi have shown to influence both the diversity and productivity of different plant communities and also protect plants against soil pathogens. In this study, the communities of AMF colonizing the roots of two plants species *Callicarpa americana* and *Chasmanthium sessiliflorum* through different seasons is characterized. The 550 base pair small subunit ribosomal RNA gene (SSU rRNA) is subjected to PCR and Denaturing Gradient Gel Electrophoresis (DGGE) followed by multivariate analysis. PCR results showed the difference between the two plants. In summer, *Chasmanthium* did not show the presence of AMF whereas *Callicarpa* showed the presence of AMF for all seasons. The rDNA fragments which potentially represent several AMF species per sample were subsequently subjected to DGGE in order to separate fragments of differing nucleotide sequence. After DGGE the difference between both the plants was obtained and the affect of seasons on the AMF population was determined. Further, the affect of other environmental factors like soil mineral content, soil moisture content was correlated to the

AMF population as soil phosphorus and moisture content are the major determinant of the AMF population in the roots of plants. DGGE is used for the analysis as it is cheaper and is a reliable technique for detecting population dynamics. This study on the AMF communities will be helpful in the development of tools to improve local forestry and agriculture depending on the different seasons.

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CDNA IDENTIFICATION, COMPARISON AND PHYLOGENETIC ASPECTS OF LOMBRICINE KINASE FROM TWO OLIGOCHAETA SPECIES

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Phosphagen (guanidino) kinases (PKs) play essential roles in the energy metabolism of animal cells. The enzymes catalyze reversible phosphorylations between a naturally occurring guanidino compound and its high-energy counterpart, the phosphagen. The typical forms in invertebrates and vertebrates, arginine kinase and creatine kinase respectively, are well studied and a plethora of sequence data are available for both. The greatest variety of PKs is found in the annelid lineage, containing seven of the eight known PKs. Current cDNA information for lombricine kinase is limited to two sequences: one for a terrestrial oligochaete and one for an echiuroid worm. This paper presents data on the cDNA sequences of LKs from two additional oligochaete species, the California blackworm (*Lumbriculus variegatus*) and the sludge worm (*Tubifex tubifex*). The deduced amino acid sequences are analyzed and compared with other selected PKs, including two additional LK sequencing extracted from DNA databases and provide further insights in the evolution and position of these enzymes within the PK family.

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CLONING OF *PYROCYSTIS FUSIFORMIS* LUCIFERASE GENES FOR THE PURPOSES OF PLASMID INSERTION AND HETEROLOGOUS EXPRESSION IN *ESCHERICHIA COLI*

Phong Ngo*, Paul Loeffler, Donovan Haines, Sam Houston State University, Huntsville, TX.

Luciferases are a class of enzymes that are instrumentally involved in the luminescence of biological systems. Luciferases in conjunction with simple substrate molecules, luciferins, combine in an enzyme substrate complex to produce a light reaction known as bioluminescence. In the particular case of *Pyrocystis fusiformis*, a common species of Protistian Dinoflagellate indigenous to the oceans of the world, the mechanism behind the luminescence in this phylum is less understood than in their bioluminescent cohorts. This revolves around the perceived presence of photo-organelles known as scintillons containing both enzyme and substrate. Additionally, the circadian expression of scintillons as well as a luciferase binding protein that inhibits the light reaction—unless the system is under specific pH conditions—is not well understood. On-going experiments are directed at cloning luciferase genes from *Pyrocystis fusiformis* via the polymerase chain reaction and extracting scintillons from *Pyrocystis fusiformis* via sucrose density gradient centrifugation. This is an *in vitro* effort to replicate the conditions of this luminescence system and is accomplished by insertion of the cloned DNA into a plasmid expression vector and bacterial transformation of *Escherichia coli*. Scintillon extraction is additionally required to provide the essential substrate molecule—which is not likely to be present in *Escherichia coli*. This effort provides an

efficient, in-depth study of the biochemical mechanisms behind this significant bioluminescent system. Results of PCR and scintillon extraction experiments will be discussed.

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COMPARING PHENOTYPIC VARIATION IN ORTHODENTICLE EXPRESSION IN *D. SIMULANS* AND *D. MELANOGASTER* EMBRYOS

Andrea Pavia-Jimenez and Lisa Goering. St. Edward's University, Austin Texas.

The relationship between phenotype and genotype is a major question in the field of evolutionary-developmental (evo-devo) biology. Recent studies have indicated that phenotypic variation is not solely caused by changes in gene-coding regions of DNA, but also in cis-regulatory elements (CRE). Studies of the gap gene orthodenticle (*otd*) in *Drosophila melanogaster* have shown that a polymorphic region in an *otd* CRE contains variation that distinguishes two different haplotypes within this species. These two haplotypes cause a shift in the expression of *otd*. However, the region with the strongest signature of selection in this CRE in *D. melanogaster* is nearly unrecognizable in *D. simulans*. This research aimed to determine how these genetic differences would affect the expression of *otd* in the developing embryos of these two species. For this, both of the haplotypes of *D. melanogaster* were used as controls to compare to the expression of *otd* in *D. simulans*. An in situ hybridization was performed on all embryos. Results indicate there is an anterior shift of *otd* expression in *D. simulans* embryos. Whether this shift in expression pattern is due to differences in the *otd* CRE was tested using a transgenic reporter construct that confirmed these results. This is a first step in identifying genetic variants that affect between species differences in gene expression in the early embryo.

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EFFECT OF FOOD ADDITIVES ON INTESTINAL MICROFLORA OF VACCINATED BROILERS CHALLENGED WITH *EIMERIA* SPECIES ANALYZED USING 16S PYROSEQUENCING

Muthu Saravanan Manoharan*, Alexandra-Martynova Van Kley, Joey Bray and Armen Nalian. Stephen F Austin State University, Nacogdoches, TX.

Chicken coccidia are prolific parasitic organisms of *Eimeria* sp. that affect the intestine and reduce the feed conversion ratio (FCR). Among *Eimeria* sp., *Eimeria tenella*, *Eimeria maxima* and *Eimeria acervulina* are the most problematic in the US. The gut flora (useful and harmful bacteria) of chicken plays a main role in FCR of broilers. Any changes in these levels could affect the chicken's health and FCR drastically. In the present study, fecal sample of vaccinated broilers challenged with combination of *Eimeria* spp. fed with one of the two food additives: Carina Alternata and Carina Poultry was analyzed for relative percent abundance of bacterial population. The total DNA extracted from the samples was amplified for 16S rRNA using PCR and was sequenced using 454 pyrosequencing. Approximately, 3000-6000 sequences were obtained for each sample from pyrosequencing. The sequences were analyzed using RDP classifier and BLAST for the relative percent abundance of intestinal microflora at different taxa level. The results showed drastic increase in the level of pathogenic organisms like: *Clostridium* spp. and *Salmonella* spp. under challenged conditions compared to unchallenged. The feed additives and vaccination had negative impact on the abundance of pathogenic

organisms. Significant increase in the levels of beneficial microflora like: *E. coli* , *Lactobacillus* was observed in feed additives treatment. Vaccination affected the FCR of chickens. A change in the relative percent abundance of beneficial and pathogenic bacterial populations under different treatment conditions was observed. The study has shone light on the biological importance of intestinal microflora in chickens.

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INVESTIGATING PHENOTYPIC VARIATION FOR ANTERIOR-POSTERIOR PATTERNING IN *DROSOPHILA MELANOGASTER*

Leon A. Venegas*, Lisa M. Goering, St. Edward's University, Austin, TX

Genetic pathways are critical factors in regulating the development and morphology of an organism, and the evolution of new phenotypes is likely due in part to changes in these same genetic pathways. Here we use the anterior-posterior (AP) patterning system of *Drosophila melanogaster* as a model system to study the connection between genetic and phenotypic variation. Previous research examined within-population variation for AP patterning using the positioning of the cephalic furrow (CF), the first indication of cell specification and determination along the AP axis, as a morphological marker of AP pattern formation. AP patterning and segmentation are controlled by a well studied hierarchy of genes; the pair rule genes are expressed in seven stripes and divide the developing embryos into segments. The expression pattern of the pair rule gene even-skipped (*eve*) was examined using in-situ hybridization in lines with an extreme anterior and posterior placed CF to determine whether a shift in the patterning system is correlated with a shift in the genes controlling the segmentation process. Results indicate that the anterior border of stripe three (A3) shows a significant difference in positioning between the anterior and posterior lines. The posterior border of stripe 3 (P3) and the anterior border of stripe four (A4) follow a similar trend but it is not significant. A correlation between *eve* stripe position and CF placement would be the first step in linking variation in a morphological marker (the CF) with variation in the expression of genes that control the patterning process.

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KRUPPEL GAP GENE EXPRESSION VARIATION AND THE POSITION OF THE CEPHALIC FURROW IN *DROSOPHILA MELANOGASTER*

Lisa Goering and Lauren Stewart

The study of phenotypic and genotypic variation in *Drosophila melanogaster* can provide insight into the evolution of new phenotypes. Variation important for phenotypic evolution arises at the population level. Thus, we examine intra-specific variation, using anterior-posterior patterning of the *D. melanogaster* embryo as a model system. The cephalic furrow is the first of several gastrulation events and distinguishes the head from the thorax. The cephalic furrow forms at approximately 67% egg length, although previous research indicates that within inbred lines of *D. melanogaster*, placement of the cephalic furrow can vary along the anterior-posterior axis. To investigate whether the expression pattern of genes responsible for anterior-posterior (AP) patterning also varies in these lines, in-situ hybridizations were performed to examine mRNA localization of Krüppel (Kr). It was hypothesized that the posterior gap gene Kr may show a posterior shift in the expression boundaries in embryos with

a more central or posterior cephalic furrow. Similarly, it was hypothesized that an anterior shift in expression boundaries will occur with a more anterior cephalic furrow. The results support our hypothesis and indicate there is a correlation between Kr expression and morphological variation in AP patterning. Further research needs to be conducted to identify molecular variants that may be causally linked to the AP phenotype.

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ORTHODENTICLE EXPRESSION AND ANTERIOR-POSTERIOR PATTERNING IN *DROSOPHILA MELANOGASTER*

Veronica Gaffney*, Lisa Goering, St. Edward's University

To study the evolution of new phenotypes, we examined phenotypic and genotypic variation in *Drosophila melanogaster*. Because variation important for evolution arises at the population level, we examined intra-specific variation in the *D. melanogaster* anterior-posterior (AP) patterning system. Embryogenesis involves several gastrulation events. The first event is the formation of the cephalic furrow, which distinguishes the head from the thorax. The cephalic furrow forms at approximately 67% egg length. Previous research indicates that the position of cephalic furrow formation is variable along the AP axis. To determine if there is variation in gene expression causing a shift in AP patterning, we performed in situ hybridizations to view mRNA localization of the gap gene, orthodenticle (*otd*). In situ hybridizations were performed on five different lines—three with extremely posteriorly placed cephalic furrow and two with extremely anteriorly placed cephalic furrows. We hypothesized that embryos with more anteriorly placed cephalic furrows will have a corresponding shift in their expression boundaries. Additionally, we hypothesize that embryos with more posteriorly placed cephalic furrows will have a posterior shift in their *otd* expression boundaries. Our results indicate that there was not a significant difference in the *otd* expression boundaries between anterior and posterior lines, and that these expression boundaries were not shifting. While more experiments need to be performed, these results suggest that *otd* expression may not play a significant role in the described morphological variation seen along the anterior-posterior axis.

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STRUCTURE AND ACTIVITY OF NOVEL CATIONIC ANTIMICROBIAL PEPTIDES (CAPS) ISOLATED FROM WESTERN COTTONMOUTH VENOM (*AGKISTRODON PISCIVORUS LEUCOSTOMA*)

Joseph J. Pleen, Angelo State University, San Angelo, TX

Sixty-five venom samples were collected from western cottonmouth (*Agkistrodon piscivorus leucostoma*) specimens from Central West Texas. The venom was fractionated using a molecular sieve column and the fractions were tested for antimicrobial activity using a disk diffusion assay. While multiple fractions exhibited antimicrobial activity, the exact venom components and mechanisms involved remain unresolved. Preliminary results indicate the presence of unidentified small molecular weight (<20kDa) compounds in the fractions, which may contribute to the antimicrobial activity of the venom. While small cationic antimicrobial peptides (CAPs) are a common component of the innate immune system in most organisms, which act upon the prokaryotic membrane, it is unclear why snake venom should contain such

a component. Current investigations are examining the antimicrobial activity of the peptides to determine if their antimicrobial action is a byproduct of a more generalized action at the membrane that influences both prokaryotic and eukaryotic cells.

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TAXONOMIC ASSIGNMENT FOR HIGH THROUGHPUT AND MASSIVELY PARALLEL PYROSEQUENCING DATA

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The introduction of massively parallel pyrosequencers allows rapid analysis of microbial community composition using short subunit sequences. However, a major challenge is to design a workflow so that taxonomic information can be accurately assigned to each read. This allows the composition of each community to be linked back to likely ecological roles played by members of each species, genus, family or phylum. The existing taxonomic assignment methods mostly rely on 16S rRNA gene sequences and vary radically in their ability to recapture the taxonomic information. Using the existing methods, new taxa by definition cannot be identified although sequences that remain unclassified are often fertile grounds for new lineage discovery. Also, there are no satisfactory tree based methods for taxonomic assignment. The current study uses a tree based approach which employs modern computational tools to process and assign taxonomy to the large datasets of short subunit sequences obtained from massively parallel pyrosequencing. This designed method is compared with existing methods for taxonomic assignment which employ RDP classifier and BLAST.

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NANOPARTICLE INFLUENCE ON BACTERIAL MUTAGENESIS

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Nanoparticles have become widely used and produced in the past twenty years, from cosmetics, paints, clothing, electronics, and medical procedures. Nanoparticle classification requires at least one dimension of the particle be to less than 100 nm. Due to their large surface area to volume ratio, nanoparticles may have unusual and unique properties not attributed to larger particles, often being more reactive. This study focuses on three *Salmonella typhimurium* Ames strains (TA102, TA1537 and TA1538) and their detection of a mutagenic compound; each strain contains a different mutation in one of the histidine genes. Using the Ames test, three nanoparticles were examined in different concentrations to detect a mutagenicity effect. Multi-walled carbon nanotubes (MWCNT), halloysite nanotubes (HNT) and sodium cloisite nanoparticles (Na+) were tested and initial findings have shown that all three nanoparticles exhibit a toxic rather than a mutagenic effect. Currently, the histidine genes are being targeted with semi-quantitative PCR to determine if the toxicity effect is random, or if it is targeting the mutated genes in the specific Ames strains.

641 Cell and Molecular Biology

TRANSMISSION EFFICIENCIES OF TWO STRAINS OF *XYLELLA FASTIDIOSA* FROM CULTURE BY GLASSY-WINGED SHARPSHOOTERS AND THE EVALUATION OF A NOVEL XYLEM VESSEL INOCULATION SYSTEM.

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The glassy-winged sharpshooter (GWSS), *Homalodisca vitripennis* (Germar), is an invasive, xylem-feeding insect that transmits of *Xylella fastidiosa* (Wells) (Xf), the causal agent of Pierce's Disease (PD) of grapevine and other plant diseases. Transmission of Xf occurs when the insect inserts its stylets into the plant's xylem vessels. Competition by different strains of Xf for space to colonize the foregut of the insect can impact the ability of an insect to be a proficient vector. In order to evaluate if biofilm formation by the PD strain is negatively impacted by an presence of a non-PD strain, we inoculated GWSS with various combinations of Xf strains. It was found that the antecedent Xf strain was likely to become dominant in the foregut of GWSS and suppress of the biofilm formation of strains that colonized later. Additionally, a xylem vessel inoculation system for placing Xf in the plant's xylem vessels for acquisition was needed to study transmission pattern of different Xf subspecies. Therefore, we developed two xylem vessel inoculation systems; a transpiration system and an injection system, to determine the parameters of competition between strains within the foregut of the sharpshooter.

P634 Biomedical

GENETIC IMMUNIZATION OF GOAT AND HORSE AGAINST RED FLUORESCENT PROTEIN

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Commercial antibodies are expensive and time consuming to produce in volume. In this procedure, genetic inoculation, we used goat and horse serum as the source of primary antibodies. The cost of the project was minimal and completed in a relatively short time. The Red Fluorescent Protein (RFP) gene was isolated from the pDsred (BD Biosciences Clontech) vector and introduced to vector pCI (Promega; pCI + RFP). The pCI vector has a mammalian expression promoter which aids in the transcription of this gene and production of this protein in a mammalian system. An equal dosage of pCI + RFP (100µg) was introduced into horse and goat via intramuscular injection. Blood samples were collected prior to inoculation and approximately every 4 weeks after, serum was harvested and tested for anti-RFP antibodies. The source of RFP protein was DH5α *E. coli* transformed with pDsred. Protein expression was induced to increase expression of RFP. The cultures were treated with lysozyme to rupture cells and lysate was used for further analysis of the antibody. Dot Blot assays using different dilutions of cell lysate were performed. The primary antibodies utilized various dilutions of horse and goat serum. A bacterial lysate as well as pGlo lysate expressing Green Fluorescent Protein were used as negative controls. Based on these assays, we have preliminary evidence that both the horse and goat are producing anti-RFP antibodies. Dot Blot Results were validated using Western Blot analysis.

P372 Biomedical

INVESTIGATIONS INTO THE MODE OF ACTION OF LOW-DOSE METHOTREXATE IN THE TREATMENT OF INFLAMMATORY DISEASES

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Low dose methotrexate is now considered the mainstay of therapy for inflammatory diseases such as rheumatoid arthritis. Although originally developed as anti-cancer drug, the mechanism of action of methotrexate in inflammatory diseases has remained largely unclear. The objective was to test the hypothesis that the anti-inflammatory properties of low-dose methotrexate are due to activation of the extrinsic apoptotic pathway and not by acting as anti-metabolite or folate antagonist. TUR cells, a pro-monocytic cell line, were treated with low dose methotrexate (0.1 -100 nM). Cellular viability was monitored by MTT assay. Induction of apoptosis was measured by characteristic apoptotic DNA laddering. The ability of a low dose methotrexate to up-regulate Fas ligand mRNA was done using a one-step Q-taq real time polymerase chain reaction. Inhibition of pro-inflammatory cytokines was done using specific ELISA. Low-dose methotrexate did not significantly inhibit the mitochondrial oxidative ability in TUR cells nor the LPS-induced release of pro-inflammatory cytokines (IC₅₀ >1mM, n=4). Low-dose methotrexate induced apoptosis and up-regulated the expression of Fas ligand mRNA at least 15 times more than the untreated cells. The studies reported here provide strong evidence that low dose methotrexate acts as an anti-inflammatory agent by induction of apoptosis via up-regulation of Fas ligand. We therefore conclude that agents that induce apoptosis in low doses such as methotrexate may serve as lead compounds for anti-inflammatory therapy. Further studies are underway to elucidate the precise mechanism of action of low dose methotrexate in the treatment of inflammatory diseases such as rheumatoid arthritis.

P459 Biomedical

LABEL-FREE ELECTRICAL BIOSENSING USING FUNCTIONALIZED NANOPIPETTES

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Nanopipette technology is capable of detecting and functional analyzing biomolecules based on difference on their size, shape and electrical charge . This unique label-free biosensor is inexpensive, easy to fabricate and versatile. It gives a fast and real time output even in small reaction volume (attoliters). At this point, the nanopipette size and geometry, together with the surface chemistry preparation for attachment of a biomarker, antibody or protein probe was optimized by both experiments and modeling to result in detectable signals by the nanopipette. In this phase, the goal of the surface chemistry procedure was to prepare nanopipette tip in a way that only controlled amount of the surface is functionalized and used for probe attachment. Preliminary experiments are demonstrating the sensitivity and selectivity of the technique with specific proteins targeting HPV as well as environmental

toxins. These results prove that nanopipettes functionalized with appropriate molecular recognition elements can be used as HPV/toxin sensors. A highly sensitive nanopipette probe can be precisely positioned, unlike other nanosensing technologies, at any subcellular region of a single living cell with submicron accuracy using a micromanipulator. This approach uses a movable sensor on an attached cell, in contrast to a fixed sensor detecting responses from floating cells. The functionalized nanopipette paves the way for in vivo immunoassay down to the single cell level. References: [1] S. Umehara, N. Pourmand, C. D. Webb, R. W. Davis, K. Yasuda and M. Karhanek, *Nano Lett.*, 2006, 6, 2486. [2] S. Umehara, M. Karhanek, R. W. Davis and N. Pourmand, *PNAS*, 2009, 106, 4611.

P545 Biomedical

MOLECULAR ANALYSIS OF *CLOSTRIDIUM DIFFICILE* AND VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE) ASSOCIATION IN *PSEUDOMEMBRANOUS COLITIS*

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Clostridium difficile-Associated Disease (CDAD) is increasing in frequency and severity with presentation ranging from diarrhea to severe pseudomembranous colitis (PMC). An emerging strain, 027/B1/NAP-1, with a mutation in the negative regulator *tcdC* gene, is associated with increasing severity of CDAD. Prevalence of *C. difficile*, toxin A and B genes, mutations in the *tcdC* gene and the presence of VRE organisms in colon specimens from CDAD symptomatic patients is examined. Ninety patients were examined. Fifty percent of tissue samples demonstrated PMC. PMC negative patients had stool samples positive for Toxin A and B PCR, with tissue specimens negative for *C. difficile*. Stool PCR, toxin EIA, and tissue PCR were positive in 86%, 60%, and 38% respectively when *C. difficile* was detected. VRE alone was detected both in tissue and stool for 7 of 45 PMC patients. Eight patients had both *C. difficile* and VRE in tissue and/or stool. Patients with either VRE alone or both VRE and *C. difficile* had worsened renal function, and it was near normal in those with only *C. difficile*. Increased mortality was observed in patients with VRE. *C. difficile* mutant *tcdC* alleles were only observed in 3 patients. VRE appears to be a major contributor to morbidity and mortality in patients with PMC. VRE is likely an under-recognized causal agent, as there were equal numbers of patients with only VRE and with only *C. difficile* detected. Patient examination for VRE when a diagnosis of PMC is entertained may be critical, as affected patients need different pharmacotherapy.

P377 Biomedical

PHENOTYPIC CHARACTERIZATION OF *PSEUDOMONAS AERUGINOSA* ISOLATES FROM CYSTIC FIBROSIS PATIENTS

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In Cystic Fibrosis (CF) health care facilities, *Pseudomonas aeruginosa* cross-infection is a concern. The first step health care management must complete in order to reduce or maintain frequency of cross-infection is to determine if the problem exists. This study involved phenotypically characterizing twelve CF patient *P. aeruginosa* isolates and three lab strains.

In addition to determining the pathogenicity of the strains based on phenotypic results, the study examined the possibility of cross-infection. Protease, phenazine, and antibiotic susceptibility results were similar for strains 1 and 8. However, mucoidy results differed between the two isolates. Genotypic tests should be implemented to further test for cross-infection.

P473 Biomedical

RECOMBINANT DNA CLONING OF A HER2/NEU THERAPEUTIC MONOCLONAL ANTIBODY

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Production of monoclonal antibodies (mAbs) through hybridoma creation has been commonplace for more than three decades. MABs are amendable for a broad range of applications, including basic life-science research, disease diagnostics, and therapeutics. Some mAbs, such as trastuzumab (Herceptin), are currently utilized in cancer immunotherapy. Hybridomas are created through the fusion of an antibody-producing murine B lymphocyte and a myeloma. It is commonly understood that antibody production by hybridomas is unstable. Multiple factors are thought to affect hybridoma antibody production, including growth factor conditions, genetic instabilities generated from the polyploidy nature of hybridoma fusions, and competition with non-antibody producing hybridomas, which may possess a growth advantage. We sought to design a recombinant DNA method to clone the variable domains of an antibody produced in a slowly dividing hybridoma, thus providing a method in which to rescue poorly producing hybridomas. The antibody we cloned, RL19a, recognizes a HER2/neu tumor-associated antigen (TAA) presented by the HLA class I molecule (HLA-A*0201/HER2/neu). In the sense that this antibody binds peptide-bound HLA molecules, as T-cell receptors do, it is termed a TCR mimic (TCRm). Therapeutic mAbs created in mice must be humanized in order to avert the body's natural immune response. Therefore, the cloned murine variable domains of RL19a were used to create a recombinant chimera antibody by combining the murine variable domains with the constant human kappa and IgG1 domains. ELISA, flow cytometry, and surface plasmon resonance (SPR) indicate that the recombinant RL19a chimera is functional and similar to the hybridoma produced TCRm.

P615 Cell and Molecular Biology

AGD1 PROTEIN LINKS MANY SIGNALING PATHWAYS RESPONSIBLE FOR TIP GROWTH IN ROOT HAIRS

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It is crucial for cells to establish polarity by using cell wall precursors and membrane materials that are targeted to specific regions of the cell. It is through the differential sorting of these materials that plants establish diverse cell and organ shapes. Root hairs are excellent

models to study mechanisms that regulate cell shape due to their highly polar growth patterns. Root hairs elongate through a process known as tip growth wherein cell material is targeted to a small region of the cell. A forward genetic screen identified the AGD1 protein as a molecular player involved in the signaling pathways of *Arabidopsis* root hair tip growth. When AGD1 was mutated, root hairs displayed a wavy growth pattern. Confocal microscopy was used to study the effects of this mutation. The fluorescent markers YFP-RabA4B and YFP-ROP2, small GTPases that are targeted to the tip of root hairs, were used in this study. In wild-type root hairs, which maintained straight growth, the proteins maintained their localization at the tip. In mutant root hairs the fluorescent gradient followed or predicted the direction of growth. The fluorescent marker, YFP-FAPP, which marks lipid microdomains, was also used. In wild-type root hairs the protein remained evenly distributed on both flanks. In wavy root hairs the protein was confined to one side and its relocalization to the opposite flank preceded the change in direction of growth. All of this data indicated that the AGD1 protein links many signaling pathways responsible for tip growth in root hairs.

P452 Cell and Molecular Biology

ANALYSIS OF BETA-LACTAM RESISTANCE MEDIATED BY THE AMPC/AMPR REGION IN *PSEUDOMONAS AERUGINOSA* CLINICAL ISOLATES THROUGH A COMPARISON OF DNA-BASED TYPING METHODS

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Pseudomonas aeruginosa, the leading cause of opportunistic nosocomial infections, utilizes several mechanisms of resistance to combat beta-lactam antibiotics. Our goal was to understand the genetic basis for high and low level resistance to cephalosporins in a set of clinical isolates obtained from the Cleveland Clinic in Cleveland, Ohio. We examined the chromosomally encoded Class C b-lactamase, AmpC which hydrolyzes cephalosporins, penicillins, cephamycins, oxyimino-cephalosporins and monobactams. Normally produced at low basal levels, AmpC is inducible by certain b-lactams such as cefoxitin and imipenem. We hypothesized that there would be more than one clone type, levels of resistance to cephalosporins would be correlated with different clone types, the same types will be identified by the three separate methods and that the sequence of AmpR genes impacts the level of resistance. Twenty *P. aeruginosa* isolates were studied by automated repetitive sequence- based PCR (rep-PCR) and random amplification of polymorphic DNA (RAPD) PCR. High fidelity PCR amplification of the AmpR and AmpC regions was performed followed by direct sequencing. A previously raised polyclonal antibody against the AmpC of *P. aeruginosa* will measure levels of expression at steady state (O.D = 0.8). Using a 95% similarity as a benchmark for genetic identity, rep-PCR analysis compared favorably with RAPD PCR. MIC determination and DNA sequencing analysis is in progress. This study will expand to include the forty remaining *P. aeruginosa* isolates. Expanding our understanding of *P. aeruginosa* resistance and the ability to identify particularly resistant strains is essential in

order to effectively implement infection control programs.

P487 Cell and Molecular Biology

CHARACTERIZATION OF THE HUMAN C-KIT PROMOTER

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The human proto-oncogene c-kit codes for a receptor tyrosine kinase. Transcriptional control of c-kit is medically significant as c-kit is expressed not only in normal hematopoietic development, but also in gastrointestinal tumors, leukemia, small cell carcinomas and germ cell cancers. Transcriptional control of c-kit is not well understood; however, the -930 to +1 region of the c-kit promoter contains several E-box binding sites which may be involved in transcriptional regulation. To determine the role these E-box binding sites play in the regulation of c-kit expression, a luciferase reporter containing the c-kit promoter region was constructed. 293T cells were transiently co-transfected with our luciferase reporter and expression vectors for E-box binding proteins and assayed for luciferase activity.

P457 Cell and Molecular Biology

DETECTING OSMOTIC STRESS IN MARINE AND FRESHWATER PLANKTON.

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Estuaries are areas where rivers and oceans meet and share a common interface. A salinity gradient exists in estuaries that varies temporally and spatially with river flow, tidal movement and meteorological conditions. As river plankton enters an estuary, it is exposed to increasingly higher salinity, whereas marine plankton that has moved into an estuary is exposed to decreased salinity. Osmotic stress due to increasing or decreasing salinity is expected to adversely affect freshwater and marine plankton as they move into the estuary resulting in a rise in oxidative stress in the cells. In phase I of our study, we used biochemical assays to detect oxidative cell damage to both lipids and proteins (TBARS, Pcarb) and enzymatic oxidative stress response indicators (Catalase, Superoxide Dismutase, Glutathione Reductase) in freshwater and marine phytoplankton cultures exposed to increased or decreased salinity, respectively. We would expect that the phytoplankton would experience an increase in stress as it was exposed to an environment outside its normal salinity range.

P621 Cell and Molecular Biology

EFFECTS OF CLAUDIN-2 KNOCKDOWN IN CULTURED KERATINOCYTES

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The purpose of this study was to examine the effects of changes in claudin-2 protein in cell monolayers following knockdown with claudin-2 siRNA. Previous studies have shown that claudin-2 is increased in wounded epidermis, both in vitro and in vivo. In order to investigate the role of claudin-2 in wound healing we developed a model which was deficient in claudin-2. siRNA, transfection medium, and control siRNA (nonsense siRNA) were purchased from Santa Cruz Biotechnology (Santa Cruz, CA). Human keratinocytes (Cascade Biologics,

Oregon) were cultured to confluence in 6 well plates. Multiple replicates were treated with either claudin-2 siRNA, nonsense siRNA, or remained untreated at 37° C. Cultures were rinsed after 6 hours, fresh medium was added, and plates were returned to the incubator. After 48 hours the cells were lysed and the lysate was assayed for protein levels using the BCA assay (Thermo Scientific, Rockland IL). Equal amounts of protein were loaded on an 8% acrylamide gel, electrophoresed, and transferred to nitrocellulose for Western blot analysis. Claudin-2 antibody (abcam, Cambridge MA) was used for detection; bands were quantified using the Kodak Imaging system. The bands in the knockdown cells were greatly decreased compared to the two controls. Utilizing the same knockdown procedures we then analyzed the effects of knockdown on cell migration using a scratch test assay. Monolayer keratinocyte cultures showed a decrease in cell migration into scratch areas following claudin-2 knockdown. We have developed a successful knockdown procedure for claudin-2 in keratinocytes, and have used this method to show a relation between claudin-2 levels and wound healing in vitro.

P581 Cell and Molecular Biology

EFFECTS OF MICROGRAVITY ON THE GROWTH KINETICS OF *ASPERGILLUS NIDULANS*

Robbyn Barnett, Olufisayo Jejelowo, Shishir Shishodia, Jason Rosenzweig

Microgravity describes the near absence of gravity that is experienced by astronauts as they float in their spacecraft. Lack of gravity in space produces affects on the growth kinetics of microorganisms. Microgravity has been shown to affect the fungal growth kinetics and morphology of fungi. The main objective of this experiment was to study the effects of microgravity on *A. nidulans* and evaluate the genes responsible for the change in hyphal growth and morphology. One very important aspect of the survival of fungi is its ability to adapt by changing cell shape and growth pattern in response to a constantly changing environment. This change in morphology and hyphal growth is regulated by several signaling. The cAMP/protein kinase A (PKA), cyclin-dependent kinase (CDK), and mitogen-activated protein (MAP) kinase pathways play central roles in this transition. Changes in morphology and hyphal growth are also important for pathogenicity, for example, most pathways found to be essential for the transition of yeast cells to hyphal growth, have also been found to be required for virulence in yeast. The Cdc28/Hgc1 complex, Flo8, the Yak1 gene, and Sep7 have all been found to be essential for hyphal growth to occur in yeast cells. In this study, a High Aspect Rotating Vessel (HARV) bioreactor was used to study the effects of simulated microgravity on the growth kinetics and morphology of *A. nidulans*.

P630 Cell and Molecular Biology

GENOTYPING *XYLELLA FASTIDIOSA* SUBSPECIES USING MULTIPLEX PCR

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Xylella fastidiosa is a gram negative xylem-limited nutritionally fastidious bacterium which causes leaf scorch diseases such as plum leaf scald (PLS), oleander leaf scorch (OLS), and Pierce's disease (PD) of grapevines. The bacterium was first isolated from grapevines with PD in North America. Three different subspecies are currently recognized in North America,

OLS is caused by *X. fastidiosa* subsp. *sandyi*, PD strains belong to *X. fastidiosa* subsp. *fastidiosa*, and *X. fastidiosa* subsp. *multiplex* causes PLS and a number of tree leaf scorch diseases. While each subspecies can occupy a large number of host plants, they cause disease symptoms in a very small subset of potential hosts. The primary insect vector in Texas and Southern California is the Glassy-winged sharpshooter (GWSS): *Homalodisca vitripennis*, which acquires the bacterium while feeding on infected plants. Genotyping the different bacterial subspecies for epidemiological studies can be time consuming and expensive using currently available approaches. We are developing a 25-gene PCR assay for distinguishing the subspecies of *X. fastidiosa* in plant and insect samples. Preliminary results using multiple primer sets have shown differences among *X. fastidiosa* subspecies and strains using GWSS. The use of 25 multiple primer sets in a single reaction will provide a rapid, inexpensive, robust method of distinguishing bacterial subspecies, and will facilitate epidemiological studies of plant diseases caused by *X. fastidiosa*.

P626 Cell and Molecular Biology

IDENTIFICATION OF A SUPEROXIDE DISMUTASE ENZYMES IN THE CALIFORNIA BLACKWORM THROUGH PCR AND CDNA ANALYSIS.

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Oxidative stress is characterized by the production of free radicals which can harm cellular structures and processes. Superoxide dismutases (SODs) are essential enzymes in combating the effects of oxidative stress. The California Blackworm, *Lumbriculus variegates*, is a freshwater Oligochaete which shows extreme vulnerabilities to pollutants. The purpose of this study is to identify the cDNA structure for SODs. This information can be used to determine if certain pollutants (such as heavy metals) cause up- or down-regulation of the message for this protein and hence provide insights in the cellular mechanisms of dealing with oxidative stress. We present preliminary data on the complete cDNA sequence of Cu/ZnSOD (SOD1) of this Oligochaete species, providing the phylogenetic relationship with other SODs.

P587 Cell and Molecular Biology

IDENTIFYING TARGET GENES OF THE TRANSCRIPTION FACTOR SOXNEURO IN THE DEVELOPMENT OF A *DROSOPHILA* DOPAMINERGIC NEURON, THE H-CELL

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The midline neurons in the central nervous system of *Drosophila* embryos provide an opportunity to study the differentiation of a diverse yet small number of neurons that express genes and undergo developmental processes that are evolutionarily conserved. The goal of this study is to determine which genes are regulated by SoxNeuro (SoxN), a transcription factor expressed in a dopamine producing neuron of the midline cells, the H-cell. SoxN is important for neuronal development in vertebrates and *Drosophila*, but its role in a gene regulatory network is unknown. To determine the role of SoxN in H-cell development, expression patterns of genes activated in the H-cell were compared in SoxN mutant and wildtype embryos using alkaline phosphatase in situ hybridization to detect the mRNAs of

these genes and the mRNA of a marker gene that identifies SoxN mutant embryos. One predicts that genes activated by SoxN may not be as highly expressed in SoxN mutant embryos as compared to wildtype. Preliminary results show that genes expressed in the H-cell are detected. Two different concentrations of the RNA probe that identifies the marker gene, however, have not detected the SoxN mutant embryos. Identifying the SoxN mutant embryos is necessary to determine whether the expression patterns of genes activated in the H-cell are altered in SoxN mutant embryos and to place SoxN in a gene regulatory network. Understanding how these networks control nervous system development may have implications for neurological diseases such as Parkinson's Disease, which is characterized by a loss of dopaminergic neurons.

P534 Cell and Molecular Biology

LOW SHEAR STRESS EFFECTS ON MICROBIAL ADAPTABILITY TO MICROGRAVITY

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Bacterial survival depends upon efficient and specific responses to various stress factors. Low shear stress, a stress analog of microgravity (MG) experienced in space, has been shown to induce increased pathogenicity (virulence) and biofilm formation in several Gram-negative bacteria. However, understanding MG-induced stress response is still at a nascent stage. Experiments were conducted on an isogenic pair of *E.coli* strains, namely NCM520 (a lac⁻ strain with the entire lac operon deleted), and MG1655 (a lac⁺ strain - the best characterized *E.coli* strain in existence) to see if exposure to MG-induced stress to one of them, gives it the selective advantage to outcompete the other (not exposed to MG-induced conditions), when both are grown together under MG conditions. Growth under shaker flask conditions showed that neither of the strains outcompetes the other in minimal media. Experiments were carried out further in the High Aspect Ratio Vessel (HARV) to test the effect of microgravity on the cultures. The lac⁺ strain was exposed to growth under microgravity conditions in the HARV, while the lac⁻ strain was grown under control conditions in the HARV for one full cycle of growth spanning 24 hrs. The two strains were combined and inoculated for growth under microgravity conditions for 24 hrs. The results indicate that with just one cycle exposure to microgravity conditions, the lac⁺ strain shows a definite selective advantage over the (microgravity) unadapted lac⁻ strain in MOPS-G.

P570 Cell and Molecular Biology

MODULATION OF MACROPHAGE PHAGOCYTOSIS AND EXPRESSION OF INFLAMMATORY MEDIATORS BY RESVERATROL, A PHYTOALEXIN OF RED WINE

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Coronary artery disease (CAD) due to atherosclerosis is a medical issue of epic proportions in developed countries. Atherosclerosis is, in part, an immune-mediated disease in that macrophages and phagocytosis have been strongly implicated in the development and maintenance of atherosclerotic plaques. Recent studies have shown that moderate consumption of alcohol, specifically red wine, may be cardio-protective by preventing the

advancement of atherosclerosis. The protective role of red wine was reproduced using non-alcoholic red grape juice, strongly suggesting that there are molecular components found in red grapes that are cardio-protective. One such compound, resveratrol, a phytoalexin produced naturally by several plants when under attack by pathogens such as bacteria or fungi, has been shown to function as a powerful anti-oxidant functioning as a scavenger of several intracellular reactive oxygen species. Resveratrol has been shown to prevent plaque formation due to the inhibition of tissue factor preventing its ability to facilitate platelet aggregation but the ability of resveratrol to influence immune activities including the function of macrophages has not been fully evaluated. In an effort to characterize the ability of resveratrol to modulate macrophage activity, murine macrophage phagocytosis assays were performed in the presence or absence of resveratrol to evaluate the effect of resveratrol on phagocytosis. Similarly, resveratrol-treated macrophages were analyzed for effects of resveratrol on chemokine and cytokine expression. Results from these investigations may lead to a better understanding of the cardio-protective role of resveratrol and the importance of macrophage-mediated events in the development of CAD.

P607 Cell and Molecular Biology

P66SHC PROTEIN EXPRESSION VARIES WITH AGE AND BRAIN REGION IN C57BL/6 MICE

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H₂O₂ (and harmful downstream ROS) have been well correlated with aging, disease and oxidative stress. H₂O₂ is believed to be the end product of normal mitochondrial metabolism, accumulating in individuals over a lifetime. One theory to explain cognitive declines seen in some aging individuals is the deleterious effects of oxidative stress on brain function. Recently deletion of the p66Shc (p66Shc^{-/-}) gene has been found to increase resistance to exogenous oxidative stress and extend lifespan in 129Sv/Ec mice by about 30%. Moreover, deletion of p66Shc gene improves performance in a spatial memory task and decreases oxidative stress markers in the hippocampus. p66Shc protein has been determined to function as a redox enzyme that is able to generate 30% of iH₂O₂. Thus it is proposed that p66Shc protein exerts control over oxidative stress that could cause cognitive declines in aged individuals. Different brain regions contribute differently to cognitive function. Although cognition is the result of myriad circuitry involving all brain areas, specific brain areas make distinct contributions to cognition. Moreover, specific brain regions appear to be more vulnerable to the effects of aging than others. We have examined p66Shc expression in different brain regions of young and aged murine subjects to determine p66Shc protein expression in various brain regions of young and aged C57Bl/6 mice.

P467 Cell and Molecular Biology

POLYMICROBIAL REGULATION OF GROWTH AND GENE EXPRESSION IN PSEUDOMONAS AERUGINOSA

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Pseudomonas aeruginosa is a ubiquitous soil bacterium and opportunistic nosocomial pathogen known for its chronic infestation of the lungs of cystic fibrosis patients. In its

natural and host environments, *P. aeruginosa* exists in the presence of competing organisms, and it is likely that these polymicrobial interactions influence *Pseudomonas* behavior. Therefore, we hypothesize that environmental isolates play a role in *P. aeruginosa* growth and gene expression. To evaluate our hypothesis, I assisted in collecting environmental isolates and devising a screening procedure to analyze the impact of the environmental strains on *P. aeruginosa* growth and gene regulation. The environmental screen makes use of luminescent *P. aeruginosa* transcriptional reporter strains containing plasmids that I generated in which promoters of three separate Resistance-Nodulation-Division (RND) efflux pumps (MexAB, MexJK, and MexXY) were fused upstream of a promoterless lux operon. RND efflux pumps, whose job it is to eliminate toxins from the cell, were selected for investigation as they are often regulated by their substrates, which are commonly antimicrobial toxins from other organisms used as drugs to control infections. Additionally, efflux pump over-expression occurs in clinical strains of *P. aeruginosa*, leading to the rampant drug resistance exhibited by this organism. Initial data indicates that *P. aeruginosa* growth and RND gene expression are indeed influenced by environmental strains, suggesting that polymicrobial interactions may influence medically-relevant gene regulation and provide new avenues for therapeutics to control the growth of drug-resistant pathogens.

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STEM CELL RECRUITMENT AND INDUCTIVE SIGNALING DURING NEURAL REGENERATION IN THE CALIFORNIA BLACKWORM, *LUMBRICULUS VARIEGATUS*.

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Studies of regeneration inspire development of therapies in tissue replacement and repair. *Lumbriculus variegatus*, an aquatic oligochaete, is an excellent regenerative model system, regenerating an entirely new worm from a three segment fragment. The present studies of regeneration in *L. variegatus* raise questions concerning axial body patterning. Determination of axial position and segmental polarity following transection is critical for the successful regeneration of missing body parts and the recovery of function. Regeneration involves many of the same cellular events that are prevalent during early development, including induction of stem cell populations and differentiation via differential gene expression. While our lab has characterized cellular and molecular aspects of regeneration within the lumbriculid central nervous system (Martinez et al., 2005; 2006; 2008), the mechanism of induction and the genes that may be involved, are not well understood. Based on our previous studies, we hypothesize that the newly regenerating head might be a source from which differential gene expression is necessary to maintain neural regeneration. The inductive potential of the newly regenerated head tissue will be tested using two-dimensional gel electrophoresis and mass spectrometry to identify possible morphogenic influences of the anterior wound blastema. Moreover, we will begin characterization of the cellular populations recruited to the regenerating head using confocal microscopy.

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THE EFFECTS OF ACUTE DOSE CHARGE PARTICLE RADIATION ON EXPRESSION OF DNA REPAIR GENES

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The space radiation environment consists of trapped particle radiation, solar particle radiation and galactic cosmic radiation (GCR) with protons being the most abundant particle type. During the mission to Moon or to Mars, constant exposure to GCR and occasional exposure to particles emitted from solar particle events (SPE) are the major health concerns for astronauts. A number of radiation biomarkers have been developed and are currently in use but none are entirely satisfactory for the application to all potential exposure situations. Therefore, in order to determine health risks during space missions, understanding of cellular response to proton exposure is of primary importance (1). We investigated gene expression changes induced by positively charged particle in four categories i.e. 0 Gy, 0.1 Gy, 1.0 Gy and 2.0 Gy in nine different DNA repair genes from testes of mouse using qPCR analysis. We used the testis tissue of irradiated mice as testis is a site of extensive proliferation, differentiation, and apoptosis which makes the testes an excellent model to study apoptotic machinery. We selected DNA repair genes on the basis of their known functions. These genes include ERCC1 (5' incision subunit, DNA strand break repair), ERCC2 (opening DNA around the damage, Nucleotide Excision Repair (NER), XRCC1 (5' incision subunit, DNA strand break repair), XRCC3 (DNA break and cross-link repair), XPA (Binds damage DNA in preincision complex), XPC (damage recognition), ATA or ATM (activates check point signaling upon double strand breaks), MLH1 (post-replicative DNA Mismatch repair) and PARP1 (Base Excision Repair). Our results demonstrate that ERCC1, and PARP1 and XPA genes showed no change at 0.1 Gy radiations, up regulation at 1.0 Gy radiation (1.09 fold, 7.32 fold, 0.75 fold respectively) and huge increase in gene expression at 2.0 Gy radiations (4.83 fold, 57.58 fold and 87.58 fold respectively). Other genes like ATA, XRCC3, and XRCC1 didn't express at 0.1 Gy and 1.0 Gy radiations but showed up regulation at 2.0 Gy radiations (2.64 fold, 2.86 fold and 0.65 fold respectively). We didn't observe any change in gene expression in rest of three genes (XPC, ERCC2 and MLH1) 0.1 to 2.0 Gy radiations.

P444 Cell and Molecular Biology

THE EVOLUTION OF OTD EXPRESSION BETWEEN *D. MELANOGASTER* AND *D. SIMULANS*

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A thorough understanding of the relationship between phenotype and genotype is the key to understanding the development of morphological differences between species. Morphological

changes between species can arise in two ways: either by a change in protein function or a change in regulation of gene expression through changes in cis-regulatory elements (CRE). Previous research showed that the orthodenticle (otd) early head enhancer CRE in *Drosophila melanogaster* contains polymorphisms that distinguish two haplotypes which have differing effects on the expression of the gene otd. To determine the function of this CRE between species, we used a closely related species *Drosophila simulans*. In *D. simulans* most of the otd CRE is similar to *D. melanogaster*; however, the region that harbors most of the variation in *D. melanogaster* is nearly unidentifiable in *D. simulans*. The purpose of this research was to determine whether this genetic variation might affect the expression of otd in developing embryos. In order to compare with previously constructed *D. melanogaster* otd CRE transgenic lines, a transgenic line was created that contains a lacZ reporter gene whose expression was driven by the *D. simulans* otd CRE. In-situ hybridization was used to visualize the boundaries of lacZ expression controlled by this enhancer. We found that there was an anterior shift in lacZ expression in lines containing the *D. simulans* CRE, relative to lines containing the *D. melanogaster* CRE. These results suggest that molecular variants in the otd CRE between *D. melanogaster* and *D. simulans* have altered the anterior border placement of otd.

P576 Cell and Molecular Biology

THE GENOMICS EDUCATION PARTNERSHIP: A COMPARATIVE GENOMICS STUDY OF *DROSOPHILA* DOT CHROMOSOMES

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Genome sequencing has opened up new ways to understand functional organization of genes and genomes, and created new opportunities for student-scientist research partnerships. The Genomics Education Partnership (GEP) brings together over 50 faculty members in a collaborative project to provide students with a research experience in genomics. The current aims of the partnership are to apply comparative genomics approaches to distinguish heterochromatic and euchromatic domains based on sequence organization and/or characteristics of the genes in these different environments, and to gain insight concerning the evolution of the fourth ("dot") chromosome, and the genes it contains. In *Drosophila*, the small fourth chromosome is unusual in that it appears to be essentially heterochromatic - packaged in a relatively condensed form, replicated late in S phase and exhibiting no meiotic recombination. The 1.2 Mb arm has a normal gene density (~80 genes), but a ten-fold higher frequency of repeated sequences than the other chromosome arms, which are euchromatic. Many of the genes on the fourth chromosome are associated with silencing marks, but can be expressed in this heterochromatic environment. Recent studies have suggested that heterochromatin formation is targeted by the presence of repetitive sequence elements, although it appears that not all repetitive elements can trigger heterochromatin formation. We will discuss our results based on finishing 9 fosmids (ca. 450 kb) of the dot chromosome of *D. grimshawi* and generation of gene models, analysis of gene density, classes of repetitive elements and their density for *D. erecta* sequences.

P640 Cell and Molecular Biology

NON-CULTURE DEPENDENT SURVEY OF THE MICROBIOTA OF THE GLASSY-WINGED SHARPSHOOTER USING 454 PYROSEQUENCING.

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The glassy-winged sharpshooter (*Homalodisca vitripennis*) is an invasive pest that has spread across the southern and western United States. It is highly polyphagous, feeding on at least 100 species in 31 families (Hoddle et al., 2003; Turner and Pollard, 1959), and a voracious feeder, having been known to consume up to 100 times its weight in xylem fluid daily. This insect is a vector of the phytopathogen *Xylella fastidiosa* (Xf), which is the causative agent of Pierce's Disease in grapevines. In order to evaluate the microbial flora associated with *H. vitripennis* hemolymph, alimentary canal excretions and whole insect bodies were subjected to 16S pyrosequencing using the bTEFAP methodology and the resulting sequences (370-520 bp) were compared to a curated high quality 16S database derived from NCBI's GenBank. Species from the genera *Wolbachia*, *Delftia* (formerly *Psuedomonas*), *Pectobacterium*, *Moraxella*, *Serratia*, *Bacillus* and many others were detected and a comprehensive picture of the microbiome associated with *H. vitripennis* was established. Some of the bacteria identified in this report are initial discoveries and having a breadth of knowledge as to the microbial flora of this insect pest can serve as a reservoir of information for developing biological control strategies. Within this study we have identified the types of bacteria which may be ubiquitous among *H. vitripennis* providing us with targets to begin to investigate these future avenues of biocontrol

P642 Cell and Molecular Biology

AGE DETERMINATION OF THE GLASSY-WINGED SHARPSHOOTER BY RED WING PIGMENTATION

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The glassy-winged sharpshooter, *Homalodisca vitripennis*, has a red pigment found in the wings of the adult insect. Over the course of the sharpshooter's lifespan, the red pigment darkens with maturation and eventually becomes brown/black in color. These pigments are unidentified but believed to be pheomelanin and eumelanin, respectively. The age of the sharpshooter can be determined by analyzing the amount of red pigment found in the wings by analyzing high resolution pictures with an image analysis software (Paint Shop Pro 7.02). In this study, we developed a standard curve for the age determination of GWSS using lab reared insects of known ages from 1 to 60 days after the final molt. The impact of three environmental conditions on these readings was then investigated. Finally, field collected insects from a variety of vineyards were successfully analyzed for age determination.

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A QTL ANALYSIS OF FERRIC REDUCTASE AND IRON CHLOROSIS IN *LOTUS JAPONICUS* (FABACEAE)

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In order for plants to take up iron, the root-active enzyme ferric reductase oxidase must reduce iron (III) into iron (II). Determining the genes responsible for or related to ferric reductase and iron chlorosis is important for improving human nutrition. Seeds from *Lotus japonicus* parental lines Gifu B-129 and Miyakojia MG-20, as well as 185 recombinant inbred lines were manually scarified and put into germination packets. After a week of germination, plants were allowed to grow for 5 weeks in high iron hydroponic solution (5 μ M Fe(III) EDDHA). At the end of the fifth week, plants were moved into low iron solutions for one week (0.5 μ M Fe(III) EDDHA). Roots were excised and assayed in order to measure reductase activity then weighed in order to get the fresh weight. Chlorophyll measurements were also taken from the newest unfolded leaves in order to measure iron chlorosis. A preliminary quantitative trait loci (QTL) analysis was run in order to find any areas of interest in the plant's genome. Once an area of interest was found, genotyping was done for any markers in that area. After the genotyping was done, a final QTL analysis was run. Results showed significant peaks on the third chromosome at marker TM0213 for both ferric reductase and iron chlorosis. TM0213 explained 20.1% of the variance in Fe reductase activity and 19.1% of the variance in chlorophyll levels. A QTL analysis was also run for the fresh weight of roots, and it showed significant peaks at TM 0711 (third chromosome) and TM0657 (fifth chromosome). More genotyping and more quantitative measurements should lead to improved understanding of the variance for both reductase activity and iron chlorosis.

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THE EFFECTS OF GRAZING ON TEXAS KANGAROO RATS (*DIPODOMYS ELATOR*) IN WICHITA COUNTY, TEXAS

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Investigations of vegetation indicate that changes in patterns of grazing and the introduction of non-native plant species may affect populations of the state-threatened Texas kangaroo rat. Intensely and moderately grazed areas were compared to each other and to a previous investigation involving an ungrazed pasture dominated by introduced Japanese brome (*Bromus japonicus*). Thirty Texas kangaroo rats were trapped at the intensely and moderately grazed sites, whereas only two animals were caught on the periphery of the ungrazed site in Wichita County. In addition, the moderately grazed site was compared to the intensely grazed site and no significant differences in vegetative richness or percentages grass and forb were found between sites. Height of vegetation, percentage bare ground and woody species coverage were significantly different in comparisons between the two grazed sites. Because the two sites contained populations of Texas kangaroo rat, it appears that they can use moderately to heavily grazed habitats as burrow locations and can tolerate significant differences in vegetation height

and amount of bare ground and woody vegetation. They rarely use ungrazed sites as habitat and in a previous investigation, an ungrazed site was significantly different from the grazed sites in vegetational height, percentage bare ground, and percentage grass coverage. Moderately to heavily grazed sites may provide better habitat for these state-threatened mammals.

624 Botany

FERN SPORE VIABILITY IN ANEMIA MEXICANA AND ANEMIA PHYLLITIDIS (PTERIDOPHYTA, ANEMIAEAE)

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Fern spores are green or nongreen. Spores that are green usually have short viability (months) while nongreen spores have longer viability. *Anemia mexicana* and *Anemia phyllitidis* are homosporous ferns with nongreen spores. This study investigated spore viability in these two ferns. In *A. mexicana*, spores collected from fifteen different years between 1978 and 2003 were tested. Spores from five years, 1981-1985, were tested in *A. phyllitidis*. Spores of both ferns had been stored in glass vials at 4C except during transport. Spore viability was determined by dusting unsterilized spores onto the surface of agar-solidified mineral medium and placing it under fluorescent lights at room temperature. Percent spore germination was determined with a dissecting microscope after nine days. Results indicated that the oldest spores of *A. mexicana*, 31 years (collected in 1978), had approximately 75% spore germination, although percent spore germination varied from 90% for spores from eight different years to as low as 10% for two years. The oldest spores of *A. phyllitidis*, 28 years (collected in 1981), also had approximately 75% spore germination. Gametophyte growth was normal at nine days with a two-dimensional prothallus and elongate rhizoid.

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COMPARATIVE ANATOMY AND MORPHOLOGY OF THE STEM IN THE CARRION FLOWERS (APOCYNACEAE-ASCLEPIADOIDEAE)

Florence Kajoia* and David E. Lemke, Texas State University, San Marcos, TX.

The carrion flowers or stapeliads (*Stapelia* and related genera, Apocynaceae) comprise a group of several hundred species of succulent plants native to the Old World, primarily Africa. Despite the size and diversity of the group, surprisingly little is known of the comparative anatomy and morphology of its members. We examined stem structure in approximately 20 genera of stapeliads and found that most species are characterized by distinctive adaptations to the stem succulent habit, including the loss of leaves, development of ribbed stems, production of abundant water storage tissues, development of a "perennial" epidermis, occurrence of stomata in the stem epidermis, development of columnar cortical cells with numerous chloroplasts and large intercellular spaces, and, in some cases, the evolution of spines. Most of these features are common to stem succulent plants in general, although some features characteristic of other stem succulents, most notably the cacti, are absent from the stapeliads.

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SCENT PRODUCTION IN THE CARRION FLOWERS (APOCYNACEAE-ASCLEPIADOIDEAE)

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The fragrance of flowers is commonly produced by volatile substances that often originate in specialized glands termed osmophores. Such glands were first described from representatives of the family Apocynaceae but have since been found in families as diverse as Aristolochiaceae, Solanaceae, Araceae and Orchidaceae. Although osmophores were originally described as occurring on the petals of certain milkweeds, we have been able to demonstrate, using histochemical staining and gas chromatography-mass spectrometry techniques, that among the stapeliads, a group of Old World genera commonly known as the “carrion flowers,” the production of volatile compounds appears to be a function of various parts of the flower including the corona, the often elaborate set of appendages situated between the corolla and androecium.

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THE GENETIC ARCHITECTURE OF HOMOPLOID HYBRID SPECIATION IN LOUISIANA IRIS (IRIDACEAE)

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A number of hybrid lineages achieve reproductive isolation from their progenitor species without polyploidization. Recent empirical and theoretical interest has focused on the genetic architecture of barriers (both pre- and post-zygotic) that contribute to the isolation of a homoploid hybrid lineage from its progenitors. *Iris nelsonii*, considered a prime example of homoploid hybrid speciation, was purportedly derived from hybridization between three congeneric species: *I. fulva*, *I. hexagona*, and *I. brevicaulis*. In order to investigate the genetic architecture of isolating barriers in this system, we created a genetic linkage map from segregation of codominant markers in an F2 mapping population between *I. nelsonii* and an ecologically divergent progenitor species (*I. hexagona*). We used this genetic map to detect quantitative trait loci associated with floral morphology characteristics (i.e. “pollinator syndrome”) and pollen sterility in the F2 generation. Overall, the pattern of isolation between *I. nelsonii* and its progenitors differed from other examples of homoploid hybrid speciation suggesting that the Louisiana Iris system presents a unique view of this form of hybrid speciation.

P370 **Botany**

COAL BALL ANALYSIS: VARIATIONS IN THE PEEL TECHNIQUE

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Abstract. - Two Carboniferous age coal balls were utilized in the evaluation of the peel technique with the goal of determining which combination of hydrochloric acid (5%, 10%, and 15%) and designated drying and etching times yielded the most detailed representation of permineralized plant parts from the coal ball surface. A total of 150 peels were made,

revealing that etching the coal ball in uncontaminated 15% hydrochloric acid solution, when the acid is at strongest, for 1-5 minutes results in the most thorough removal of the permineralizations regardless of the drying time.

P488 **Botany**

PRELIMINARY FLORA OF HUNEWELL RANCH, ERATH COUNTY, TEXAS

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Floristic data are critical in establishing species' ranges, management practices, documenting range extensions, and monitoring the spread of introduced and invasive species. Native, endemic, introduced, rare, and county records for Erath County, Texas are reported as part of an ongoing flora of vascular plants at Tarleton State University's Hunewell Ranch. Species are compared to those occurring on the Texas Parks and Wildlife Department's noxious weeds and threatened or endangered lists. Plant specimens were collected from September 2006 to August 2007 and from January 2009 to October 2009. Currently, 63 species represent new records for Erath County and include 61 native species (of which four are endemic) and two that are introduced. No plants listed on the state noxious weed or rare, threatened or endangered lists have been collected.

P514 **Botany**

THE VASCULAR PLANTS OF INDIAN SPRINGS AND CIENEGA OF CHINATI MOUNTAINS STATE NATURAL AREA, PRESIDIO COUNTY, TEXAS, BASED ON SAMPLING FROM LATE FEBRUARY 2009 THROUGH APRIL 2009

Patsy Roberts* and James Zech, Sul Ross State University, Alpine, TX.

The Texas Parks and Wildlife Department requested a list of vascular plants in the Chinati Mountains State Natural Area and more specifically the Indian Springs and the Cienega located within the park. Plants were collected, identified, and classified over the course of two trips during the spring of 2009. The trips yielded a total of 49 species including 7 monocot and 42 eudicot taxa with the most prevalent families being Asteraceae (*Baileya multiradiata*, *Xanthisma spinulosum* var. *chihuahuanum*, *Trixis californica*, *Melampodium leucanthum*, *Porophyllum scoparium*, and *Pseudognaphalium* sp.), Brassicaceae (*Draba cuneifolia* var. *cuneifolia*, *Lepidium lasiocarpum* var. *wrightii*, *Macropodium* sp., *Physaria purpurea*, and *Descurainia pinnata*), Solanaceae (*Calibrachoa parviflora*, *Nicotiana glauca*, and *Chamaesaracha* cf. *texensis*), Fabaceae (*Senna pilosior*, *Tephrosia vicioides*, *Vicia ludoviciana*, *Zapoteca media*, and cf. *Zapoteca media*), Euphorbiaceae (*Chamaesyce arizonica*, *Croton bigbendensis*, and *Ditaxis* cf. *neomexicana*) and Cyperaceae (*Cyperus laevigatus*, *Schoenoplectus pungens* var. *longispicatus*, *Eleocharis* cf. *montevidensis*, and *Eleocharis* cf. *geniculata*). All of the plants collected were identified, mounted, and included in the A. Michael Powell Herbarium at Sul Ross State University in Alpine, Texas.

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THE GENETIC ARCHITECTURE OF ANTHOCYANIN CONCENTRATION IN LOUISIANA IRIS (IRIDACEAE)

Luis Rojas*, Sunni J. Taylor, and Noland H. Martin, Texas State University, San Marcos, TX.

Ecological divergence is associated with speciation in numerous plant and animal taxa. Recent attention has been focused on understanding the genetic architecture (i.e. number of loci, their effects on the traits, and any interactions between these loci) that underlies this ecological divergence. Often this divergence results from selection on existing variation within a lineage. However in some circumstances, ecological isolation can result from selection on loci in the novel genomes that are present in hybrid swarms. Indeed, ecological divergence is prominent in systems that harbor homoploid hybrid species. The Louisiana Iris species complex contains three widespread species and one homoploid hybrid species, *Iris nelsonii*, that resulted from hybridization between the three widespread species and differs from its progenitors in both habitat associations and pollination syndrome. In order to investigate the genetic architecture that underlies the divergent pollinator syndromes of *I. nelsonii* (hummingbird-pollinated) and *I. hexagona* (bumble-bee pollinated), we created an F2 mapping population between these species. We extracted anthocyanin pigments from the petals of these hybrids and pure species plants and conducted quantitative trait loci (QTL) analyses to determine the genomic regions associated with variation in this trait. We will use these regions as hypotheses in selection experiments during the flowering season.

P623 Botany

LINKAGE MAPPING IN LOUISIANA IRIS (IRIDACEAE)

Joshua Matlock*, Sunni J. Taylor, and Noland H. Martin, Texas State University, San Marcos, TX.

Botanists have long realized the constructive potential of hybridization. Such reticulate evolution can occur with or without a doubling of chromosome number. Hybrid lineages that are isolated without a doubling of chromosome number are the rare minority due to difficulties of attaining isolation in sympatry. As such, the few examples of homoploid hybrid speciation are the subject of intense study of their genomic makeup and the genetic architecture underlying isolation. *Iris nelsonii* is often used as a prime example of a homoploid hybrid species and is the subject of our study into the genetics of homoploid hybrid speciation. We genotyped 289 individuals of an F2 mapping population at 120 microsatellite loci in order to create a genetic linkage map. Approximately half of the loci exhibited transmission ratio distortion due to either over-representation of one or the other parental alleles or excesses or deficits of heterozygotes. Furthermore, we genotyped wild-collected individuals at those same loci in order to determine blocks of the *I. nelsonii* genome that were contributed by each progenitor species. This linkage map will be used in quantitative trait loci (QTL) mapping studies of traits associated with reproductive isolation between *I. nelsonii* and its progenitors in order to further our understanding of the process of homoploid hybrid speciation.

498 Chemistry and Biochemistry

COMPLETE ACTIVE SPACE SELF-CONSISTENT FIELD (CASSCF) CALCULATIONS: SET-UP AND EXAMPLES OF APPLICATIONS.

Benny E. Arney, Jr.*, Department of Chemistry, SamHouston State University, Huntsville,

TX.

Singlet photochemical processes and reactions cannot be modeled by Hartree-Fock (HF) or Density-Functional theory methods (DFT) because the excited state cannot be described or optimized by a single-determinant method. Complete Active Space Self-Consistent Field (CASSCF) methods use a multi-determinant process to more accurately describe the electronic wave function. This method is not automatic and requires the experimenter to select the MO's that are involved in the excited state process and to position them at the consecutively at the HOMO-LUMO boundary. Examples of setting up CASSCF calculations and results will be shown and discussed from the literature and research.

492 **Chemistry and Biochemistry**

DETERMINATION OF CAFFEINE AND PYRIDOXINE IN RED BULL

Dr. Julian Davis, Rachel Leacock Favila*, Dr. John Stankus, University of the Incarnate Word, San Antonio TX

Beverages and supplements containing caffeine have been a popular source of analysis in undergraduate laboratory classrooms due to their popular consumption, especially among college age students. The latest new sources of caffeine come from “energy drinks” like Red Bull which also contains additional energy additives such as B-vitamins and taurine. While much research has been published regarding methods for analyzing caffeine content of teas, soft drinks, coffee and vitamins, little to no research has been published on the extraction of caffeine in these largely consumed energy drinks. We have developed an experiment which successfully analyzes the amount of caffeine and vitamin B-6 (pyridoxine) through solid phase extraction and high performance liquid chromatography. Due to Red Bull’s popularity among college students, this lab seeks to captivate the interest of junior and senior level instrumental analysis participants while exposing them to HPLC technology and experimental techniques.

422 **Chemistry and Biochemistry**

DEUTERIUM LABELING RESULTS IN THE PHOTOCHEMISTRY OF STYRENE OXIDE

Benny E. Arney, Jr.*, Rick C. White, and Emilie Rascher, Department of Chemistry, SamHouston State University, Huntsville, TX.

β,β -Dideuteriostyrene oxide was prepared from acetophenone and utilized to investigate the photochemistry of styrene oxide. The labeling allowed the tracking of hydrogen movement during the photo-induced rearrangement to phenylacetaldehyde and the formation of toluene and bibenzyl. The results of these photochemical reactions will be presented as well attempted trapping experiments for postulated carbene intermediates. The implications of these results for the currently accepted photomechanism will also be discussed.

456 **Chemistry and Biochemistry**

DIRECT ROUTE SYNTHESIS OF POTENT ANTI-HIV CHALCONES

Steven Griffith*, Danette Vines, Schreiner University, Kerrville TX, Welch Foundation

β -hydroxychalcones isolated from the roots of *Desmos dumosus* have been shown to possess

potent anti-HIV activity and are thus attractive synthetic targets. These chalcones are from a class of compounds called flavonoids and possess the ability to inhibit an enzyme critical in the life cycle of the human immunodeficiency virus. The first total synthesis of anti-HIV chalcone, 2-methoxy-3-methyl-4,6-dihydroxy-5-(3'-hydroxy) cinnamoylbenzaldehyde, was achieved by Lee et al.¹ The goal of this research is the creation of a chalcone which bears significant conformational similarity to other known potent anti-HIV chalcones through total synthesis. Originally, we used chlorotrimethylsilane to form the trimethylsilyl (TMS) ether of 2,4,6-trihydroxyacetophenone (THAP); however, difficulties arose in the workup and TLC analysis resulted in decomposition of the product. We therefore reacted the crude TMS-ether with lithium diisopropylamide and the aldehyde to yield a product which was unconfirmed by NMR. In response, we decided to prepare the more robust methyl ether from THAP. The next step involves preparation of the enolate and reaction with 3-furaldehyde. Subsequent oxidation using PCC (pyridinium chlorochromate) should provide the chalcone and a new route to novel analogs. Using this methodology, we hope to prepare many interesting analogs by reaction of the lithium enolate of protected THAP with various aromatic and heterocyclic aldehydes.

418 **Chemistry and Biochemistry**

DUAL PATHWAYS IN THE PHOTOCHEMISTRY OF CYCLIC SULFITE ESTERS

Rick C. White, David Leggett, Jeremy Mitchell, Sam Houston State University

The photolyses of styrene glycol sulfite and meso-hydrobenzoin sulfite undergo extrusion of both sulfur dioxide to generate a 1,3-diradical as well as sulfur trioxide to generate alkenes. The loss of sulfur dioxide and sulfur trioxide are singlet state pathways as shown by isoprene quenching studies. Results from both direct and sensitized irradiations will be presented.

519 **Chemistry and Biochemistry**

EFFECTIVENESS OF CLAY PURIFICATION BY CEC DETERMINATION

Joshua Perry*, Alyx Frantzen, Stephen F. Austin State University, Nacogdoches, Texas

The effectiveness of purification of clay samples is determined through the comparison of Cation Exchange Capacity (CEC) values obtained from each step of purification via analysis with an ammonium ion selective electrode. The purification process includes: sedimentation, carbonate removal, metal removal, organic oxidation, and saturation with desired cation. After each successive step of purification, the clay samples are saturated twice with an aqueous 1.0M NH₄Cl solution followed by removal of excess halogen ions via dialysis. Dry clay samples from each step of purification are analyzed to determine CEC values using an ion selective electrode that analyzes exchanged ammonium ions in solution as they are converted to ammonia gas by solution saturation with a strong base.

462 **Chemistry and Biochemistry**

EFFECTS OF QUORUM QUENCHING ON AHLs USING HUMAN LIVER MICROSOMES P450 AND UGT-A

Amy Davis*, Dr. Donovan Haines, Sam Houston State University, Huntsville, Tx

Some bacterial pathogens like *Pseudomonas aeruginosa*, often fatal to cystic fibrosis patients, rely on a process called quorum sensing to control gene regulation. In recent years hosts,

including humans, have been shown to interfere with the quorum signals by destroying them, a process termed quorum quenching. Investigations into the inner workings of quorum quenching enzymes led us to assess the ability of human liver microsome P450 cytochromes (P450s) to inhibit or limit acyl homoserine lactone (AHL) quorum sensing in *Agrobacterium tumefaciens*. Results indicated that P450s can inhibit quorum sensing activity up to 80%. Additionally, studies were performed on UDP-glucuronic acid transferases (UGTs) and their capacity to exhibit quorum quenching abilities. Results showed a similar effect with P450s quenching AHLs between 70-80%. These results also indicated a need to assess the amount of quenching observed when the two systems are combined. Assays indicated that UGTs and P450s maintain their quenching ability with slightly increased quenching activity relative to either enzyme alone. While studies continue, these results are a good indication of the role that P450s and UGTs play in defending us against infection by AHL-dependent pathogens.

518 **Chemistry and Biochemistry**

ENANTIOMERIC SEPARATION USING MODIFIED CLAYS

Jennifer Perry*, Alyx S. Frantzen, Stephen F. Austin State University, Nacogdoches, TX

Enantiomers are stereoisomers that are non-superimposable mirror images of each other. Many pharmaceutical drugs are enantiomers in which one is active and the other is inactive or an inhibitor. The pharmaceutical industry is required to produce enantiomerically pure drugs. The current techniques used are expensive and inefficient. Finding a procedure that is effective and efficient for separation would enhance pharmaceutical research. The difficulty is that enantiomers share both the same physical and chemical properties. The only way to tell the difference is by the way each stereoisomer rotates plane-polarized light. This study utilizes several different clays exchanged with different amino acids to determine whether enantiomers can be separated with the modified clays. The modified clay was mixed with different stereoisomer and the optical rotation was determined by using a polarimeter. The results indicated that a more in-depth look at this process would be advantageous.

609 **Chemistry and Biochemistry**

HANSEN SOLUBILITY PARAMETER DETERMINATION METHOD DEVELOPMENT

Bryan Crom*, Trisha O'Bryon, Kyle Lesko, Blake Howard, Darren Williams, Sam Houston State University, Huntsville, TX

The Hansen solubility parameters are useful for partitioning the solute-solvent interactions between dispersion forces, polar forces, and hydrogen-bonding forces. When the HSPs are known for a given material, then it is very easy to predict what solvents and solvent blends will strongly interact with that material. This presentation will outline the method development for determining the HSPs for a grease contaminant. This will allow intelligent solvent blending for removing grease from precision metal parts and tooling. The general scheme is to select solvents that cover a range of HSP values. Place the grease in vials and expose to the selected list of solvents. Digital images are taken at various intervals depending upon the speed of the interaction. The interactions are scored on a 6-level scale, and the HSP interaction sphere is determined.

531 **Chemistry and Biochemistry**

INFRARED STUDY OF INTERMOLECULAR HYDROGEN BONDING BETWEEN CATECHOL AND SUBSTITUTED BENZENES

Adriana Pavia* and J.D. Lewis, Department of Chemistry, St. Edwards's University, Austin, TX 78704

We have examined the OH stretching band in the infrared spectrum of 0.003M catechol in solvent mixtures of cyclohexane with various substituted benzenes at concentrations varying from 0.1 M to 2.0 M. The shift in the OH band frequency is used to evaluate the relative strength of the intermolecular hydrogen bond formed between catechol and the substituted benzenes. This paper reports on the effect of using different substituent groups such as halogens and alkyl groups, and the effect of varying the number and location of the substituent groups on the benzene ring. We also consider how the formation of intermolecular hydrogen bonds with the various substituted benzenes influences intramolecular hydrogen bond formation in the catechol molecule.

538 **Chemistry and Biochemistry**

MODULATION OF PRODUCTION METHODS OF COPPER OXIDE CRYSTALLINE ARRAYS CREATED BY CHEMICAL BATH DEPOSITION

Melissa Chan*, M. Jiang, L. Spears, University of Houston - Downtown, Houston, TX, I. Bobowska and P. Wojciechowski, Technical University of Łódź, Łódź, Poland

CuO-based materials are important for their electrical conductivity and high temperature superconductivity. Creating these materials in a template-free fashion, in mild conditions, has proven a challenge. We have produced crystalline films on nano-crystalline CuO nucleation layers using chemical bath deposition (CBD) in $\text{Cu}(\text{CH}_3\text{COO})_2$ and $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$, forming layers of Cu (II) hydroxy acetate or Cu (II) hydroxy nitrate, respectively. This study investigates the results of changes in production methods on composition, morphology and behavior of the films using X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), electrochemistry, and Raman spectroscopy. Using these techniques, we investigated the effects of varying CuO surface area in the nucleation layer, CBD conditions, and choice of metal salt incorporated into the bath. We also observed how impregnation of the layer with titania nanosheet-(2-hydroxypropyl) cellulose (HPC) solution or plain HPC solution affected the results of calcinating the deposited layer. Preliminary results indicate that, although CuO from CBD shares some characteristics with conventional cupric oxide, including the featured Cu(I/II) redox activity, the CuO surface density of the nucleation layer affects the morphology of the copper (II) hydroxy nitrate platelets formed through CBD. Higher CuO surface densities ($\sim 0.3\text{g/m}^2$) created layers with carnation-shaped aggregates of plates, while lower surface densities did not. Post-CBD hybridization resulted in the formation of CuO-TiO₂ crystalline composite. Other electric and sensory applications of the resultant CuO are currently under investigation.

535 Chemistry and Biochemistry

NOVEL APPLICATION OF HOMOGENEOUS ELECTROCATALYSIS WITH CONVENTIONAL DYES

Preeti Choudhary, Dr. Jiang Mian, Dr. Larry Spears, University of Houston- Downtown

The fast mass and electron transfer nature of homogeneous catalysis has made it a powerful synthesis tool in material science. Homogeneous electrocatalysis is application oriented, but has yet received little attention in measurement science and sensing chemistry. Here we wish to report our exploratory effort to apply homogeneous electrocatalysis for detecting some important small molecules of toxicological and environmental significance. The electrocatalysts employed in this study are eurhodin based dyes and other histology stain dyes including Brilliant Cresyl Blue (BCB), Toluidine Blue (TB), Neutral Red (NR), and Methylene Blue (MB). Among these, BCB, TB, NR, and MB all exhibit well-defined, reversible voltammetric redox peaks in a wide pH range with various peak potentials, which indicate their fast electron exchange features at the solution/electrode interface. Our further examination show that these fast interfacing processes offer great potential for catalysis, which was evidenced by significantly enhanced reduction peaks of BCB, TB and NR upon adding small molecules KIO_3 , NaNO_2 , NaIO_4 , Na_3AsO_4 , Selenite salt, Formaldehyde and Benzaldehyde in acidic media. A control experiment indicated that these analytes do not produce any appreciable redoxactive transition in the potentials examined. Our mechanistic study revealed that the enhanced reduction peaks are merely from the dyes surface chemistry, yet their redox processes are coupled with a homogeneous electrocatalysis. Further, these cathodic peak ~ concentration plots displayed linear response at various concentration ranges. Our preliminary study thus sheds great promise for the new detection of these compounds by catalysis.

528 Chemistry and Biochemistry

PHOTOCATALYTIC ACTIVITY AND CHARACTERIZATION OF TiO_2 DOPED WITH GOLD AND SILVER

Julio E. Valladares*, Aide Ponce, Diane Nguyen and Vianney Flores, Midland College, Midland, TX

Several samples of nanocrystalline TiO_2 doped with different transition metals were successfully prepared by a simple impregnation method, using solutions of inorganic salts of gold and silver soluble in water. The samples were characterized by using UV Spectroscopy and Scanning Electron Microscopy- Energy Dispersive X ray Analysis. The photocatalytic activity of the different samples was studied by using initial rates of the photocatalyzed degradation reaction of phenol and the dye Methylene Blue in a stirred tank reactor under the UV illumination of a lamp peaking at 365 nm. The experimental results showed a substantial increase in the rate of photodegradation of the doped materials (Kinetic constant, $k = 0.0219 \pm 0.005 \text{ min}^{-1}$) when comparing with pure titanium dioxide semiconductor (Kinetic constant, $k = 0.0037 \pm 0.0008 \text{ min}^{-1}$), indicating a higher photocatalytic activity of the different materials prepared by modifying the semiconductor properties of the TiO_2 semiconductor by using silver and gold. These results demonstrate the higher efficiency and the potential use of TiO_2 doped materials in the design of more efficient water treatment systems or in future solar cells.

419 **Chemistry and Biochemistry**

PHOTOCHEMISTRY OF PHENYLCYCLOALKENE OXIDES

Rick C. White and Jacob W. Broadway Sam Houston State University

2-Phenylcyclohexene oxide undergoes irradiation to generate phenylcyclopentane via ring contraction in a 1,3-diradical followed by extrusion of carbon monoxide. However, the photolysis of phenylcyclopentene oxide behaves differently. The major pathway open to this system seems to be hydrogen migration. Results will be presented and a unifying mechanism will be presented.

455 **Chemistry and Biochemistry**

RESONANCE CONTRIBUTION DETERMINATION VIA HUCKEL MO METHODS

Benny E. Arney, Jr.*, Department of Chemistry, Sam Houston State University, Huntsville, TX.

Use of resonance structures is a mainstay of descriptive chemistry, both organic and inorganic. Qualitative rules for the evaluation of the relative importance of potential resonance structures are given in General Chemistry as well as being revisited in the higher level classes when resonance is utilized to rationalize some molecular or reactive property. Use of the Hückel MO theory to quantify the contributions of individual resonance structures will be demonstrated. Other aspects of this application will also be addressed.

532 **Chemistry and Biochemistry**

STRUCTURAL INFORMATION FROM INFRARED STUDIES OF OH STRETCHING IN ALCOHOLS AND DIOLS

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Our group has examined the OH stretching band in the infrared spectrum of several hundred aliphatic and aromatic alcohols and diols in dilute cyclohexane solution. This paper will present specific examples of the types of structural information we have been able to obtain from these studies. For various molecules we have been able to obtain information about ring conformation, OH internal rotation about the CO bond, presence or absence of intramolecular and intermolecular hydrogen bonding, steric compression of the OH group, and the influence of various substituents on the strength of hydrogen bonds.

428 **Chemistry and Biochemistry**

SYNTHESIS AND CHARACTERIZATION OF FATTY ACID ALKYL ESTER MIXTURES

Russell J. Franks*, Department of Chemistry, Stephen F. Austin State University

Synthesis and Characterization of Fatty Acid Alkyl Ester Mixtures Russell J. Franks*
Department of Chemistry, Stephen F. Austin State University, Nacogdoches, TX, 75962 The search for alternatives to petroleum-based transportation fuels coupled with the desire for cleaner-burning more environmentally-friendly fuels has spurred much research into the use of biodiesel as a substitute for petroleum-derived diesel fuel. Biodiesel is a mixture of fatty acid alkyl esters (FAAEs), which is readily synthesized via either acid-catalyzed or base-catalyzed

transesterification of a triglyceride with an alkyl alcohol. The overwhelming majority of research work on biodiesel fuels has focused on fatty acid methyl esters, derived from methanol. Some work has been published on biodiesel made from ethanol, however, relatively little work has been done on biodiesel made from higher alcohols, particularly from C3 and C4 alcohols. Modification of the alkoxy group in biodiesel mixtures can have significant effects on the chemical and physical properties of the mixture including combustion energies, viscosities, and cloud point. A number of FFAE mixtures from C1-C4 alcohols and a variety of triglyceride sources have been synthesized using acid-catalyzed transesterification using conventional acids (e.g. H₂SO₄, H₃PO₄). Results from work on the development of alternative acid catalysts (e.g. Lewis acids, acidic clays) are also presented.

592 Chemistry and Biochemistry

THE EFFECT OF WATER TREATMENT ON THE ESSENTIAL OIL QUALITY AND COMPOSITION OF *THYMUS VULGARIS* (ENGLISH THYME)

Sigmund Courtney, Midwestern State University, Wichita Falls, TX

Thymus vulgaris (English thyme) plants were grown under three watering conditions; control (300 mL every three days), T1 (600 mL every three days), and T2 (300 mL every six days), for 90 days. The essential oil of the plants was extracted via hydro distillation at 30 d, 60 d, and 90 d, and the volatile components were identified using GC-MS analysis. Thymol was the major component quantified, prior to water treatment, thus defining the chemotype. The watering conditions affected the essential oil composition and quality. Variations were observed in the concentration of thymol and its precursors, p-cymene and γ -terpinene. The concentration of thymol was highest in the T1 plants, which also produced the best quality of essential oil. The concentration of thymol decreased and its precursors increased in the control plants as they aged. In T1 plants p-cymene and γ -terpinene were converted to thymol.

P539 Chemistry and Biochemistry

A FACILE AND COST-EFFECTIVE METHOD FOR NITROGEN-CONTAINING COMPOUNDS

Teena Thomas, University of Houston-Downtown, Houston, TX

Hydroxylamine, hydrazine, and azide are small nitrogen-containing molecules that have found many applications in medicine, fertilizers, fuel, explosives, and nucleic acid study. Existing methods for these compounds are based on spectrophotometric analyses which are not easy to be adopted into fast field screening. In this work we developed a facile and cost-efficient method to tackle the potential field monitoring. We utilized commercial pencils as substrates with gold thin film coated chemically or electrochemically. Such gold/pencil leads exhibit excellent features and electrochemical windows as the bulk gold metal electrodes, with much lower operational cost and higher catalytic activity. By coupling with amperometry, hydroxylamine revealed well-defined oxidation voltammetric response in alkaline media, hydrazine displayed irreversible oxidation in neutral condition, and azide presented the reduction peak in strong acidic media. The optimal media for these three compounds were found to be NaOH, H₂SO₄, and NaNO₃ respectively. We compared different brands of pencil leads for the response of nitrogen-containing compounds, and it appeared that the “harder” leads turn to give better performance. Our pencil sensors seem to

work with good specificity, as other common co-existing species do not interfere with the quantization of our targeted small organic nitrogen compound. The use of commercial pencils has made these important determinations readily accessible to the general public and wide application.

P484 **Chemistry and Biochemistry**

ANALYSIS OF OMEGA-3 FATTY ACIDS FROM COMMERCIALY AVAILABLE FISH OIL, FARM RAISED & WILD CAUGHT FISH, AND OTHER SOURCES

Junior Swanston* and Michael Shipley, Department of Biology, Midwestern State University, Wichita Falls, TX, 76308.

Omega-3 fatty acids have been shown to have many health benefits, such as reducing the risk of stroke and heart disease. These polyunsaturated fatty acids must be obtained from food, such as cold water fish and nut oils. We tested for the percent composition of omega-3 fatty acids (alpha-linolenic acid, ALA; eicosapentaenoic acid, EPA; and docosahexaenoic acid, DHA) from several fish oil capsules in addition to farm-raised and wild-caught salmon, tuna, walnuts, flaxseed oil, and eggs. A wide variation was seen in commercially available fish oil, which ranged from 32% to 92% omega-3 fatty acids. Flaxseed oil had 78% omega-3's (all of it ALA). Tuna steak was the highest of the sampled fishes (42%) followed by wild-caught (35%) and farm-raised (22%) salmon. Omega-3 fortified eggs had only 1.2% omega-3's, compared to regular eggs at 0.9%. The results showed that 6 grams of wild-caught salmon is required to obtain the omega-3 content of 1 gram of the top fish oil.

P516 **Chemistry and Biochemistry**

CHEMICAL ANALYSIS OF SILK FIBROIN PROTEINS: A SET OF LABORATORY EXERCISES FOR EXPLORING PROTEIN SCIENCE SUITABLE FOR UNDERGRADUATE COURSES IN BIOLOGICAL AND ORGANIC CHEMISTRY

Elena Davila*, Nickolas Lemley, Rick Peigler, David Coleman, University of the Incarnate Word, San Antonio, TX

Silks are composite biomaterials that form strong, flexible strands and sheets that are insoluble in water, and are found, for example, in spider webs, moth cocoons, and man-made silks harvested from the domesticated larva of the silk-moth *Bombyx mori*. Silk Fibroin Proteins are the major component of silks, and are a class of fibrous proteins composed primarily of a simple (-GX-) repeat, where (G) is glycine and (X) is usually alanine (65%), serine (23%) or tyrosine (9%). Silk fibroins form stacked beta sheet structures which are responsible for the physical properties of silk, such its exceptional strength and flexibility. Because silk fibroin can be easily purified and converted into a water soluble form which is stable for several months at 4 °C, it is a good system for exploring protein science in undergraduate labs, in contrast to more sensitive proteins. This work describes 3 laboratory exercises, adapted from established procedures, that are suitable for undergraduate courses in biological and organic chemistry: 1) Purification and preparation of soluble silk fibroin from domestic and natural cocoon silks (protein purification); 2) Analysis of silk fibroin size and composition using electrophoretic and chromatographic methods (analytical biochemistry) and; 3) Chemical modification and analysis of silk fibroin tyrosine residues via diazonium coupling chemistry (synthetic organic chemistry). In addition, a computer graphics exercise

using silk fibroin to demonstrate simple protein structure is described.

P427 Chemistry and Biochemistry

COMBUSTION ANALYSIS OF FATTY ACID ALKYL ESTER MIXTURES

Roberto J. Molina, Alyx S. Frantzen, and Russell J. Franks*

Combustion Analysis of Fatty Acid Alkyl Ester Mixtures Roberto J. Molina, Alyx S. Frantzen, and Russell J. Franks* Department of Chemistry, Stephen F. Austin State University, Nacogdoches, TX, 75962 In recent years, fossil fuels have been challenged by alternative fuels including biodiesel. While biodiesel derived from plant sources has been extensively studied, biodiesel derived from animal sources, particularly from poultry fat, has not been as extensively studied. A number of fatty acid alkyl ester (FAAE) mixtures were prepared from a variety of plant- and animal-derived triglyceride sources, including: soybean oil, olive oil, corn oil, cottonseed oil, sunflower oil, canola (rapeseed) oil, pork lard, and poultry fat. Methyl, ethyl, n-propyl, isopropyl, n-butyl, and isobutyl FAAE mixtures were synthesized via acid-catalyzed transesterification of triglyceride with various C1-C4 alkyl alcohols. The combustion energies of these FAAE mixtures were then determined using bomb calorimetry. Combustion energies for FAAEs made from poultry fat ranged from 39 MJ/kg (methyl ester) to 40 MJ/kg (n-butyl ester).

P445 Chemistry and Biochemistry

EFFECT OF AMINO ACIDS AND AQUEOUS SOURCE POLYPHENOLS ON ACRYLAMIDE PRODUCTION IN FRENCH FRIED POTATOES

Kaci Pruser*, Nick Flynn

Fried, starchy foods contain high amounts of acrylamide, a neurotoxin and suspected carcinogen, as a result of the Maillard reaction between asparagine and carbohydrates. We examined the effect of amino acid side chains and aqueous source polyphenols on acrylamide production in french fries. Neutral, basic, acidic, and aromatic amino acids, as well as grape juice were analyzed. White grape juice was chosen because a previous study demonstrated that french fries cooked in olive oil exhibit a decrease in acrylamide production. Olive oil and grape juice possess high quantities of polyphenols, measured as gallic acid equivalents. Grape juice polyphenols, however, are present in an aqueous media whereas olive oil polyphenols are present in a predominately organic media. French fries were soaked in water, a 5% amino acid solution or grape juice prior to cooking. A solid phase extraction procedure was utilized followed by UV-Vis, HPLC analysis. The amount of acrylamide formed from serine, lysine, aspartate, phenylalanine, water and grape juice treatments was 82.49 ± 6.82 , 119.86 ± 15.73 , 80.62 ± 3.37 , 324.78 ± 64.28 , 93.48 ± 18.9 and 110 ± 7.0 $\mu\text{g}/\text{kg}$, respectively. Statistically, acrylamide was only higher in fries soaked in a phenylalanine solution. The effect of other aromatic compounds on acrylamide production in foods should be investigated. Results of this study also demonstrate that aqueous source polyphenols, present via white grape juice, do not lower acrylamide production. Future studies should examine the effect of red grape juice which has higher concentrations of polyphenols than white grape juice and olive oil.

P542 Chemistry and Biochemistry

EXPLORATION OF DIFFERENT ANCHORING TECHNIQUES FOR FABRICATING EFFECTIVE SENSORS

Nameera Baig* (University of Houston Downtown), Tomasz Marszalek (Technical University of Łódź-Poland), Mian Jiang and Larry Spears (University of Houston-Downtown)

Transducers from carbon base have found the broadest use thus far in sensor chemistry because of their high conductivity, wide electrochemical window, chemical inertness, and thermal/mechanical stability. Functionality and effective adhesion of various carbon material, on the other hand, have remained a major challenge in sensor chemistry. In this work we tested four approaches to attach various carbon particles - graphite, fullerene (Bucky ball), activated carbon, charcoal, and carbon nanotubes - to form functional composites in chemical and biochemical sensing. These four anchoring approaches -sol-gel technique, zone casting/coating, electropolymerization, and plant tissue mixing, represent the application of inorganic, organic polymeric, and bio-incorporation for surface functionality.

Tetramethyloxysilane (TMOS), polyfloro polymer Nafion, commercial cosmetic nail polish, and grocery produce potato were used in our study to implement the three approaches for sensor fabrication and comparison. These different attachment avenues displayed different surface activities with nail polish, demonstrating the most promising entrapment capacity toward electroactive species including ferri/ferrocyanides. Various chemicals and biochemicals were examined for their possible sensing on these new functional surfaces. By using voltammetry, we found thiocyanate, hydrogen peroxide, dopamine, and other environmentally-significant analytes exhibit electrocatalysis on these sensors. Further, the enhanced voltammetric current peaks display linear dependence towards respective concentrations of these analytes. These demonstrated properties may have application in detecting cigarette-smoking related study (with high thiocyanate content in body), enzyme electrode (with hydrogen peroxide as reactant or product) and clinic neuroscience research (with dopamine and other neurotransmitter conveying).

P625 Chemistry and Biochemistry

FISHER ESTERIFICATION

Bob Holloway , Schreiner University

Fisher esterification (methyl esters) was found to be suitable for volatilizing fatty acids as part of a profiling analysis of a commercial bovine serum albumin product. This was done through a simple synthesis, using sulfuric acid and methanol, along with our methyl ester. To make sure that the synthesis was complete a TLC was ran. Our product was then run through a washing process to remove any excess solute that did not come off during synthesis. It was then run through a distillation to remove all water. Another TLC was ran to determine if the product was in any way compromised during the process of washing and distillation.

P438 Chemistry and Biochemistry

NOVEL AND RAPID DETERMINATION OF THREAT AGENTS BY VOLTAMMETRY

Christine Varghese*, Nirmal John, Charles Varghese, University of Houston - Downtown, Houston, TX.

Threat agents, especially residues from nitrogen-containing explosives, biohazards, and fuels, remain as high priority issues for national security and environmental safety. Existing assays for these agents have relied heavily on the sophisticated protocols, often involved in pre- and post-treatment for analysis, and the use of a central facility. Nevertheless, the prospect of chemical and biological terrorism presents the urgency of field testing by a simple, integrated, portable and cost-effective means. In this work we developed new determination protocols for some of these hazardous compounds. Our methods are based on electrochemical response of these agents on noble metals as well as carbon electrodes. By using voltammetry, the detection of hydrazine, azide, and other nitrogen-containing molecules can be quantitatively measured in acidic media. Because of the direct surface redox activities, our new detection is rapid and cost-effective. We systematically compared the medium composition, pH, and co-existing substances for the optimal operation of detection. The resultant data showed that under ambient condition all of electrodes employed in our study possess excellent response of these representative threat agents.

P441 Chemistry and Biochemistry

SAMPLE PREPARATION METHOD DEVELOPMENT FOR DETERMINING THE BIOMARKER, 2-AMINOTHIAZOLINE-4-CARBOXYLIC ACID (ATCA), FROM MICE LIVER AFTER CYANIDE EXPOSURE

Katelyn Stafford*, Jorn C.C. Yu, Bat-erdene Myagmarjaya, Ilona Petrikovics, Sam Houston State University, Huntsville, TX.

The purpose of this research was to develop a new analytical technique to determine the chemically stable urinary metabolite of cyanide, 2-aminothiazoline-4-carboxylic acid (ATCA), in mice liver samples. Two extraction techniques, solid phase extraction (SPE) cation exchange and molecular imprinted polymer stir bar (MIP-SB), were tested to determine the efficiency of ATCA extraction. Mice were exposed to doses of cyanide, and a method was developed to dissect, preserve organs, and homogenize the livers. Endogenous ATCA is always present in the body in low quantity originated from dietary intake of cyanide, smoking, fires or the normal metabolism of amino acids. A selective and sensitive analytical method is needed to determine the endogenous level of ATCA or identify cyanide poisoning. The use of ATCA as a biomarker for cyanide poisoning is promising due to its stability at ambient, as well as freezing temperatures and its production is directly related to cyanide exposure. The authors will present an effective method of preparing liver samples from the cyanide-exposed mice for extraction, and will compare the two extraction methods (SPE vs. MIP-SB). The effectiveness of the extraction techniques will be determined by employing known concentrations of ATCA evaluated by the LC/MS/MS. Liver ATCA contents will be compared to the dose of cyanide mice were given. These studies were supported by the ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE under the auspices of the U.S. Army Research Office Scientific Services Program and the Robert A. Welch Foundation at Sam Houston State University, Huntsville TX.

P407 Chemistry and Biochemistry

STUDY OF EFFECTIVENESS OF RHODANASE ENCAPSULATION INTO STEALTH LIPOSOMES

Sarah Martin*, Galina Kuzmicheva and Illona Petrikovics, Sam Houston State University, Huntsville, TX

Rhodanese (Cyanide: Thiosulphate Sulfur Transferase) is an animal mitochondrial sulfurtransferase which plays a major role in detoxification of cyanide into less toxic thiocyanate using different sulfur donors. Thiocyanate is then excreted through the kidneys. The enzyme is also widespread in bacteria and cyanogenic plants, yet in mammals, it is mainly concentrated inside the mitochondria of the liver. Clinically proven sulfur donors (such as thiosulphate) have limited membrane penetration capability to reach the Rhodanese localization. One of the promising approaches in cyanide detoxification is intravenous delivery of external Rhodanese to the body exposed to cyanide. However, it was shown that unprotected external Rhodanese had a decrease in activity quickly in the blood stream. Previously, we have shown that encapsulation of Rhodanese into stealth liposomes protects enzymes from fast inactivation and allows enzymes to function effectively against cyanide.

Here we investigated two different liposome compositions to estimate the most advantageous condition to deliver Rhodanese into the blood stream. The first liposome composition included palmitoylcholine (POPC), cholesterol, and Dipalmitoylphosphoethanolamine-polyethylene glycol (DPPE-PEG). The second had a cationic phospholipid, Dioleoyl trimethylammonium propane (DOTAP), added to the previous mixture. Four different concentrations of Rhodanese, 1.67 mg/ml, 1 mg/ml, 0.5 mg/ml, and 0.25 mg/ml, were analyzed. Rhodanese incorporated the best (74%) at concentration of 0.25mg/ml and with composition of liposomes which included DOTAP. These studies were supported by the ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE (Delivery Order 0878, Contract No. DAAD19-02-D-0001, TCN 06-170 and 08284), and the Robert A. Welch Foundation (x-0011) at SHSU, Huntsville TX.

P541 Chemistry and Biochemistry

STUDY OF POLYPYRROLE-CARBON NANOTUBE COMPOSITES AND OXIDIZED POLYPYRROLE NETWORK

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Polymer composite materials have received growing attentions in recent years because they offer both polymer network and unique features of embedded or intercalated mixing dopants. A main challenge for preparing these substances is the homogeneity of the resultant composites. Conducting polypyrrole (PPy) is a widely studied polymer because of its ease in preparation and its biocompatible capacity. On the other hand, carbon nanotubes possess high volume/surface area ratio that would enable them to entrap or include molecules of biological significance. In this work we have made PPy–nanotube composites through in situ fabrication from pyrrole monomer and multiwalled carbon nanotubes. By using voltammetry, coulometry, chronopotentiometry, and impedance, we have characterized the composite films as well as their comparison to conventional conducting polymer, and examined their potential as supercapacitor and new battery material. Further, by employing unique chemical and electrochemical perturbations, we have successfully made a new, electrochemically active

overoxidized polypyrrole thin film. To our knowledge this is the first report of this kind in the study of PPy and overoxidized PPy. The resultant overoxidized PPy exhibits well-defined, reversible voltammetric peaks in acidic media, which block the surface reactions of most of solution electroactive species but show dependence upon the solution pH. Further exploration of these new, unique properties of our composites and overoxidized polymer thin films are currently underway. This work was supported by ORC-UHD, UARP-SACP, Brown Grant, and Welch Foundation (BJ-0027).

P460 Chemistry and Biochemistry

SYNTHESIS OF A DIAMINO PHENOL LIGAND AND ITS DERIVATIVES FOR USE IN A MIXED-METAL ASSEMBLY

Elizabeth Walther* and Julian Davis

We present the preparation of 3,5-bis((diethylamino)methyl)phenol and its derivatives by a four-step synthesis based on modified literature procedures. This ligand, which is known to bind platinum and palladium, is being appended to a terpyridine ligand via a variety of flexible and rigid linkers to create mixed metal complexes we hope will have strong interactions with DNA.

P590 Chemistry and Biochemistry

TAILORING A SURFACE ENHANCED RAMAN SENSOR FOR THE DETECTION OF THE CYANIDE METABOLITE, 2-AMINOTHIAZOLINE-4-CARBOXYLIC ACID

Ashley Pipken*, Ilona Petrikovics, David E. Thompson, Sam Houston State University, Huntsville TX

The toxin cyanide has a short half-life in the human body. Thus, in addition to testing for the presence of cyanide itself, it is advantageous to test for longer-lived metabolites of cyanide. A metabolite of cyanide that has good stability and biomarker characteristics is 2-aminothiazoline-4-carboxylic acid (ATCA). The purpose of this research is to tailor, construct and characterize a surface enhanced Raman sensor with the long-term goal of developing a rapid and cost effective sensor for ATCA. Unenhanced Raman spectra of ATCA are presented, along with a description of how this has guided the design of a surface enhanced Raman sensor for ATCA. Scanning electron microscope and localized surface plasmon extinction data characterize preliminary attempts to construct the ATCA sensor.

P448 Chemistry and Biochemistry

THIN LAYER CHROMATOGRAPHY SOLVENT SYSTEM FOR SEPARATION OF SECONDARY METABOLITES OF CANDIDA SPECIES

YuYu Chu*, Julian Davis, Ana Vallor, University of the Incarnate Word, San Antonio, TX

The objective of this project was to identify an ideal solvent system for the detection and separation of secondary metabolites produced from three clinically relevant *Candida* species by thin layer chromatography. The interactions between the secondary metabolites of this species and the host and their potential role as early diagnostic markers for infection have yet to be investigated. It has been reported that selected *Candida* species may be able to produce

an epipolythiodioxopiperazine metabolite whose properties include immunosuppressive activities and induction of apoptosis in a host when present in other virulent fungi or yeast. Yeast were cultured on potato dextrose agar plates and secondary metabolites were extracted using acetone followed by chloroform rinses at varying time points of growth. Sample solutions were allowed to evaporate to dryness and precipitates were suspended in 1ml of acetone. Experimental samples along with standard molecules were loaded onto thin layer chromatography fluorescent plates and placed in selected solvent mixtures. Spots were visualized on the plates by UV light. After testing solvent combinations which included methanol, ethanol, dichloromethane and hexane, the solvent system consisting of 80% ethanol:20% dichloromethane yielded the best separation of distinct yeast secondary metabolites extracted by this procedure.

P426 Chemistry and Biochemistry

VISCOMETRIC STUDIES OF FATTY ACID ALKYL ESTER MIXTURES

Jeffery D. Briggs and Russell J. Franks*, Department of Chemistry, Stephen F. Austin State University

VISCOMETRIC STUDIES OF FATTY ACID ALKYL ESTER MIXTURES Jeffery D. Briggs and Russell J. Franks* Department of Chemistry, Stephen F. Austin State University, Nacogdoches, TX, 75962 Biodiesel has garnered much recent attention as a possible alternative to petroleum-derived diesel fuels. Most research work on biodiesel has focused on methyl esters of fatty acids, particularly vegetable-derived fatty acids. One potential triglyceride source for biodiesel is poultry fat, which is a by-product of poultry processing. Moreover, most research work has focused on methyl and ethyl esters of fatty acids. Not as much work has been done using biodiesel made from other alcohols. A variety of fatty acid alkyl esters (FAAEs) have been synthesized by transesterification of plant- and animal-derived triacylglycerols with various C1-C4 alkyl alcohols under acid-catalyzed conditions. A number of triacylglycerol sources were used including: soybean oil, olive oil, corn oil, cottonseed oil, canola (rapeseed) oil, sunflower oil, pork lard, and rendered poultry fat. Methyl, ethyl, n-propyl, isopropyl, n-butyl, and isobutyl alcohols were used to synthesize the various FAAE mixtures. The viscosities of these FAAE mixtures were measured. The viscosity of the FAAE mixtures tends to increase as the number of carbons on the alkoxy group of the ester increases. The viscosity of poultry fat-derived FAAE mixtures was similar to viscosities observed for plant-derived FAAE mixtures.

P635 Chemistry and Biochemistry

ISOLATING CHEMICAL CONSTITUENTS IN CANID URINE TO DEVELOP ANTI-PREDATION TOOL

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The conflict between humans and wolves represents one of the most well documented conflicts between wildlife and humans. This conflict resulting primarily from livestock predation issues, demonstrates the often challenging problem faced by wildlife managers when dealing with predator conservation. Management strategy for the wolf and other large predators has involved both lethal and non-lethal methods, but as public attitude toward conservation gained favour, more emphasis has been placed on non-lethal control methods.

Many of these rely on chemicals to induce sickness, irritation, or fear, and artificial stimuli such as strobes and lights to deter predation. We find that a more focused approach may be to target specific aspects of wolf ecology. Because scent marking plays such an integral role in wolf ecology and seems to be a means of delineating and determining movement patterns, this seems like one avenue of controlling wolf-livestock interactions that should be subject to further investigation. Wolf urine seems especially important in this context and may contain chemical constituents that once isolated could be used to develop more effective anti-predation tools. A comparison of these compounds with various canid species (including red wolf (*Canis rufus*); gray wolf (*Canis lupus*); domestic dog (*Canis domesticus*); coyote (*Canis latrans*); and wolf-dog hybrids) will identify species specific compounds, facilitating development of potential anti-predation tools.

564 **Computer Science**

MODELING CHAPERONE INTERACTION NETWORK OF MYCOBACTERIUM TUBERCULOSIS: PROTEIN NETWORKS AS GRAPHS

Zane Goodwin*, Eamonn Healy, Peter J. King and Charles Hauser, St. Edward's University, Austin, TX

Recent advances in systems biology have introduced computational methods that allow the interactions between proteins within cells to be viewed as networks. These networks can be displayed as two-dimensional graphs of nodes and edges, where edges represent functional linkages between pairs of protein nodes. Chaperones constitute a class of proteins known to participate in numerous interactions within the cell, primarily facilitating protein folding and preventing refolding and aggregation. Chaperones are essential at two stages in the life of a protein: during de novo protein folding following translation of an mRNA on a ribosome, and upon denaturation during conditions of environmental stress such as heat, cold or oxygen deprivation. In addition, novel roles for a sub-class of chaperones, the small heat-shock proteins (sHSPs), have been proposed in several diseases including tuberculosis. Tuberculosis, resulting from infection by *Mycobacterium tuberculosis* (Mtb), is the leading cause of death worldwide due to a bacterial pathogen. Due to its impact on human health and putative novel chaperone functions we initiated construction of a chaperone interaction network for Mtb. The network was created using interolog mapping, where interologs are protein-protein interactions conserved across species. The set of human chaperones and their interactors were used to identify homologs in Mtb using BLAST and, as a control, the proteome of *Plasmodium falciparum*. Cytoscape, a network-viewing program, was used to display the resulting networks. Analysis of the resulting Mtb network may provide a theoretical basis for experiments designed for understanding the involvement of this class of proteins in Mtb pathogenesis.

451 **Computer Science**

A SPREADSHEET ALGORITHM FOR FITTING A MATHEMATICAL MODEL OF HYSTERESIS TO PHYSIOLOGICAL CAUSES AND EFFECTS

John A. Ward, Department of Clinical Investigation, Brooke Army Medical Center

Hysteresis is the lagging of an effect behind its cause and can occur in any system that stores energy in electromagnetic fields or compliant compartments. In this study, we developed a

spreadsheet that fits a mathematical model to a hysteresis loop in a graphical analysis of physiological and electrical forcing functions. The model uses four variables, an attenuator, two rate constants and an offset to find the best fit by iteration. The rate constants are independent and are selected by a comparator that uses the first derivative of the waveform to detect leading and trailing edges. To demonstrate the efficacy of the algorithm, we used a stepwise process to fit the amplitude, leading and trailing edge and baseline of a rectangular forcing function to a following function that was modified by resistive and compliant components. To demonstrate practical application, we applied the model to physical and physiological examples of hysteresis.

421 **Physics**

DISCOVERY & MEASUREMENT OF MAIN BELT ASTEROIDS

Matthew Davis, Hardin-Simmons University

Using image sets from the 24" and 32" prime focus telescopes at the Astronomical Research Observatory (Charleston, IL) Main Belt asteroids were discovered and astrometrically measured, not known to the Minor Planet Center (Smithsonian Astrophysical Observatory) database maintained for the International Astronomical Union. The astrometric measurements were used to determine their orbits and build ephemerides to predict the positions for the coming days. Follow-up images were taken based upon these predictions using the 24" telescope at the Sierra Stars Observatory (Alpine County, CA). The original discoveries along with the follow-ups were reported to the Minor Planet Center to complete the discovery process as required for official recognition by the Center. For the original discoveries the 16" Internet-accessible telescope at the Ironwood North Observatory (Queen Creek, AZ) was used to take a sequence of images over a period of several nights. Aperture photometry was performed to determine the light curves, from which the rotational periods were calculated. Again using the 16" telescope, images were taken in four different bandwidths (R, G, B, IR). Aperture photometry gave the flux as a function of wavelength with the best-fit Planck's curve providing a calculation of the surface temperatures.

411 **Mathematics**

METHODS OF APPROXIMATING SQUARE ROOTS

Elsie M. Campbell*, Angelo State University, and Dionne T. Bailey*, Angelo State University, jointly

The problem of finding a square root dates back centuries to ancient times. Although differing in details, all early methods required a good deal of trial and error. With the invention of the calculator, we no longer concern ourselves with the tedious arithmetic tasks. We will demonstrate three methods: the algorithm method, Newton's method, and the method of bisecting intervals.

572 **Mathematics**

FIBONACCI CYCLES MOD P

Stacy Lee*, James Kelly, Seth Chomout, Valentin Torres, Trey Smith, Angelo State University, San Angelo, TX

Nearly everyone is familiar with the classic Fibonacci Sequence, 0, 1, 1, 2, 3, 5, 8, ... In this sequence, an element is obtained by adding the previous two elements together. The notion may be expanded to include generalized Fibonacci sequences where an element is obtained by first multiplying each of the previous two elements respectively, by a pair of fixed constants. So, for example, if the constant pair was (3, 5) then the resulting generalized sequence would be 0, 1, 5, 28, 155, Given a generalized Fibonacci sequence, one may divide each element by a fixed prime to obtain a new sequence consisting of the remainders. So, for the prime $p=3$, the classic Fibonacci sequence would become 0, 1, 1, 2, 0, 2, 2, ... and the generalized sequence 0, 1, 5, 28, 155, ... would become 0, 1, 2, 1, 2, It may be easily shown, that when you construct these new sequences, they will eventually repeat themselves, and continue to do so. This gives rise to what is known as a generalized Fibonacci cycle mod p . Historically, one of the questions concerning these cycles has related to the maximal length. That question has been answered. Another question arose, however, and that question is, "Can a pair (a,b) be found that will guarantee the associated Fibonacci cycle is maximal?" This project has centered on successfully answering that question. Additionally, we will extend these ideas to include other types of recursively defined sequences.

617 Mathematics

PATH PLANNING USING PARTICLE SWARM OPTIMIZATION

Lewis Nichols*, Michael Frye, University of the Incarnate Word, San Antonio, TX

Particle Swarm Optimization (PSO) has become more popular over the last ten years as a powerful optimization technique using swarm intelligence. PSO is a biologically inspired optimizer based on the emergent search behavior of bee or ant swarms. Path planning is the process of developing a navigable path from one waypoint to another waypoint on a surface without violating a constraint. The trajectory generation technique will make use of a particle swarm optimizer in conjunction with a predictive method. The intent is to use this method to predict an optimal path through simulated terrain. Dynamic targets are used to continually produce an optimal path to target in changing conditions. It is this dynamic environment that makes PSO a good choice to develop possible solution paths. The solutions are evaluated according to pre-set criteria nested inside the PSO algorithm. The results are then evaluated in a dynamic environment to test feasibility of solution. The limits of the terrain space itself can be dynamically changed to produce a 'receding horizon' wherein the PSO itself can operate. Early testing of these simulations have involved both FESTO's ROBOTINO and Lego Mindstorm robots. Due to the attractive property of rapid prototyping MATLAB has remained the main platform for the coding of the algorithms and visualization of the results. Simulink is being used to address integration between the ROBOTINO and MATLAB. The application of a dynamic pathfinder has many implications in both the military and private sectors.

P594 Computer Science

VIDEO- BASED SURVEILLANCE IN DISTRIBUTED ENVIRONMENTS

Marvin Weatherspoon, Jerry Garcia, and John Shoboiki, Texas Southern University, Houston, TX

Steadily, over given periods of time, crime rates around different areas of Houston have risen and fallen. The solution to crimes and their deterrence can often be difficult without the

presence of police units to survey a particular area for a long period of time. Colleges and Universities such as Texas Southern and the University of Houston utilize closed-circuit television systems (CCTV) for the police to keep eyes on several locations on the campuses 24/7. This study tracks the correlation between crime and CCTV surveillance; specifically, the rate's of crime and the rate of cases solved using CCTV.

P461 Computer Science

WEBSITE EVALUATION USING THE RAPID CONTEXTUAL DESIGN

B. Nsekpong*, M. Holiday*, L. Rocha*, D. Blazek*, S. Allen*, and R. Alvarado*, Concordia University Texas

Evaluating and designing a web site is a structured process. In this project the six-step Rapid Contextual Design created by Hugh Beyer and Karen Holtzblatt (1998) was used. A pre-existing website was the main focus of the project and the goal was to create a formal document suggesting changes for the website. Contextual interviews were held with members of the “client” organization (Can-Do Missions) to discover the requirements. Using the data gathered in the interviews, an interpretation session was held to create an affinity diagram. All members of the design team and representatives of the organization documented problematic or beneficial ideas. These Ideas were then organized and discussed. Then, “Personas and Scenarios” were developed where each person considered a potential user of the website and attempted to mimic their likely responses and reactions. The “Data Walk” was then performed to discover any flaws contained in the affinity diagram. This allowed changes to be made to the diagram as well as permit the addition of new ideas. The suggested changes were considered and a “Visioning” process was begun to aid in the development of the “Paper Prototype”. The flow of information in the website was considered in the visioning allowing an understanding of what pages were essential for the site. The Paper Prototype is a model of the webpage’s design. The prototype was then evaluated to see if it met the client’s expectation. When accepted, a detailed design was then created, as well as the final recommendation document.

P410 Computer Science

WII™-HABILITATION: THE PRELIMINARY FINDINGS OF THE UTILIZATION OF THE NINTENDO WII? AS A THERAPEUTIC INTERVENTION DEVICE BY SURVEY.

Steven Miller*, Carol Luckhradt Redfield, St Mary's University, San Antonio, TX.

In the early 1980’s, researchers began finding evidence to suggest the use of video games in patients’ rehabilitation sessions. The Nintendo Wii(TM) is currently use in rehabilitation sessions. However, there is little evidence of its therapeutic usage from scientific studies. I conducted a research study on the role the Nintendo Wii(TM) has in medical rehabilitation. I created a survey, which consists of 13 questions. I then mailed it out to rehabilitation professionals mainly from the United States. I received 76 completed surveys. Data collected from the surveys is still preliminary. I will share my preliminary findings at this presentation. My research provides new additions to the known patient diagnoses treated by the Nintendo Wii(TM) as well as the Wii games chosen by rehabilitation professionals. My presentation will include my literature review findings such as the physiological

and psychological/behavior benefits of using the Nintendo Wii(TM).

P504 Physics

DIFFRACTION OF ELECTRONIC WAVE PACKETS BY CRYSTALS

Robert Nicholas Lanning, Robert Holman, Christopher Grover Lee, Cristian Bahrim

It is well-known that light travels as sinusoidal waves described by Maxwell's equations. When passing through narrow openings, light spreads out (diffracts) and eventually interferes resulting in the formation of bright (maxima) and dark (minima) fringes. Interference and diffraction (I&D) are fundamental phenomena which confirm the wave characteristic of light. They are discussed in different degrees of sophistication ranging from basic undergraduate physics courses to special topics. The formation of I&D patterns with quantum particles, such as electrons in motion, proves the existence of matter waves. These waves are usually represented as the Fourier transform of sinusoidal waves called "wave packets". Our goal is to understand the formation of wave packets through experiments involving electron diffraction by crystals. It is known that a diffraction grating acts as a Fourier transform for light. Likewise, we can show that the crystal lattice can Fourier transform the sinusoidal waves associated to free electrons traveling toward a crystal. The regular array of atoms in a crystal acts similar to the slits of a diffraction grating. We perform experiments of crystallography with the purpose of analyzing the interaction between the electronic wave packets and the atomic array in crystals. Applications in electron microscopy, crystallography, analysis of micro-structures in bulk matter and biologic samples, including the investigation of proteins are discussed. This project is done under the STAIRSTEP program at Lamar University sponsored by NSF – STEP program with the award # DUE 0757057.

P614 Physics

NEURAL NETWORKS AND FOURIER SHAPE DESCRIPTORS FOR AUTOMATED CLASSIFICATION OF LIGHT CURVES OF ECLIPSING BINARY STARS

Katherine Leaveck*, Shaukat Goderya, Bert Little, Tarleton State University, Stephenville, TX

Advances in observational astronomy have given astronomers the opportunity to conduct sky surveys capable of collecting terabytes of data nightly. Photometric observation of stars has drastically increased the number of known variable stars to a point where traditional object-by-object analysis is not feasible. Using artificial neural networks for data mining, data reduction and analysis is of great interest to astronomers who now have more data readily available than any person or team could analyze in a lifetime. This poster presents initial efforts to build a scheme to automatically classify light curves of eclipsing binary stars using Fourier descriptors and artificial neural networks. The raw data was obtained from available public domain databases and a FORTRAN code was written to compute the Fourier descriptors. Large variation in the shape of the light curve can be seen in the Fourier descriptors, with the majority of information found to be contained within the first 3-4 descriptors calculated. The Fourier descriptors are presented as inputs to the supervised neural network for training and classifying the light curves. The initial results from this work

confirm a feasible model to classify binary stars using data mining on databases of tens of thousands of stars to isolate previously unknown contact binaries for further observation.

374 **Conservation Ecology**

ASSESSING AVIAN MORTALITY RATES AND POPULATION IMPACTS ASSOCIATED WITH AN ELECTRICAL TRANSMISSION LINE IN JEFFERSON COUNTY, TX

Andrea J. Ayers*, James W. Armacost, Jr, Lamar University, Beaumont, TX

The construction of a 230 kV transmission line lying adjacent to the J.D. Murphree Wildlife Management Area (WMA) in Jefferson County, TX began in February 2008, and the line was energized in July 2008. Carcass searches and population surveys began in August 2008. Between August 2008 and July 2009, 40 carcasses have been found. Passerines and rails were the most common victims. Population densities for all birds in the southern portion of the WMA averaged 5.84 birds/ha for the entire year, with highest densities in the winter (12.56) and lowest in the summer (1.20). Mortality rates (deaths/total birds present) attributable to the transmission line for all birds averaged 0.0023 for the entire year, with a peak in the fall (0.0029) which is most likely associated with migration. Mortality rate estimates will be revised as we collect more data and correct for potential biases. Mortality rates at the WMA were lower than many published values, possibly due to dense vegetation in the carcass search area and low numbers of birds foraging directly under the lines.

508 **Conservation Ecology**

EFFECT OF PRESCRIBED BURNING ON THE AVIAN COMMUNITY IN THE SAM HOUSTON NATIONAL FOREST.

Mallory J. Brodrick & Diane L. H. Neudorf

In the past century there has been a drastic change in vegetation due to fire suppression in the southern pine ecosystem, which has had negative impacts on many avian species. In particular, the red-cockaded woodpecker (*Picoides borealis*) was affected so severely it was placed on the endangered species list. The U.S. Forest Service actively manages red-cockaded woodpecker habitat in the Sam Houston National Forest by prescribed burning. I have investigated the effects of three prescribed burning regimes on the avian community. Avian species richness, diversity and abundance was documented in areas burned every 1 to 3 years, 5 to 10 years and in areas not burned for well over 10 years, through year-round point count surveys. The Sam Houston National Forest hosts Neotropical migrants for both stopover and breeding grounds. The results from the study will be discussed.

503 **Conservation Ecology**

DEVELOPMENT OF THE FIRST NEWELL'S SHEARWATER BREEDING HABITAT SUITABILITY MODEL USING A GEOGRAPHIC INFORMATION SYSTEM

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458, Waimea, Hawaii 96796, USA 3-Division of Forestry and Wildlife, State of Hawaii Department of Land and Natural Resources, P.O. Box 458, Waimea, Hawaii 96796, USA

The island of Kauai in the Hawaiian Archipelago is the stronghold of the federally threatened Newell's Shearwater, or 'A'o (*Puffinus newelli*). Numbers of Newell's Shearwaters are in dramatic decline and the species appears to be exhibiting a breeding range contraction on Kauai. Few locations of active breeding sites are known and the existence of additional sites is difficult to determine because of inaccessibility due to steep terrain and land ownership. In an attempt to quantify potential breeding habitat for this species and aid future searches, we developed the first breeding habitat suitability model for the Newell's Shearwater using existing distributional data from systematic surveys, a suite of remotely sensed environmental variables, and ArcGIS. The habitat suitability model and maps produced from this effort will aid in prioritizing areas for future surveys and habitat protection, a critical next step in the conservation of this imperiled species.

446 Conservation Ecology

DISTRIBUTION AND GIS-BASED HABITAT MODELING OF RED PANDA (*AILURUS FULGENS*) IN NEPAL

Naveen K. Mahato* & Michael R. J. Forstner - Dept of Biology, Texas State University

The distribution of red panda (*Ailurus fulgens*), an endemic species to the Eastern Himalaya, is not well understood, however, western Nepal is generally considered to be the western-most limit of its range. In Nepal, the red panda has been recorded in several pockets of habitat, mainly in protected areas. Data collected from these areas was used to build a distribution model for Nepal using maxent entropy modeling to estimate the distribution of red panda. The results indicate a higher probability of its occurrence in eastern Nepal compared to the western areas. The probability of occurrence is greatly reduced west to the Kali Gandaki George which intersects the Himalayan range between Eastern and Western Himalaya. These preliminary findings are aligned with the known information regarding its distribution. Additional survey work and habitat mapping now planned will assist in further tests of the efficacy of this model for the species distribution in Nepal.

432 Conservation Ecology

SEASONAL VARIATION IN THE DAILY ACTIVITIES AND TIME BUDGETS OF THE AMERICAN BLACK BEAR (*URSUS AMERICANUS*) IN BIG BEND NATIONAL PARK, TEXAS

Alisa Lanning* and Steven Platt, Sul Ross State University, Alpine, TX

We began collecting direct behavioral observations of black bears (*Ursus americanus*) in Big Bend National Park beginning in the Spring of 2009 in order to determine if behavior differs based on demographic factors and/or seasons. Black bears have only recently returned to Big Bend National Park after being extirpated from the region at the turn of the century, and although radio telemetry and food analysis studies have been conducted on this population, no extensive observational data have been collected and analyzed. We predict that feeding times would increase as the winter season arrived, as well as predict that adults without offspring would travel further and more often than sows with juvenile cubs. To date, 6.56 hours of

observations have been recorded.

425 **Conservation Ecology**

CHANGE OF THE HERPETOFAUNA FROM CERRO EL POTOSI, GALEANA, NUEVO LEON, MEXICO.

Jorge A. Contreras- Lozano, David Lazcano, and Armando J. Contreras- Balderas. Laboratorio de Herpetología and Laboratorio de Ornitología, Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León. Apartado Postal 425. San Nicolás de los Garza, Nuevo León, México. 66460

CHANGE OF THE HERPETOFAUNA FROM CERRO EL POTOSI, GALEANA, NUEVO LEON, MEXICO. Jorge A. Contreras- Lozano, David Lazcano, and Armando J. Contreras- Balderas. Laboratorio de Herpetología and Laboratorio de Ornitología, Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León. Apartado Postal 425. San Nicolás de los Garza, Nuevo León, México. 66460 In the northeast of Mexico Cerro el Potosí is a high priority region for conservation, it is situated in the Sierra Madre Oriental and at an altitude of 3750mosl, these determines particular ecological conditions for the presents of endemic flora and fauna. Jaccard and Cody index were used. The first indexes serves to compare historical and present records, and that have been influences by different causes, such as forest fires and anthropogenic activities. On the other hand, the Cody index helps to identify gain or lost of species. Historical data were obtained from national and international preserved collection, taking its locality and altitude references. A list of 29 species reptiles and amphibians was obtained, 24 were historical reports and 16 obtain from October 2006-October 2008. The Jaccard index obtained had a 42% similarity, while Cody index reports a 8.5 lost of species. Until now our work indicates that reptiles and amphibians fauna of Cerro El Potosí have been heavily impacted.

417 **Conservation Ecology**

DIVERSITY α AND β OF THE AVIFAUNA IN LAGUNA MADRE, TAMAULIPAS, MÉXICO, FROM 1964 TO 2007

Ana L. Domínguez-Orozco, Juan A. García-Salas*, Armando J. Contreras-Balderas and Gerardo G. Morales-Garza. Universidad Autónoma de Nuevo León. Ciudad Universitaria. A.P. 425. San Nicolás de los Garza, Nuevo León, México. C.P. 66451

DIVERSITY α AND β OF THE AVIFAUNA IN LAGUNA MADRE, TAMAULIPAS, MÉXICO, FROM 1964 TO 2007 Ana L. Domínguez-Orozco, Juan A. García-Salas*, Armando J. Contreras-Balderas and Gerardo G. Morales-Garza Universidad Autónoma de Nuevo León. Ciudad Universitaria. A.P. 425. San Nicolás de los Garza, Nuevo León, México. C.P. 66451 We analyzed birds α and β diversity at Laguna Madre Tamaulipas, México. We use data since 1964 to 2008. The study area was visited monthly from September 2007 to may 2008 in the zone of Enramada-Mezquital, the Carbonera and Soto la Marina. Each survey was at the continental part, inside and some islets of the lagoon. Data base was created using records from 1964 to 2008. Our data shows eight orders, 16 families and 41 species with a total of 302,993 individuals. We applied Shannon Index to obtain α diversity and “T” test ($P < 0.05$ $df = \infty$). The highest Shannon index obtained were Perales (1981) and Garza (2001). Diversity β was obtained using Sorensen and Cody indexes, where the second index was greater (Cody)

with 46 species were increased and 59 were lost from 1964 to 2008. Our data shows that weather conditions are the possible reason of this biodiversity changes.

526 Conservation Ecology

TWO-YEAR POPULATION SURVEY AT TWO SITES OF THE GEORGETOWN SALAMANDER *EURYCEA NAUFRAGIA*

Alexis L. Ritzer*, Taylor A. Jones, and Benjamin A. Pierce. Southwestern University, Georgetown, TX, 78626

The Georgetown salamander, *Eurycea naufragia*, is a paedomorphic spring- and cave-dwelling salamander known from only 13 sites in the San Gabriel River drainage of central Texas. Rapid urbanization places all known populations at risk, and poor understanding of their species ecology hinders conservation strategies planning. We conducted monthly, minimally-invasive salamander surface counts at two spring sites over two years. At each site, both number of salamanders and percent cover objects occupied by salamanders varied monthly, with a general trend of higher abundance in spring and summer. Within the spring flow, salamander abundance decreased with distance from spring origin. The number of salamanders and water temperature deviated from the mean, showing significant positive correlation. Analysis of research literature suggests that salamander abundance will be negatively impacted by increasing urbanization, small substrate particles, and variation in water temperature; salamander abundance will be positively affected by increases in cover objects, factors that maintain substrate interstitial spaces, and by increasing aquatic invertebrates.

412 Conservation Ecology

POPULATION AND COMMUNITY ECOLOGY OF FISHES AT SAN SOLOMON CIENEGA AND REFUGE CANAL AT BALMORHEA STATE PARK, TEXAS.

Ivy McClellan, University of Mary Hardin Baylor. Chad Hargrave & Raelynn Deaton, Sam Houston State University.

Abstract In the early 1900's the construction of irrigation canals and a large spring fed pool depleted all the natural ciénegas in the Balmorhea springs complex. As a result, *Cyprinodon elegans* (Comanche Springs Pupfish) and *Gambusia nobilis* (Pecos gambusia) became endangered species. In order to conserve these fishes, a refuge canal and ciénega were constructed. We are currently monitoring both locations to gain additional insight on the changes that have occurred in the ciénega since the completion of population estimates in 2001. We estimated population size and density on all the fish species in both the ciénega and refuge canal. We compared the diet of all the fishes in both locations and estimated the trophic levels to determine the intensity of competition faced by *C. elegans* and *G. nobilis*. Finally, we have also estimated the quantity of resources available at both locations. This information will tell us which location has better resource heterogeneity available to the endangered residents. The compilation of this data will assist in predicting the efficacy of the second ciénega that was completed in August 2009. The Texas Parks and Wildlife Department will use the data collected to create a more sound management plan for the endangered species. Our population and gut content analysis has shown that resource heterogeneity does not seem to be a significant factor in determining population numbers. Dietary overlap as well as

overall population is greater in the ciénega than in the refuge canal.

606 Conservation Ecology

PRELIMINARY ANALYSIS OF CRITICAL CURRENT SPEED BETWEEN TWO CONGENERS (*GAMBUSIA NOBILIS* AND *G. GEISERI*) AT BALMORHEA STATE PARK, TX

Travis Kocurek*, Raelynn Deaton, Sarah Sendelbach, Ivy McClellan, Jessica Sanchez, and Chad Hargrave, Sam Houston State University, Huntsville, TX

This study assesses possible morphological determinants of critical current speed (the maximum flow that a fish can tolerate before being displaced downstream) of two congeners (*Gambusia nobilis* and *G. geiseri*) at Balmorhea State Park in Balmorhea, Texas. The endangered *G. nobilis* is native to the Balmorhea area, while *G. geiseri*, an invasive species, was introduced to the area in the 1930's. The most significant threats to the existence of *G. nobilis* are competition from the sympatrically occurring *G. geiseri*, spring flow declines, and anthropogenic habitat modifications. Because *G. nobilis* and *G. geiseri* vary morphologically, I predicted these variations would be significant indicators of critical current speed. I tested critical current speed in a flow chamber and made morphological measurements of 40 *G. nobilis* and 37 *G. geiseri*, collected from the San Solomon Cienega at the state park. Of the six morphological measurements made, two were shown to be significant indicators of critical current speed. These data, along with other important habitat considerations, are important for the persistence and management of *G. nobilis*.

573 Conservation Ecology

BITTERSWEET SUCCESS STORY OF HEADSTARTING IN THE HOUSTON TOAD (*BUFO HOUSTONENSIS*)

Diana J. McHenry*, University of Missouri-Columbia, MO, and Michael R. J. Forstner, Texas State University-San Marcos, TX

As part of the recovery effort for Houston toads, from 1983 to 1987 almost half a million eggs, metamorphs, and adults were translocated from Bastrop County, Texas to Attwater Prairie Chicken National Wildlife Refuge (APCNWR), Colorado County, Texas in order to establish new populations. Houston toads had been observed in Colorado County, including one sighting in 1982 within APCNWR, and still occur in the county today. Measuring success of this translocation program is difficult because budgetary constraints allowed few return visits to survey APCNWR from 1987 onward, but no new populations had been successfully established as of 1991. Yet, it is known that Houston toads bred in 1985 (a developing egg string was found) and chorused in two years (one in 1984 and seven in 1986) at sites near the San Bernard River which abuts APCNWR. The translocation program has widely been deemed a failure, even by the program's participants. Here we present results from a population genetics study which indicate that the program may represent one of the few successful translocation/reintroduction efforts for endangered amphibians. Houston toads currently found in Colorado County may be descendants of the translocated toads. These possible descendants were observed 25 km NW of APCNWR in 2007. Since the San Bernard River is close to both APCNWR and the 2007 site (3 km away), it is feasible that toads and their descendants traveled along the river from APCNWR over the past 20 years and results

presented here characterize that movement.

547 **Conservation Ecology**

POTENTIAL COMPONENT ALLEE EFFECTS AND THEIR CONSEQUENCES IN HOUSTON TOAD (*BUFO HOUSTONENSIS*) STEWARDSHIP

Michele A. Gaston*, Akiko Fuji, Floyd W. Weckerly, Michael R. J. Forstner, Texas State University - San Marcos

Effective management of wetland quantity and quality is crucial to effective conservation of declining amphibian populations. In particular, frogs and toads that employ aggregative breeding strategies may suffer negative population impacts in response to changes in availability of aquatic breeding habitat, including overabundance of suitable habitat, if density of conspecifics attending aggregations is positively correlated with reproductive success. Here we document such a positive relationship, potentially the first example of a component Allee effect in an anuran, in the critically endangered Houston toad (*Bufo houstonensis*). We assessed the relationship between mean yearly chorus size and reproductive success of males at the pond level using an information theoretic model selection approach and a two-sample t-test. The chosen model contained the single variable of mean yearly chorus size to predict probability of reproduction, as selected using the Akaike Information Criterion corrected for small sample size. Mean chorus sizes were significantly higher among ponds exhibiting evidence of reproduction than in those that showed no evidence of reproduction. Our results suggest that chorusing alone is a poor proxy for inference of population stability and highlight a need for reassessment of widely-used amphibian monitoring protocols. Further, amphibian conservation efforts should account for potential Allee effects in order to optimize benefits and avoid underestimating critical population thresholds, particularly in species exhibiting rapid population declines.

600 **Conservation Ecology**

RED-EARED SLIDER (*TRACHEMYS SCRIPTA ELEGANS*) HOOP NET ESCAPES: SIZE VERSUS SEX

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Passive sampling techniques are often used in population structure investigations. Hoop nets are one of the most common devices used to study freshwater turtle populations. We investigated the influence of sex and body depth on red-eared slider (*Trachemys scripta elegans*) hoop net escapes to assess if trap escape could potentially bias population structure estimates. We performed this experiment using 139 turtles spanning the red-eared slider size-distribution. Turtles remained in traps for at least 34 h and traps were checked at ca. 12 h intervals. Body depth was not an influential variable for hoop net escape. With only females escaping traps, sex was a significant variable. This study provides evidence that previously held beliefs about hoop net efficiency and bias could potentially be a result of escapes rather than attraction.

415 Conservation Ecology

A FUTURE WITHOUT BOX TURTLES? INVESTIGATING THE IMPACT OF URBANIZATION ON WESTERN BOX TURTLES, *TERRAPENE ORNATA*

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Habitat fragmentation can have devastating effects on the persistence of a population including reducing population sizes, altering population dynamics, and reducing genetic diversity. Maintaining genetic variation within a population is important because it is an indicator of a population's potential to respond to diseases, pollution, or stochastic factors. A large-scale decline in North American box turtle populations has been attributed to urbanization and road mortality; however, there is no empirical evidence to support this hypothesis. Using microsatellite markers, I tested two hypotheses: 1) urban-prone populations of *Terrapene ornata* will have decreased genetic diversity compared to natural populations due to anthropogenic barriers, and 2) large highways significantly reduce gene flow within urban-prone populations. We found that natural and urban-prone populations share similar allelic diversity (natural: 9.92; urban-prone: 9.75) and observed heterozygosity (natural: 0.5831; urban-prone: 0.5154), but four loci were heterozygote deficient in the urban-prone population compared to two in the natural population, supporting our first hypothesis. The deficiency at these four loci (as well as the overall deficiency within the population) is likely due to the construction of Highway 82, a four-lane highway that acts as a gene flow barrier leading to significantly differentiated populations north and south of the highway. This supports our second hypothesis and demonstrates the importance of establishing a conservation strategy for this long-lived group. If a conservation plan is not soon developed, it is unlikely that this group will be able to recover from the negative consequences of urbanization.

P555 Conservation Ecology

ARE BEACHES' SUITABILITY AS SAND CRAB HABITAT AFFECTED BY HUMAN RECREATION?

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Albuneid sand crabs are extremely specialized for digging and spend most of their lives submerged in sand. Because sand crabs' ecology is almost entirely unknown, and because the fine, sandy beaches that are excellent habitats for sand crabs are also excellent for human recreation, sand crab populations could be affected by humans inadvertently. We are testing whether human beach use and urbanization near beaches affects sand crab populations by conducting a long-term survey of *Lepidopa benedicti* on South Padre Island, Texas. Collection of *Lepidopa benedicti* began in late August 2009 at two locations at South Padre Island: Site A is in an undeveloped region where there are few people; Site B is urbanized and highly used. If human beach use is affecting *L. benedicti*, we predict that there would be more and / or larger animals at Site A than Site B. *Lepidopa benedicti* are collected weekly by digging multiple 10 m transects, parallel to the beach, and sifting through the overturned sand. Animals collected are sized, sexed, and females checked for eggs. To date, the number and the size range of *L. benedicti* appears comparable at the two locations (Site A: 10 animals

collected, up to 9.53 mm maximum carapace length; Site B: 13 individuals collected, up to 9.73 mm maximum carapace length). We have found no ovigerous females to date. Thus, our preliminary data suggest that human use of the South Padre Island beach does not affect *L. benedicti* populations.

P416 Conservation Ecology

ASSESSING THE CAUSES AND IMPACT OF ROAD MORTALITY ON TURTLE POPULATIONS IN AN URBAN-PRONE AREA

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Although turtle mortality has been well documented across the United States, it is unclear exactly how road mortality influences population dynamics of these long-lived organisms. Further, we do not have a strong understanding of the most important predictors of road mortality for this group. In this study, we assessed road mortality of Testudines in north Texas and investigated predictors of road mortality specifically in two counties north of the Dallas metroplex (Cooke and Grayson). We assessed road mortality for all identifiable turtle species (*Chelydra serpentina*, *Pseudemys concinna*, *Terrapene carolina*, *T. ornata*, and *Trachemys scripta*) sampled over the 2009 activity season (May - September) and regressed the number of carcasses against road width, traffic volume, temperature, and precipitation. Traffic volume and temperature were both significant predictors of road mortality, explaining approximately 89% and 40%, respectively, of the variation in turtle road mortality. Although precipitation was not significantly correlated with road mortality, it is likely important to turtle activity, and thus, road mortality. Further, most carcasses (98%) were collected in May and June, when temperatures were mild and precipitation was high, suggesting that temperature and precipitation likely interact to influence turtle mortality. Terrestrial turtle mortality was similar in May and June whereas aquatic turtle mortality was highest in May, followed by a drop in June. The drop in June aquatic turtle mortality is likely due to decreased precipitation. These results emphasize the need for conservation measures to be immediately developed and implemented to preserve this group.

P471 Conservation Ecology

FEEL FREE TO HIT THE SNOOZE BUTTON: TIME OF DAY DOES NOT INFLUENCE SURFACE COUNTS OF THE GEORGETOWN SALAMANDER (*EURYCEA NAUFRAGIA*)

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Determining population size and density plays an important role in developing management strategies for species of conservation concern. Surface counts are commonly used for assessing population density of aquatic salamanders. This sampling method may be influenced by environmental factors such as temperature, oxygen levels, stream flow, and time of day. We examined the influence of sampling time and other environmental variables on the number of salamanders observed during surface counts of one population of the Georgetown salamander (*Eurycea naufragia*), an aquatic species endemic to the San Gabriel River drainage of central Texas. Surface counts were conducted at one spring pool over a

ten-week period in the fall of 2009. One morning and one afternoon survey, separated by approximately 48 hours, were conducted weekly and which survey came first (morning vs. afternoon) was randomized. Water temperature, oxygen concentration, specific conductivity, water depth, and percent cloud cover were recorded during each survey. No significant differences were found in number of salamanders observed between morning and afternoon surface counts. Additionally, the number of salamanders was not correlated with any of the environmental variables measured. These results suggest that sampling at different times during daylight hours will not bias the results of surface counts.

P413 **Conservation Ecology**

PRELIMINARY NOTES ON CLARION BURROWING OWL, A FORGOTTEN SUBSPECIES OF NORTH AMERICAN CONTINENT

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Clarion Burrowing Owl *Athene cunicularia rostrata* (Townsend, 1890) is an endemic, endanger subspecies from Clarion Island, Archipelago of Revillagigedo (MX). This volcanic island 8.53 km long by 3.48 km wide is located 700 km SW Baja. We conducted fieldwork in the island from May 20 to April 7. Nine Active burrows were described, 7 of them constructed by introduced rabbits and 2 were part of natural cavities conformed by lava as a result of the volcanic activity. Pellets were scarce in presence of high densities of rabbits, however our results confirmed the diet was largely represented by invertebrates. Beetles constituted the highest frequency (65%) followed by orthoptera (26%). Clarion Cricket, not yet assigned a scientific name, is one of the biggest insects available. The rest of the items are integrated by spiders and caterpillars. Only one case of a small mammal gray-pellet was provided by a female owl containing a juvenile rabbit partially consumed. During our stay we described the habitat attributes as well as vegetation structure associated to the roosts. Censuses were conducted in either low lands as well as the upland we estimated the population as “uncommon” respectively to the rest of the birds present. During our visit we observed couples sharing the same roost mainly at the upland where soil is softer, deeper, and pastures surrounded. This study has been conceived as long term project designed to answer a number of questions associated the ecology and evolution of the owl, its continuity will depend on funding sources available.

373 **Environmental Science**

EXAMINATION OF SEVERAL METHODS FOR CONTROLLING GIANT RIVER CANE, *ARUNDO DONAX*

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The Department of Homeland Security is working to improve surveillance along the Texas-Mexico Border by removing the giant river cane, *Arundo donax*. Some methods (aerial spraying of herbicides and the use heavy equipment) proposed by the government are potentially damaging to the environment. Preliminary observations of the "cut paint technique"

of cane control suggest that, although it is more environmentally friendly, it is not very effective. This study is designed to find more environmentally responsible alternatives for removing cane and restoring native vegetation. It is a cursory examination of alternative methods of cane removal, including grazing animals, allelopathic plants (i.e. *Chloracantha spinosa*), cane cutting techniques, and light mechanical removal.

568 **Environmental Science**

ISOLATION AND CHARACTERIZATION OF BACTERIA TOLERANT TO ATRAZINE AND OXAMYL AS POTENTIAL BIOREMEDIATION TOOLS FOR PERSISTENT PESTICIDES

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Atrazine, an herbicide, and Oxamyl, a nematicide, are two pesticides used in south Texas which have been found to be moderately persistent in the environment. Both have been detected in groundwater due to run-off and leaching beyond the area of application. Bacteria capable of metabolizing anthropogenic compounds make them promising tools for bioremediation. Several bacterial genes for Atrazine tolerance and degradation have been described (e.g., *atzA*, *atzB*, *atzC*); less is known about genetic mechanisms for Oxamyl tolerance and/or degradation. This study was undertaken to isolate and characterize bacteria tolerant to Atrazine and Oxamyl for potential bioremediation use. Water samples from four agricultural canals in South Texas were cultured on minimal media containing 2% Atrazine or 1% Oxamyl. Isolated bacteria were observed visually, Gram-stained, tested for multiple pesticide tolerance, profiled biochemically using commercial test strips, and screened for the presence of *atzABC* genes using PCR. Results showed that bacteria populations grown on Atrazine were 10-fold higher than populations grown on Oxamyl (12,603 cfu ml⁻¹ vs. 1157 cfu ml⁻¹). However, bacteria were able to tolerate both pesticides regardless of which they were isolated. Colonies were generally irregular in shape and pale yellow; cells were typically Gram-negative, small, and bacillus-shaped. Isolates showed diverse biochemical profiles. The present research provides evidence to continue studying the genetic mechanisms for the bacterial tolerance to these pesticides. Future experiments will use molecular techniques to isolate genes involved in Oxamyl resistance and analytical assays to determine rates of pesticide degradation by isolated bacteria.

375 **Environmental Science**

MONITORING OF PESTICIDE RESIDUES IN RIYADH CULTURED FISH

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The monitoring of pesticides residue levels in farming fish in the Riyadh area, Kingdom of Saudi Arabia are investigated. Thirty three pesticide residues related to the groups of insecticides (Organochlorine (OCPs), Organophosphorus (OPPs), and Pyrethroids), Herbicides, Acaricides and Fungicides were studied by LLC coupled with SPE extraction techniques and determination by GC/ ECD-NPD of fish samples namely Tilapia, Catfish, Musa fish and Grey mullet, collected from 4 local farms (Alkharg, Almezahemya, Deyrab and Tebrak regions) to monitor the pesticide residues. Results obtained from this research of five seasons during

summer and winter of 2006, 2007 and summer of 2008 indicated that the pesticide residues detected in fish samples were 5 members of Organochlorines pesticide, namely p,p-DDT, p,p-DDE, p,p,-DDD, γ -HCH and Heptachlor; and 3 members of Organophosphorus pesticide, namely α -Endosulfan, Diazinon, and Chlorpyrifos with deferent concentrations levels. All detected Pesticide residues were under the MRLs. Recovery % was ranged from 94.2 ± 2.64 to 99.6 ± 1.88 . Minimum Detection Limit also was determined to evaluate the efficiency of the extraction and analysis methods of pesticide residues under this research and it was ranged from 0.001 ppm for OCPs and 0.002 ppm for other detected pesticides . The most important conclusions from this study will be present by details during the presentation.

593 Environmental Science

THE RELATIONS BETWEEN SIZE AND GROWTH PARAMETERS IN *ARUNDO DONAX* AND INFESTATION BY THE WASP *TETRAMESA ROMANA*

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Giant reed (*Arundo donax*) is a large, non-native grass growing 3-9 m tall that often invades riparian habitat and damp soil. Giant reed was brought to North America almost two centuries ago as a material resource. It displaces native plants and associated wildlife species and forms large stands. In the Rio Grande valley thousands of acres of native vegetation have been displaced by near monocultures of giant reed. The arundo wasp (*Tetramesa romana*) has been approved as a biological control agent. We examined six sites in and around Austin, Texas, during two sampling periods approximately one month apart in October and November. At the beginning of the study four sites were known to be infected with the arundo wasp and two were thought to be uninfected. Plants at each site were measured for diameter and height. Other parameters such as the presence of an inflorescence, lateral shoots, nodes, and the presence of arundo wasp exit holes were examined. Overall, uninfected plants exhibited greater height and had more nodes with side shoots than infected plants. Average diameter was greater in infected plants for 0-1, 1-2, and 3-4 m size classes, but among plants greater than 4 m tall uninfected plants exhibited greater diameter. For most size classes there were more wasp exit holes in November than October. Infected plants had significantly fewer inflorescences than uninfected plants. These data indicate wasp infection was related to decreasing plant height and that the wasp infection rate increased during the study period.

P392 Environmental Science

CHARACTERIZATION OF HEAVY METAL INDUCED OXIDATIVE STRESS IN SEVERAL BRASSICACEAE PLANT SPECIES

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Heavy metal elements such as cadmium (Cd), copper (Cu), lead (Pb), nickel (Ni) and zinc (Zn) are the most common metal pollutants introduced into the environment via anthropogenic activities. Heavy metals present in the environment can cause toxicity to plants via several mechanisms such as the disruption of cellular ion balance, substitution for natural metal centers in the catalytic sites of enzymes, and the generation of reactive oxygen intermediates (ROIs). However, a subset of plants exists that can tolerate and even thrive in heavy metal rich environments. These plant species are known as hyperaccumulators which

contain adaptive mechanisms to tolerate heavy metal toxicity. One possible mechanism is the increased tolerance to oxidative stress induced by the heavy metals. In this study, members of the Brassicaceae plant family were exposed to the heavy metal nickel for six and twelve days. Two biochemical assays that were employed to measure oxidative stress are the thiobarbituric acid reactive substances (TBARS) and the protein carbonylation (PCarb) assays which detect the physical effects of oxidative stress via lipid peroxidation, and protein carbonylation, respectively. Additionally, assays that measure the plant's enzymatic response to the heavy metal induced oxidative stress (OSR enzymes) were performed to monitor the level of the OSR enzyme activity. Enzymes assayed include Superoxide Dismutase (SOD), Catalase (CAT), and Glutathione Reductase (GR). If a difference is identified in the OSR between hyperaccumulators and non-accumulators, this difference may be exploited to be used as a guide for the genetic engineering of plants used in phytoremediation.

P575 Environmental Science

CULTURE AND MOLECULAR CHARACTERIZATION OF SULFATE REDUCING BACTERIA POPULATIONS FROM THE LAGUNA MADRE OF SOUTH TEXAS

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Sulfate reducing bacteria (SRB) are anaerobic bacteria that enzymatically reduce oxidized, soluble sulfur compounds to hydrogen sulfide (H₂S). SRB are common inhabitants of marine or brackish waters and sediments, which typically contain moderate to high concentrations of sulfate. SRB are a diverse group of microorganisms and possess considerable tolerance ranges for salinity, temperatures, and nutrient requirements. Not all SRB are easily cultured and there is little information about the diversity of SRB in the Laguna Madre, a hypersaline estuary in South Texas. Furthermore, SRB-produced sulfide may induce stress in marine organisms, including seagrasses that are critical components of the Laguna Madre ecosystem. To characterize Laguna Madre SRB populations, sediment samples from the laguna were collected during June 2009. Samples were inoculated into Postgate's Medium B to enumerate common aerotolerant SRB using the Most Probable Numbers (MPN) method. Tubes were incubated anaerobically for three weeks then scored positive or negative for formation of iron sulfide (indicative of SRB growth). Results showed the average sediment SRB density was 4.7×10^6 cfu g⁻¹. Sediment DNA was extracted to detect SRB resistant to culturing methods. PCR primers were used to amplify the *dsrA* and *dsrB* genes; these genes are only found in SRB. We are currently using the presence of these genes to estimate the abundance of SRB by quantitative PCR (qPCR) amplification of *dsrA* from the total bacterial DNA pool. Future experiments will assay PCR products by denaturing gradient gel electrophoresis (DGGE) to determine the number of SRB genotypes present in Laguna Madre sediments.

P521 Environmental Science

DETECTING THE PRESENCE OF ENVIRONMENTALLY ADAPTED *ESCHERICHIA COLI*

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High levels of fecal coliforms can indicate recent contamination of water with possible

pathogenic organisms. One common fecal coliform measured is *Escherichia coli*. The benefit of using this organism is that it is cheap and easy to screen for its presence. The drawback of using *E. coli* is its potential to adapt to the environment and survive after any threat of pathogen contamination has passed. This study compares *E. coli* levels from initial water and sediment collection to levels found to survive in the laboratory five weeks or longer. There was a significant decrease ($p < .0001$) between time 0 and week five *E. coli* levels in water, but a significant decrease was not found in the sediment collected until week six ($p = .021$). A study was also done on antibiotic resistance of the *E. coli* to determine if the resistance profiles to the six antibiotics used might be useful to determine whether a group of *E. coli* is novel to the environment or environmentally adapted. There was a trend towards the environmentally adapted organisms having profiles that were resistant to multiple antibiotics, with one particular profile increasing from 10% of the population at time zero to 32% at time ≥ 5 weeks. This research suggests that *E. coli* associated with sediment types found in the Austin, Texas area can survive past six weeks, and that antibiotic resistance profiles may be useful in determining when high levels of *E. coli* indicate new contamination and are not merely environmentally adapted.

P433 Environmental Science

EVALUATION OF *E. COLI* AND *B. SUBTILIS* AFTER SPACE FLIGHT ON BOARD ATLANTIS STS-129

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Escherichia coli and *Bacillus subtilis* are two very well characterized Gram-negative and positive bacterial model organisms that are approved for NASA flight. This project sought to evaluate the effects of space flight on both organisms' morphology and gene expression profiles while grown at either 22°C for 32 hours or at 37°C for 24 hours. Prior to loading both organism in specialized hardware termed fluid processing apparatuses (FPAs—Bioserve Space Technologies) for flight, multiple ground optimizations needed to be established to determine the appropriate growth media, static solution and and fixative solutions. For flight, fresh bacterial cultures were harvested at OD_{600nm} of 1.0 and re-suspended in equal volume Phosphate Buffered Saline (PBS). Based on optimizations, each individual FPA was divided into three compartments containing fresh Luria-Bertani (LB) broth, static bacteria in PBS, or the fixative (either paraformaldehyde or RNAlater 2X--Ambion Inc.). Various concentrations of either bacteria were used to ensure that log phase growth was achieved by the end of the defined growth period at either temperature studied. This experiment provides unique insight into how space flight affects two well characterized bacteria at both the morphological and gene expression levels and can be used as a reference when studying other bacteria, including pathogens that could find their way on board future space missions.

P567 Environmental Science

SPECTRAL REFLECTANCE BY FOLIAGE OF COMMON SUNFLOWER AS AN INDICATOR OF ARSENIC CONTAMINATION OF SOIL

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Arsenic is a natural element found in soil as well as an environmental contaminate; therefore, arsenic contamination has become a serious human health concern. Traditional methods to detect the presence and level of arsenic accumulation in plants consist of monotonous and high-priced soil sampling. Use of various types of remote sensing technology may provide a potential alternative (or adjunct) to conventional sampling methods provided that arsenic accumulation is associated with changes in spectral reflectance that are distinct in one or more waveband regions of the spectrum. Research was therefore conducted to evaluate the effects of arsenic accumulation on a common weed species (*Helianthus annuus*) and to determine if changes in spectral reflectance associated with arsenic accumulation (if any) are detectable using conventional multispectral imagery. Exposure of hydroponically-grown sunflower plants to three levels of arsenic (5.0, 7.5 and 10.0 mg/l) for a period of three weeks was associated with 1) minimal changes in visible reflectance by plants subjected to the two lowest rates of arsenic, and 2) significant reductions in reflectance of near-infrared wavelengths, which tended to be most pronounced among plants subjected to the highest concentration of arsenic and least among plants exposed to the lowest concentrations (no changes were evident among untreated controls). These results suggest that spectral reflectance data and multispectral imagery provide a potentially useful technology for detection of arsenic contamination of soil which should be pursued in future research.

P523 **Environmental Science**

THE EFFECT OF PERIODIC SEDIMENT DISTURBANCE ON *ESCHERICHIA COLI* SUSPENSION AND SURVIVAL

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A common indicator organism for water quality assessment is *Escherichia coli*, since high levels of *E. coli* can indicate the presence of pathogenic organisms. An inherent problem in using an indicator organism is that some persist outside of the host for prolonged periods while others die off quickly. Therefore, it is important to understand what factors influence environmental survival. Several studies have examined survival of *E. coli* due to random disturbance events. However, not much is known about areas such as public beaches and off-leash dog parks, whose use results in mild disturbances of sediment on an almost daily basis.

Samples obtained from Walnut Creek in Austin, Texas were tracked for a six week period to determine if mild agitation for 5 minutes every weekday would impact *E. coli* survival. In water, *E. coli* fell below EPA acceptable levels in control and agitated samples by 48 and 168 hours respectively. There was a significant difference in survivability between control and agitated water at 48 (p=0.002) and 96 hours (p=0.019). Sediment samples also indicated an increase in survivability due to disturbance, with controls staying below EPA standards but agitated samples showing a significant net increase in *E. coli* up to 96 hours (p=0.018). It was also found that *E. coli* took between 3 and 6 hours to settle out of the water. These data suggests that recreational waters may benefit from short closures prior to water testing and periodic closures to prevent *E. coli* from becoming environmentally adapted.

391 **Freshwater Science**

NUTRIENT IMPACTS ON AQUATIC COMMUNITIES IN SIX WADEABLE BRAZOS-BASIN STREAMS

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Aquatic communities in six wadeable Brazos-basin streams were examined for effects of nutrient enrichment, to aid the development of numeric nutrient criteria for Texas streams.

Water quality, flow, habitat, fish, benthic macroinvertebrates, mussels, and benthic algae were sampled four times at each of six sites. Ecoregional differences were observed for fish, invertebrate and diatom communities. Dissolved nutrient levels tended to be higher in the Blackland Prairie ecoregion than in the East Central Texas Plains ecoregion. Stream flow varied widely during the two-year study and influenced water quality and biological collections. We found good agreement among three independent measurements of nutrient impacts on benthic algae: rapid aquatic vegetation field assessment, benthic algal biomass (ash-free dry mass and chlorophyll-a), and diatom community composition. The wastewater-dominated tributary of Little Elm Creek had the highest mean chlorophyll-a and ash-free dry mass. Samples from this stream also had the highest percentage of tolerant and eutrophic diatom taxa and the lowest percentage of sensitive diatom taxa. Numeric nutrient criteria for wadeable streams will need to account for ecoregional differences. All three techniques used to characterize levels of attached algal density show promise for use in assessing nutrient effects in wadeable streams. It may be possible to develop rapid aquatic vegetation survey methods to differentiate among streams along a gradient of nutrient impacts.

463 **Freshwater Science**

OPTIMAL MALE MATING STRATEGIES IN COERCIVE LIVEBEARING FISHES: A TEST OF THE PATERNITY ASSURANCE HYPOTHESIS

Rachel Martin*, James Cureton, Raelynn Deaton, Sam Houston State University, Huntsville, TX

Coercive mating (when males harass and force copulations onto females) can affect both male and female reproductive success (RS) In coercive livebearing fishes, a limited number of studies have tested factors influencing male mating behavior; and to our knowledge no studies have tested the paternity assurance hypothesis, which states that male RS increases with number of copulations, in this group. This general assumption may be important in explaining why male coercive mating has evolved as a successful male reproductive strategy. Therefore, I will test this hypothesis in the western mosquitofish, *Gambusia affinis*, and have developed two questions: 1) Does male fitness increase with repeated copulations, and 2) Does male fitness increase with an extended amount of time spent with a female. I am also incorporating a novel component to this hypothesis by testing if male fitness increases at different rates in virgin versus non-virgin females. My null hypothesis states that male fitness will increase at the same rate regardless of female reproductive state. I predict that either 1) male fitness will increase at a faster rate with repeated matings with non-virgin females; or 2) male fitness will increase at faster rate with repeated matings with virgin females. Although I found a steady increase in male mating success (number of fertilized embryos) as number of copulations increased, these differences were not statistically significant. However, there is no difference

in male RS in virgin versus non-virgin females. Further, I found the amount of time a male spends with females did not significantly influence male RS. These results do not support the PAH, and thus neither of my alternate predictions. One possible explanation as to why males repeatedly mate is potentially due to sperm competition; however, no studies have yet addressed this factor.

404 **Freshwater Science**

GREGARINE PARASITISM IN THE DRAGONFLY *ERYTHEMIS SIMPLICICOLLIS* (ODONATA: LIBELLULIDAE) AT A CONSTRUCTED CENTRAL TEXAS WETLAND

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Dragonflies frequently carry a burden of gregarine parasites, but the degree of that burden and the relationships among parasite prevalence, load, time, and environment are not well known. Previous studies report that these parasites are detrimental to a broad spectrum of insect hosts, but the effects on dragonflies have not been studied. We surveyed gregarine infection in the adult Eastern Pondhawk dragonfly, *Erythemis simplicicollis*, at the Lake Waco Wetland in 2009 and investigated the effects of parasitism on host egg size and clutch size. The Lake Waco Wetland was constructed as a habitat mitigation project in 2001 as a result of the Lake Waco pool rise. High-nutrient water is pumped from the Bosque River into the wetland and flows through a series of cells which reduce the nutrient levels. The water returns to the Bosque River. Dragonflies were collected weekly along a water nutrient gradient using handheld nets. To quantify parasite prevalence and intensity, abdomens were dissected at 60X magnification. Eggs in the abdomens were also counted. To provide eggs for measurement and to determine clutch sizes, females were forced to oviposit into vials of water. Ten random eggs from each female were measured using an ocular micrometer. Clutch size was determined by summing the number of eggs forced oviposited with those remaining in the abdomen. Parasite prevalence remained constant through the year (ca. 30%) and did not differ along the water nutrient gradient. Dragonfly egg and clutch sizes did not correlate with parasite intensity. Our results suggest that gregarine parasitism was not influenced by the water nutrient gradient at the wetlands and that parasites do not affect dragonfly egg or clutch sizes.

443 **Freshwater Science**

TEMPORAL AND SPATIAL VARIABILITY IN THE ABUNDANCE OF *ESCHERICHIA COLI*, ENTEROBACTERIACEAE, AND OTHER BACTERIA IN THE LOWER RIO GRANDE, TEXAS

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The Rio Grande is one of the most impacted freshwater rivers in the United States. Although regularly monitored by the Texas Commission of Environmental Quality and the International Boundaries Water Commission, the ability to manage water quality in the river is limited because of it being a border. Untreated water originating from point and nonpoint sources from the US and Mexico enters the river adding microbes and nutrients. Previous studies on Section 2302 of the Rio Grande indicated a positive correlation in river flow and microbial abundance

in the river. The goal of this study was to describe the seasonal microbial abundance patterns in the river and compare upstream/downstream microbial abundance at an urban site. The study was performed at two river sites, one above and one below the McAllen-Reynosa area. Water samples were collected monthly and tested for total bacteria, total coliform bacteria, and *E.coli* abundance using MPN assays with three different media. Field parameters were recorded and water samples were also collected and analyzed for dissolved phosphate, ammonium, nitrate-nitrite and water column chlorophyll a. The results indicate higher levels of nutrients and higher microbial abundance (all categories) at the site below the McAllen-Reynosa area compared to the upstream site.

475 **Freshwater Science**

EFFECTS OF DENSITY, TIME AND FEMALE PRESENCE ON MALE SAME-SEX MATING IN THE WESTERN MOSQUITOFISH, *GAMBUSIA AFFINIS*

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Homosexuality is widespread across the animal kingdom and has been documented in birds, mammals, and fishes. It is difficult to explain the origin of homosexual behavior because it is commonly induced when animals are in captivity and is rarely observed in nature. As a result, most studies relate homosexuality to unusual social conditions with male-biased sex-ratios. In Poeciliids, it has been suggested that a lack of females could cause “frustration” because males are not usually in large densities. Other studies have shown high frequencies of same-sex mating in males that were reared without females for long periods of time. We investigated the effects of density, time and female presence on male same-sex mating in *Gambusia affinis*. We observed that male density significantly affects the frequency of male aggression and same-sex mating attempts. The amount of time that males spent together did not affect male aggression, and marginally affected the frequency of homosexual behaviors. The presence of a conspecific female had no affect on male same-sex mating. It is not known if homosexual behaviors are due to frustration or defense behaviors to keep other males away. Possible explanations for homosexuality in *G. affinis* are an established dominance relationship between males and increased levels of testosterone derivatives such as 11-ketotestosterone (11-KT). Hormone analysis was not performed in this study, but we will attempt to explain the role that 11-KT plays in same-sex mating in the future.

466 **Freshwater Science**

THE PERSISTENCE OF PINK: PERIVITELLIN FLUID FAILS TO PROTECT *POMACEA INSULARUM* EGGS FROM PREDATION

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Exotic invasive species can be difficult to remove because they often disappear into the landscape. *Pomacea insularum*, a large but cryptically brown apple snail, recently established reproductive populations along the Gulf Coast. Adult snails remain aquatic except when female snails lay bright pink egg clutches on terrestrial vegetation above aquatic predators. In contrast to adults, these eggs stand out. However, eggs rarely show predator damage. Speculation exists that proteins, specifically ovorubin, in the “pink” of clutches makes eggs undesirable. No research exists that investigates how ovorubin and accompanying proteins ecologically influence predation. We tested egg consumption by juvenile snails (mean

operculum 32+/-3mm; mean weight 24+/-6g) as mediated by the presence of “pink” by using two reconstitution methods: a) using perivitellin fluid versus water; b) using egg and lettuce powder to create a gradient of potential deterrence. Our experimental results showed that no significant differences occurred in consumption of “pink” versus lettuce pellets, suggesting that “pink” did not deter predation by aquatic juvenile snails. Management efforts suggest submerging eggs to slow invasion, yet no one has considered implications of such a strategy. Although “pink” likely plays a specific functional role in terrestrial environments, we did not observe an obvious avoidance of eggs, suggesting that aquatic predators may consume clutches dropped in water. However, we need to build a better understanding of what ecological function “pink” plays in riparian-aquatic links and in hatching efficiency to assure that clutches inundated by management actions suffer predation and do not disperse.

554 **Freshwater Science**

A DESCRIPTIVE STUDY OF POTENTIAL DIVERGENCE OF GONOPODIAL MORPHOLOGY IN TWO SPECIES OF LIVEBEARING MOSQUITOFISHES

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Sexual selection, as first described by Charles Darwin, is the struggle between the individuals of one sex, generally the males, for the possession of the other sex. Several mechanisms of sexual selection often are present in any given mating system, including female mate choice, male-male competition, and male coercion. In some instances, female mate choice is clear; it increases female reproductive success by choosing males with traits that can be passed on to her sons. One major mechanism of sexual selection is divergence in genital morphology, as these traits are often under strong sexual selection via female mate choice. Livebearing fishes of the family Poeciliidae are excellent organisms to test divergence in genital morphology because the gonopodium is a trait known to be under sexual selection via female choice. There is considerable variation in this trait and certain species of livebearers live in disjunct populations. Herein, I aim to assess inter- and intrapopulation variation in gonopodial structure in two species of livebearing fishes in the genus *Gambusia*, targeting largespring *G. geiseri*, a stenoecious species and *G. affinis*, a euryoecious species found throughout most river drainages in Texas. The main objective of this study was to determine intra- and interpopulation variation in gonopodial structure in two species of *Gambusia*. We are in the process of collecting additional data and all results will be presented.

472 **Freshwater Science**

NEW SPECIES OF *HETERANDRIA* FROM COAHUILA STATE, MEXICO

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It is reported a new species of poeciliid fish of genus *Heterandria*, was found in chanel from Allende, Coahuila, México. The new species is related to *Heterandria formosa*, that is not reported from México, is distributed in coast of North Carolina and Florida until Louisiana, USA, the new species and *Heterandria formosa* are similar in size, they are a pygmy species, are very small individuals, do not reach 3 cm, and some characteristics of coloration, like the bars in the body sides and the ocelo of the dorsal fin. They are different in dentition type,

structure of the gonopodium, measurements and genetic studies.

586 **Freshwater Science**

A COMPARATIVE FIELD STUDY ON MATING BEHAVIOR ACROSS THREE ISOLATED POPULATIONS OF THE SPRING DWELLING *GAMBUSIA*, *GAMBUSIA GEISERI*

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The large spring *Gambusia*, *Gambusia geiseri*, was distributed across Texas for mosquito control in the 1930's, when it was mistaken for the mosquitofish, *Gambusia affinis*. *Gambusia affinis* are very robust and can tolerate a range of environments, from muddy, stagnant water to cool, flowing water. However, *G. geiseri* require cool, flowing headwaters; therefore, they died in other environments and left disjunct populations across the state. We completed a descriptive field study of group, male, and female behavior in three populations of *G. geiseri* in the San Marcos River, Anson Spring, and the Comal River to determine what, if any, differences exist between the populations which have had approximately 80 years to differentiate. Foraging behaviors and interactions between and within the sexes were observed via snorkeling. We found a significant effect of location on fish behavior, with key mating behaviors differing between populations, which could indicate possible divergence from the original translocated *G. geiseri*.

491 **Freshwater Science**

SEASONAL DYNAMICS OF PARASITIC HELMINTHS OF BLUEGILL SUNFISH, *LEPOMIS MACROCHIRUS* (CENTRARCHIDAE) AND CERTAIN PHYSIOCHEMICAL FACTORS IN A EUTROPHIC MEANDER SCAR LAKE IN SOUTHEAST TEXAS

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A total of 110 bluegill sunfish (*Lepomis macrochirus*) were collected during 5 seasonal samples between 5/23/07 and 09/07/08 from Massey Lake, in Hardin County Texas. Fish were examined for endoparasites and ectoparasites. All host individuals (prevalence of infection = 100%) were infected with one or more parasites. A total of 9064 parasite individuals representing 5 phyla were collected. These included representatives of the Acanthocephala, Arthropoda (Copepoda), Platyhelminthes (Cestoidea, Trematoda) Nematoda, and Mollusca (glochidia larvae). The mean abundance of infection was 82.8 parasites per host individual. The metacercarial stage of the trematode *Posthodiplostomum minimum* occurred with highest prevalence (97.3%), and abundance (76.9 worms per host (range = 0-658)).

524 **Freshwater Science**

WATERLOGGED: EGG MATURITY MITIGATES EFFECTS OF WATER STRESS ON REPRODUCTIVE EFFORTS OF A FRESHWATER INVASIVE APPLE SNAIL (*POMACEA INSULARUM*)

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Successful reproduction in new habitats represents a critical determinant of an exotic

organism's invasive capability. For mollusks, fecundity (specifically annual offspring per female) best predicts invasive success. *Pomacea insularum*, a large South American freshwater gastropod, has successfully invaded several Texas waterways through multiple introductions. This aquatic snail lays egg clutches (often exceeding 2000 eggs) above the waterline so that they dry before hatching. To expand our understanding of how water exposure alters clutch hatching efficiency (HE = hatchlings/unhatched eggs + hatchlings), we examined how clutch age affected susceptibility of eggs to water stress. To investigate this question, we exposed clutches (N=8) to different durations (8/24 hrs) and intensities (float/submergence) of water stress at 3, 6, or 9 days after oviposition and compared HE to non-stressed clutches. HE significantly increased (from 30% to 60%) across clutch maturity and significantly decreased with increased duration (57% to 32%) and intensity (60% to 25%) of water stress. When compared to control HE (86%), high intensity and duration significantly reduced 3 and 6 day-old clutch HE by 75%, but only by 50% in 9 day-old clutches. Mature clutches (9 days before stress) remained the least susceptible to water stress of all types. Duration most strongly affected 3 day-old clutches. Current work involves quantifying hatchling quality across stress treatments using AFDM to measure shell inorganic content. Research targeted at understanding what factors control HE may aid in management efforts aiming to reduce the number of viable offspring produced, and consequently, the progress of this destructive invader.

588 **Freshwater Science**

EFFECTS OF BLACK SPOT DISEASE ON THE *GAMBUSIA AFFINIS* MATING SYSTEM

Richard Lewis, James Cureton, Rachel Martin, Stacy Stoops, Raelynn Deaton, and Sam Houston State University, Huntsville, TX

Parasite-mediated sexual selection can be a major driving force in evolutionary biology. Livebearing fishes (family Poeciliidae) are susceptible to a myriad of parasites because of the wide range of habitats in which they live. Particularly, the western mosquitofish *Gambusia affinis*, a cosmopolitan and invasive livebearer, is vulnerable to black spot disease, which is caused by a larval trematode. Studies have shown that black spot disease affects shoaling preferences in mollies and mosquitofishes; however, to date, no studies have tested for effects of black spot disease on the *G. affinis*' mating system. Herein, we conducted three behavioral experiments (dichotomous, open choice, forced choice) to test the hypothesis that black spot disease affects male and female mate choice, male mating behaviors, and female responses to male coercion. We found no significant association preferences by either males or females for non-parasitized individuals of the opposite sex. Moreover, we found no significant differences in male or female mating behaviors (or female responses to male coercion) when individuals were forced to choose between infected or uninfected individuals of the opposite sex. However, during forced choice observations (when focal animals were tested with either one parasitized or one nonparasitized individual), male mating behavior was significantly lower toward uninfected females. Results suggest that this parasite may not play a large role in the *Gambusia* mating system and that competition among individuals may interact with male mate choice.

536 **Freshwater Science**

MERCURY CONCENTRATION IN MACROINVERTEBRATES FROM GRASSLAND PONDS WITH AND WITHOUT FISH COMMUNITIES

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Mercury (Hg) is a highly toxic element that bioaccumulates in the tissues of organisms living in aquatic ecosystems. Grassland ponds, the dominant aquatic ecosystem of the Great Plains, have hydroperiods ranging from ephemeral to permanent. Only permanent ponds support fish populations and fish are known to influence the biomass of macroinvertebrates in ponds. The purpose of this study was to compare the biomass and Hg concentrations of macroinvertebrates from grassland ponds with and without fish communities. Macroinvertebrates were collected from five ponds with fish and five ponds without fish, at LBJ National Grassland in Wise County, Texas. Total mercury concentrations of macroinvertebrate and fish were analyzed using combustion atomic absorption spectrometry. In ponds without fish, the biomass of macroinvertebrates was 7.9 times higher than in ponds with fish. The average Hg concentration of macroinvertebrates from ponds without fish was 2.4 times higher than the average Hg concentration in ponds with fish. Because ponds without fish contained a higher biomass of macroinvertebrates and unique taxa with higher concentrations of Hg, the total amount of Hg in the macroinvertebrate community in ponds without fish was 12.9 times higher than in the ponds with fish. In ponds with fish the average Hg concentration of the fish community was 12.7 times greater than Hg concentration of the macroinvertebrates community. These data suggest that when fish are present Hg accumulates in fish rather than in the macroinvertebrate community, which has implications for the movement of Hg into terrestrial ecosystems when macroinvertebrates emerge as aerial adults.

578 **Freshwater Science**

PARASITES AND HOST ENERGETICS: EFFECTS OF A PARASITIC CASTRATOR ON THE CONSUMPTION AND METABOLISM IN AN AQUATIC SNAIL HOST

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Parasites are widespread and ubiquitous organisms, contributing a substantial amount of biomass to both aquatic and terrestrial ecosystems. Since biomass and energetics are related, we conjecture that parasites would have a considerable impact on the flow of energy through a system. In order to study how parasitism influences energy available to other trophic levels, the consumption and metabolism of the freshwater snail red-rim melania (*Melanoides tuberculatus*), host to the Oriental avian eye fluke (*Philophthalmus gralli*), was determined. Methodology was developed to quantify snail consumption and, in a separate experiment, the effect of infection on snail consumption was studied. Dried samples of algae were added to 60 cups, 30 cups containing snails and 30 cups containing no snails. Algal consumption was measured over a period of 7, 10, or 14 days. Data showed snail treatment resulted in a significant reduction of algae at 7, 10, and 14 days ($p = 0.0112, 0.00019, < 0.0001$,

respectively) when compared to control treatment. Using the developed methodology, the effect of snail size and infection status on consumption was tested over a period of 14 days. Results showed snail size affected consumption ($p < 0.001$), but that snail infection status had no significant effect on consumption ($p = 0.841$). Future studies will address differences in the metabolism of infected and uninfected snails using a respirometer. The results of the experiments will be discussed in relation to potential effects of parasites on host energetics.

603 **Freshwater Science**

DIVERSITY AND ABUNDANCE OF UNIONID MUSSELS IN THREE SANCTUARIES ON THE SABINE RIVER IN NORTHEAST TEXAS

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Populations of freshwater mussels (Bivalvia: Unionidae) are declining for reasons that are primarily anthropogenic. The Texas Administrative Code lists 18 freshwater mussel sanctuaries (“no-take” areas) within Texas stream segments and reservoirs with three being on the Sabine River in Northeast Texas. Visits to each Sabine River sanctuary were made multiple times between April and September 2007 with two goals: to establish species richness by locating rarer species not found in earlier surveys and to collect unionid data that could be used to evaluate abundances among the sanctuaries. Using timed and density surveys (0.25 meter square quadrats) 1956 individuals of 18 unionid species were recorded. Densities ranged from means of over 21 per meter square in one sanctuary to 3.6 per meter square in the sanctuary nearest the dam at Lake Tawakoni. Because a range of sizes were found for several species at the two downstream sanctuaries, recruitment evidently occurs. One of the healthiest unionid populations in these areas was *Fusconaia askewi*, which is a species of concern in the Texas Wildlife Action Plan. The mussel beds were found only in small, isolated patches in any sanctuary and silting over of beds with sand from bankfalls was evident throughout the river. Whether these sanctuaries will sustain all species within the upper Sabine River is questionable and it will be important to continue to monitor them.

610 **Freshwater Science**

EFFECTS OF MALE HARASSMENT AND GONOPODIAL STRUCTURE ON FEMALE FITNESS IN COERCIVE LIVEBEARING FISHES OF THE GENUS *GAMBUSIA*

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Sexual conflict arises when males and females have different reproductive strategies. For example, in some animals, males force females to mate (coercive mating systems), which should reduce female fitness (reproductive success). Reduced fitness of one sex often leads to counter-adaptations by the other, resulting in sexually antagonistic co-evolution. Livebearing fishes (family Poeciliidae) provide an excellent model system to study sexual conflict because levels of male coercion and gonopodial structures vary among species. In this group, males use an elongated, modified anal fin (gonopodium) equipped with hooks and spines to transfer sperm to females. To date, preliminary data using scanning electron microscopy (SEM) suggests that female mosquitofish may incur a mating cost from coercive males via tissue tears

around the genital region. Thus, male coercion may decrease female fitness directly via increased susceptibility to tissue damage. Male coercion also may affect female fitness indirectly, by increasing female resistance to males, and increasing latency time to re-mating. The cost to females may depend on both the level of coercive mating by males and the structure of the gonopodium, which varies across congeneric species of *Gambusia*. We aim to determine whether male coercion and gonopodial structure are involved in decreased female fitness in closely related coercive mosquitofishes (*G. affinis*, *G. geiseri*, and *G. clark-hubbsi*) that may vary in levels of male mating strategies and have differing gonopodial morphologies. We hypothesize that male coercion decreases female fitness directly via increased damage to the female genital region, and indirectly via behavioral responses by females. Herein, we will report our findings from this comparative study.

P574 **Freshwater Science**

ASSESSMENT OF STREAM CONTINUUM CONCEPTS FOR A NEOTROPICAL WATERSHED OF THE MAYA MOUNTAINS, BELIZE, CENTRAL AMERICA

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Rapid biological assessments were performed on first, third, and fifth order streams of the South Stann Creek watershed in the Maya Mountains, Belize, Central America, to test stream continuum concepts. Sampling was at the end of the dry-season in 2007 and 2009 when discharge was 0.007-0.012 m³ s⁻¹, 0.064-0.085 m³ s⁻¹, 3.02-4.11 m³ s⁻¹ for the three stream orders. Canopy cover, litter deposition and cobble substrate decreased with stream order. Water temperature, hardness, pH, percent saturation of dissolved oxygen, and soluble reactive phosphate (SRP) increased with stream order, as did the taxa richness for macroinvertebrates and fish. The macroinvertebrate community was dominated by shredders, scrapers, and predators in the first order tributary; whereas, filter feeders and collectors became more dominant in the third and fifth order streams. *Astyanax aeneus* (Central Tetra) and *Poecilia* spp. (Mollies) were most abundant at all stream orders, but *Brycon guatemalensis* (Machaka) dominated fish biomass in the fifth order stream. Although most metrics followed the stream continuum concept, periphyton biomass, as chlorophyll a, was lower in the fifth order stream than small tributaries. Dissolved inorganic nitrogen (DIN) concentration decreased to near undetectable levels in the fifth order stream, and nitrogen-limiting conditions are hypothesized based on DIN:SRP molar ratios of 0.2 to 4.

P599 **Freshwater Science**

EFFECT OF BLACK SPOT DISEASE ON FEMALE FECUNDITY AND BODY CONDITION IN THE WESTERN MOSQUITOFISH

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Parasites can have significant adverse affects on fish behavior, reproduction, growth and condition. Livebearing fishes (family Poeciliidae) are highly susceptible to larval parasitic trematodes that cause black spot disease. Tobler et al. (2006, 2007) have shown that female mollies and mosquitofish avoid shoaling with other infected individuals, and suggest this is due to predator avoidance. On the other hand, Martin et al. (in prep) have found no female

mating preferences or change in mating behaviors for non-infected males, but males coerce non-black spot females at higher rates than those females infected with black spot. This, however, occurs only when males are not placed in a competitive situation. When males are forced to compete, they do not show preferences for non-infected females, or show any change in mating behaviors. These results suggest that this disease may have little to no effect on the *Gambusia* mating system, but may still have adverse effects on other characteristics, such as fecundity and body condition. It remains unknown, however, whether this parasite adversely affects host reproductive life history. Herein, we test the effects of black spot disease on female fecundity and condition. If this parasite reduces condition or fecundity of female hosts, then males may avoid mating with heavily infected females. We predict a threshold of decreased condition and fecundity of females infected with black spot, where females heavily infected are less fecund and in poorer condition. If so, this could help explain why males prefer to mate with nonparasitized females.

P595 Freshwater Science

EFFECT OF MALE GONOPODIAL LENGTH ON MALE AND FEMALE REPRODUCTIVE SUCCESS IN THE WESTERN MOSQUITOFISH

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In 2005, Langerhans et al. showed that males with longer gonopodia (intromittant organ) were preferred by females. This study, however, based their findings solely on video imaging. Using live fish, Deaton et al. (in progress) showed that *G. affinis* females prefer males with longer gonopodia. Moreover, they showed that males with shortened gonopodia mate with females, but males with longer gonopodia were most coercive. Herein, we investigated whether males with manipulated gonopodia can successfully fertilize embryos. We tested the hypothesis that male gonopodial length directly influences male and female reproductive success. We predicted that males with manipulated gonopodia will fertilize fewer embryos than control males. We raised virgin females, and, upon maturity, mated them for 24 or 48 hours with a male from one of five randomly chosen gonopodial treatments (-100%, -50%, -25%, -tip, and a no manipulation control). Following the experiment, females were isolated from males for two weeks to embryos to allow embryos to develop. Females were then dissected, and embryos were counted and staged. We found no effect of time on male mating success, and no significant interaction between male treatment and time. However, there was a significant effect of gonopodial length on male reproductive success where males with manipulated gonopodia could fertilize embryos at the same rate as unmanipulated males, with the exception of males with 100% of the gonopodia removed. These results show that the gonopodium is necessary for fertilization; however, males with shortened gonopodia are still capable of attaining reproductive success.

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EFFECTS OF BLACK SPOT DISEASE ON THE *GAMBUSIA* MATING SYSTEM: PART II

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Black spot disease (BSD) is caused by a larval trematode that embeds under the scales of

fishes, particularly livebearers in the family Poeciliidae. Tobler et al. (2006, 2007) showed that BSD affects shoaling behaviors in female mollies and mosquitofish. However, to date, no published studies have investigated the effects of this parasite on any Poeciliid mating system. Mosquitofishes (*Gambusia* spp.) are an ideal model to test hypotheses on parasite-mediated sexual selection because they are abundant, invasive, and internal fertilizers. On a broader scale, mosquitofishes are coercive (males of all sizes force copulations on females), a system in which little is known regarding the effects of parasites on mating behaviors. In a sister study (Martin et al., in prep), we investigated mating behaviors and preferences of male and female *G. affinis* in three experimental situations: 1) dichotomous choice test (where we measured association time with an infected versus uninfected individual of the opposite sex); 2) open water choice test (where we measured mating behaviors toward uninfected versus infected individuals of the opposite sex); and 3) a forced choice test (where individuals were paired with only one infected or uninfected individual of the opposite sex). These experiments were conducted with both sexes as focal individuals (for a total of 6 experiments) and focal individuals were not parasitized. In this study, we followed the same methodology for six additional experiments where all focal individuals were parasitized. Here, we report our updated results from these additional experiments.

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EFFECTS OF MALE GONOPODIAL LENGTH ON FEMALE MATE CHOICE IN LIVEBEARING COERCIVE MOSQUITOFISH, *GAMBUSIA AFFINIS*

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Many livebearing fishes, including the mosquitofishes (Genus *Gambusia*; Family Poeciliidae) reproduce coercively. Males force females to copulate using a modified anal fin (gonopodium). Since copulations are coercive, female mate choice is not always evident. However, Langerhans et al. (2005) showed that female *G. affinis* preferred males with longer and larger (lateral area) gonopodia. Further, data showed a trade-off between natural and sexual selection in that males with longer gonopodia, although preferred by females, were more susceptible to predation. However, the Langerhans et al. (2005) study used video imaging only for their measures of female choice. Herein, we tested the hypothesis that male gonopodial length influences female mate choice in live mosquitofish. We aimed to replicate a portion of Langerhans et al. (2005) study using live fishes, rather than video images, to test if female preference for longer gonopodia holds true under more natural conditions. Additionally, we tested a wider range of gonopodial length treatments through gonopodial manipulations (shortening and extending). Surgeries resulted in six experimental gonopodial length treatments and two female control treatments. Behavioral trials were conducted using a dichotomous choice test with each trial including a focal female and a randomized combination of gonopodial length for all possible combinations. To date, results suggest that females prefer males with longer gonopodia, verifying Langerhans et al. (2005). These results, along with additional data from dichotomous choice tests, will be presented.

P522 Freshwater Science

EFFECTS OF NUTRIENT-TYPE AND CLIMATE ON THE OVERALL GROWTH AND DEVELOPMENT OF *LUMBRICULUS VARIEGATUS* IN THE LABORATORY

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Lumbriculus variegatus is found throughout North America and Europe. It prefers shallow habitats at the edges of ponds, lakes, or marshes where it feeds on decaying vegetation and microorganisms. Favorite microhabitats include layers of decomposing leaves, submerged rotting logs, or sediments at the base of emergent vegetation (Drewes, 1996). For most laboratory experiments, *L. variegatus* is kept in a shallow amount of water with pieces of brown paper towels or burlap sack as sediment. Paper towels and burlap produce micro flora/fauna which serve as a food source for the worms. Additional food used in most laboratories consists of flake fish food or spirulina powdered algae (Lasier, 2009). Laboratory studies would greatly benefit from the production of larger worms, as the larger size may provide for ease of study using biochemical and imaging techniques. Moreover, larger worms develop sex organs during short periods of time in the late spring/early summer in more cooler, northern climates. Development of sexually mature worms in the laboratory would allow for extensions of basic biological and biochemical studies of cellular processes, like nervous system development, in developing worm embryos. Therefore, the purpose of our investigation is to identify a particular nutrient and a preferred climate inside the laboratory that would promote larger growth and possible development of sex organs in *Lumbriculus variegates*. We hypothesize that with a readily available (and preferred) food source and with lower temperatures, the laboratory raised worm's will increase in size and will enter a sexually reproducing stage of life.

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FLUOXETINE AND ITS EFFECTS ON MALE BETTA COURTSHIP

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Some evolutionary biologists propose that elaborate courtship displays in animals may have evolved from aggressive displays between males. Some species show a striking similarity between courtship and aggressive displays, with the only noticeable difference being the sex of the individual at which the display is directed. Fluoxetine, also known by its pharmaceutical brand name Prozac, is one of the most widely known and prescribed antidepressants in the United States. Fluoxetine is an SSRI which blocks the reabsorption of serotonin, and is known to decrease aggressive displays in male *Betta splendens*, an extremely aggressive fish species. Since many patients taking Prozac report sexual side effects, we hypothesized that fluoxetine might also decrease courtship behavior in bettas. To test this we observed behavioral displays in 16 male betta fish, half of which were treated with 3µg/mL of fluoxetine, while the other eight betta fish acted as the controls. After the exposure period, each male was introduced to a female betta in a 12L tank, separated by a glass divider. We observed how fluoxetine affected courtship behaviors of each male betta

fish by measuring the latency of each betta to respond to the female through the glass divider, as well as record and observe the number of courtship behaviors which include: flares, broadside turns, and frontal displays. Fluoxetine decreased courtship displays in male bettas. These results illustrate the importance of serotonin signaling systems in courtship behavior, and indicate that the neurochemistry underlying courtship and aggression is the same in this species.

P409 Freshwater Science

FOREWING ASYMMETRY IN DRAGONFLIES (ODONATA: ANISOPTERA) OF CENTRAL TEXAS

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Bilateral symmetry is a defining characteristic of many animal groups, however, subtle asymmetries in some traits are common. Asymmetry is thought to originate from different combinations of genetic, developmental, and environmental processes. Dragonflies are hemimetabolous predators with aquatic immatures and terrestrial adults. As with most aquatic insects, dragonfly reproduction is a function of the terrestrial adult. In some dragonfly species, reproductive success depends on the male's ability to defend a territory, obtain a mate, fly in tandem, and guard an ovipositing female. Dragonfly fitness, therefore, is flight-dependent, and symmetrical wings should promote efficient and maneuverable flight. Here, we investigate the frequency and magnitude of forewing asymmetry in seven dragonfly species. Dragonflies were collected in 2009 from the Lake Waco Wetland, Waco, TX. Right and left forewing lengths from 326 adults were measured to the nearest 0.1 mm, and the percent difference in each individual was calculated. We compared wing asymmetries between male and female conspecifics, flyers and perchers, and among individuals with various wing loads. The frequency of forewing asymmetry was common in all dragonfly species (ranged from 66.7% - 100%), but the magnitude was subtle (0.4% - 1.5%). Only a single species exhibited a male/female difference in the amount of asymmetry present. No differences were detected between flyers and perchers or among wing loads. Our results suggest that the frequency of forewing asymmetry is common among dragonflies, but the trait itself, i.e., the reduced magnitude of asymmetry, is likely under strong stabilizing selection pressure.

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INVESTIGATING POPULATION-LEVEL IMPACTS OF FEMALE MASCULINIZATION IN *GAMBUSIA AFFINIS* WITHIN THE BRAZOS RIVER DRAINAGE, TEXAS

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Female masculinization is a phenomenon that can occur via environmental contaminants (e.g. agricultural run-off) or non-chemical stressors (e.g. overcrowding caused by drought). When females become masculinized, they develop male sexual characteristics, such as male intermittent organs or testes. Female masculinization is commonly reported in the livebearing fishes (family Poeciliidae). In particular, female mosquitofishes (genus *Gambusia*) are highly susceptible to masculinization because they can live in extreme habits, such as sewage

effluent. We found a large number of masculinized females in the Brazos River in 2008, but none in 2009. We investigated the effects of masculinization on female size and fecundity, and on male size and testes mass (Deaton and Cureton, in review). In this study, we found that masculinized females (MF) had lower fecundity and were smaller than non-masculinized females, and that females in the masculinized populations (from 2008) were less fecund and smaller than those in the non-masculinized population in 2009. Although MF did have eggs, there were very few and none were fertilized. Males in this population were smaller and had smaller testes than males from the 2009 collections. We have continued monitoring this site (along with the Little Brazos, a small tributary to the Brazos River) since March 2009, making monthly collections to assess the prevalence of MF, fecundity, body size, and gonadosomatic indices of males. We will report our findings from this study in progress.

P517 Freshwater Science

PHOSPHORUS SORPTION CHARACTERISTICS OF STREAM SEDIMENTS OF THE NORTH BOSQUE RIVER

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Sediments may retain P making it less available for biological assimilation and may also release or desorb P back into the water column as a source of P. The sediment equilibrium P concentration (EPCo) defines the concentration of soluble P in the water column at which there is no net adsorption or desorption of P to sediment. The objective of this study was to determine P sorption characteristics for stream sediments at various locations within the North Bosque River watershed. Sediment samples were collected at 20 locations along the North Bosque River representing a variety of land uses and water quality conditions. Phosphorous sorption was evaluated under aerobic and anaerobic conditions. In most cases, P sorption parameters did not change notably between these two redox conditions. Variability in maximum P sorption (PSmax) was positively related to the percent clay and P content of the sediment and negatively related to the percent sand. EPCo was more strongly related to water quality characteristics than to sediment characteristics and showed a strong positive correlation with TP and PO4-P concentrations of the water.

P502 Freshwater Science

PLAYA LAKES: ENVIRONMENTAL FACTORS INFLUENCING SURVIVAL SUCCESS OF SEVERAL PHYLLIPODS AND OSTRACODS

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Temporary playas fill with water and go dry in a highly unpredictable manner. The length of the wet phase is important to the fugitive species that must hatch, grow and reproduce before the playa dries once again. Also, the distribution and occurrence of freshwater crustacean inhabitants in what appears to be similar playas is often unpredictable and unexpected. Along with desiccation that is associated with the erratic patterns of rainfall, soil texture of the playa bottom mud, turbidity, and the usual environmental parameters such as temperature, light penetration, salinity, ionic composition and oxygen tension may affect the unexpected patterns of phyllopod and ostracod distribution. The distribution and diversity of eight genera of playa phyllopods and ostracods collected from Wyoming and Texas will be presented in

relation to (1) biotic interactions of competition and predation, (2) chemical conditions, and (3) physical conditions of the playa. In addition to presenting data on the various environmental parameters and how they influence playa inhabitants, special emphasis will be given length of the wet dry cycles and how they impact the occurrence of the a rather unique freshwater ostracod, *Candona*.

P556 Freshwater Science

SPATIAL VARIATION OF HG, 15N, AND 13C IN SEDIMENT AND MACROINVERTEBRATES IN CADDO LAKE

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The Caddo Lake ecosystem is composed of several unique habitat types including forested wetlands, braided river channels, and open-water. In previous studies of fish from Caddo Lake we identified habitat-specific variation in mercury concentration (Hg). Because fish are capable of moving over relatively large distances they are only capable of revealing patterns of Hg contamination that occur over large areas. We hypothesized that the complex hydrology of the lake, which includes multiple river inputs, imposed additional fine-grained spatial complexities that could not be addressed in the earlier fish studies. The purpose of this study was to gain insight into the complexity of spatial patterns within Caddo Lake using macroinvertebrates and sediment. We determined Hg, $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ values (common food web and biogeochemical tracers) in macroinvertebrates and sediment at twenty different locations in the summer of 2007 and six different locations in the summer of 2008 in Caddo Lake. In shrimp and sediment, Hg, $\delta^{15}\text{N}$, and $\delta^{13}\text{C}$ values varied with location. Hg in sediment was highly correlated with % organic matter in sediment which may be a proxy for flow. $\delta^{15}\text{N}$ values in shrimp and sediment were correlated with % organic matter in sediment. Within wetland sites, Hg in macroinvertebrates were correlated with $\delta^{15}\text{N}$ but not $\delta^{13}\text{C}$ values. High variability in $\delta^{13}\text{C}$ values suggests varied diet amongst macroinvertebrates. The variability of Hg, $\delta^{15}\text{N}$, and $\delta^{13}\text{C}$ values in macroinvertebrates and sediment observed between sites within close proximity to one another has implications for both food web and contaminant monitoring studies and indicates that a large sampling effort may be necessary in spatially complex ecosystems.

P500 Freshwater Science

UNUSUAL MACROINVERTEBRATE ASSEMBLAGE OF A SMALL SPRING-FED STREAM

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Spring-fed streams provide important habitats for aquatic organisms in the semi-arid regions of central and western Texas. We studied a small spring-fed tributary of Geronimo Creek in the Blackland Prairie Ecoregion near Seguin, Texas. The tributary is only 30 m in length but has perennial flow. Surber samples were used to estimate macroinvertebrate densities. The fauna was dominated by larvae of the water penny beetle, *Psephenus texanus*. Densities of *Psephenus* greatly exceeded previously reported values for this insect. We discuss this

finding in relation to other streams and springs in the region.

478 **Geosciences**

GULF COAST STORM SURGE DEPTHS IN CHAMBERS AND JEFFERSONS COUNTIES GENERATED BY HURRICANE IKE

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The storm surge from Hurricane Ike in September of 2008 devastated the SE Texas/Louisiana Gulf Coast. High water mark data were collected in an attempt to generate a more accurate map of the storm surge in a specific area. Similar data were also collected by FEMA, NOAA, and the USGS, but lacked control in some areas. Due to this, additional high water marks were measured between January 2009 and June 2009. The primary area of study extended from High Island northward along Highway 124 until marks were absent. The east-west extent of the study area includes the Anahuac Wildlife Preserve, and other areas of Chambers County, such as Smith's Point. Also marks were gathered along the coastline southwest of Sabine Pass. The high water marks measured were mostly grass lines and other debris in trees. The marks were measured using a stadia rod and the location was recorded with a GPS. The measured marks range vertically from ground level to 16 ft. These measurements have been added to land elevations from digital elevation models and show that the deepest surge waters were in southwest Jefferson and eastern Chambers counties. Depths as great as 18 ft. are modeled west of High Island, with the new data indicating that maximum surge depths were greater, and water depths above 12 ft were more widespread, than previously thought. Currently, land elevations are being collected by survey-grade GPS instruments from each location to refine the accuracy of the surge elevations and depth model.

449 **Geosciences**

SPECTRAL ANALYSIS AND PRINCIPAL COMPONENT ANALYSIS OF THE BUCK HILL VOLCANIC GROUP, TRANS-PECOS TEXAS

Jonathan Dyess, Sul Ross State University

The Oligocene age Buck Hill volcanic group consists of several rock types including: basalt, welded tuff and non-welded tuffaceous units. This study uses spectral analysis and principal component analysis of Landsat 7 Enhanced Thematic Mapper Plus (ETM+) data to delineate spectral differences between the various volcanic units. The five volcanic units analyzed in this study are the Pruett Formation, Cottonwood Springs Basalt, Duff Formation, Mitchell Mesa Tuff and the Tascotal Formation. Also, spectra were taken from the nearby Cretaceous Boquillas Formation and from Quaternary alluvial sediments. Imagery for this study was gathered by the Landsat 7 ETM+ on November, 9 2002 and was downloaded from the archives at www.texasview.org. The image covering the study area is designated path 31 row 39. ERDAS Imagine 9.2 was used to composite the original image and convert the raw digital number values to reflectance. The spectral analysis and principal component analysis was done in Arcmap 9.3. Reflectance spectra for each unit were generated by plotting the average reflectance for each band over a uniform area. Also, the average values for each principal component were similarly plotted. Applications of this study range from general geologic mapping to mineral exploration. The Tascotal Formation has been shown to contain

economically valuable deposits of microcrystalline zeolites. By analyzing the spectral differences between these volcanic units it may be possible to locate previously unknown zeolite deposits.

464 Geosciences

A GEOCHEMICAL STUDY OF THE IGNEOUS AQUIFERS OF WEST TEXAS

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The igneous aquifers of west Texas are essential to both the natural and economic health of the region; however, flow and chemical evolution within these aquifers is still not well understood. The purpose of this study was to improve the understanding of the geochemistry of these waters. Field water quality parameters were measured and water samples were collected from 49 springs and wells in Brewster, Jeff Davis, and Presidio counties between May 2009 and November 2009. Field parameters measured included acid neutralization capacity, pH and specific conductivity. Collected samples were analyzed for major and trace ion composition, and the isotope ratios of oxygen (18/16), hydrogen (2/1), and strontium (87/86). These results were then compared to data from other regional aquifers and values from other igneous systems. The major and trace ion composition was consistent with expected values for flow through igneous rock, oxygen and hydrogen isotope ratios were generally consistent with recent recharge, and strontium isotope ratios were found to be below that of modern seawater. Analysis of these data shows similarities and differences in the geochemistry of the water both within the units of the igneous aquifers and with surrounding water-bearing units. The results can be used to better assess the rock-water interactions and water flow relations in the region.

577 Geosciences

DIGITAL TOOLS FOR MAPPING GEOLOGY AND PALEONTOLOGY COLLECTIONS

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The Non-vertebrate Paleontology Laboratory at the University of Texas at Austin houses approximately four million specimens including invertebrate and plant fossils, microfossils, rock and mineral samples, and recent comparative material. The collections consist of an amalgamation of material from many different sources, including the Texas Bureau of Economic Geology (the state geological survey), the Texas Natural Science Center, and individual donors and institutions throughout the country. To improve organization, ease of access, and data retrieval, we mapped the collections facilities using a GIS interface that documents two buildings containing a total of 1,110 square meters of floor space and 739 cabinets. We measured and digitized features such as cabinets, open shelving units, and workstations to scale in the maps. We also mapped other features pertaining to safety and conservation such as fire extinguishers, first aid kits, pest control, and inventory status in additional layers. Upon completion of the digital map, we joined and related data tables for both buildings with the specimen databases. Linking the databases enables researchers, collections managers, and volunteers to search for a specimen number to determine its physical location, as well as to digitally open a cabinet and learn what specimens are housed there, their history, and current status. The maps are also helpful when moving specimens, sending or

receiving loans, and traveling between the two buildings. Applying this method to collections management improves the daily function of the repository and is a valuable tool for the organization of large and continually expanding collections.

453 Geosciences

LATE ORDOVICIAN THROUGH MIDDLE SILURIAN GASTROPODA OF THE EASTERN GREAT BASIN

Phil Frederick Sul Ross State University

The geologic history of the Great Basin of the western United States is one of great complexity, and is one that has been well studied. This is in contrast to the understanding of preserved Ordovician and Silurian gastropod fauna within Great Basin strata. This study deals with gastropods recovered by P. Sheehan during his work on Great Basin brachiopods and stratigraphy in 1980 and 1982. Collections are from the Late Ordovician, Ely Springs and Fish Haven Dolomites, as well as the Middle Silurian, Laketown Dolomite in Utah and Eastern Nevada. In addition, the Hanson Creek Dolomite of the Late Ordovician and Early Silurian age was sampled southwest of Eureka, Nevada. The gastropods are silicified and were etched from dolomitized rock. The collection shows various degrees of preservation. Late Ordovician gastropods include: *Phragmolites cellulusus* (Ulrich and Scofield, 1897), murchisonids, *Gyronema* Salter, 1859, raphistomatids, and *Cyclonema* Hall, 1852. Silurian taxa include: *Euomphalopterus alatus* (Wahlenberg, 1821), *Trochonema* Salter, 1859, *Pachystrophia* Perner, 1903, *Fusispira* Hall, 1872, *Oriostoma* Munier-Chalmas, 1876, *Stylonema* Perner, 1907, and *Platyostoma* Conrad, 1842. This is the first reported occurrence of *Phragmolites*, *Oriostoma*, *Pachystrophia*, *Euomphalopterus* and *Platyostoma* from cratonic western North America. The gastropod faunas have North American (Laurentian) biogeographic affinities and lack any of the characteristic gastropods found in the terranes of northern California or Alaska.

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REPORT OF NEW LUNGFISH (CERATODONTIDAE) FROM THE CRETACEOUS (CENOMANIAN) WOODBINE FORMATION AT THE ARLINGTON ARCHOSAUR SITE, NORTH TEXAS.

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The Arlington Archosaur Site (AAS) in North Arlington, Tarrant County, is a prolific fossil locality that has produced the remains of middle Cretaceous vertebrates. The vertebrate fossils range from dinosauria (ornithomimid & theropod), crocodylian, and chelonian to elasmobranch and dipnoan. All of the AAS fossils occur within the coastal Cretaceous (Cenomanian; 95 Mya) Woodbine Formation. The environments of the Woodbine at the AAS are coastal delta plain; fine-grained organic-rich sediments (mud and clay) that overlie a peat bed. Of the fossils recovered, a new species of lungfish has been identified. Six lungfish (Ceratodontidae) tooth plates were collected from fine grained mudstones attributed to an organic rich delta plain lake. Both upper and lower tooth plates; 1 pterygopalatine and 5 prearticulars were recovered. All tooth plates are relatively small; prearticulars range in size from 1.2 - 2.5 cm in length (labial) and the pterygopalatine is 2.1cm in length (labial). The variation in size is attributed to ontogeny. The sharp crests are attributed to a slicing feeding behavior rather than

crushing. This is unusual as *Ceratodus* is typically referred to as a grinder. Cretaceous North American specimens are referred to the genus *Ceratodus*, however specimens from Texas belong to an as yet unnamed new species. Only one lungfish tooth plate has previously been reported from the Woodbine Formation. The lungfish tooth plates collected from the AAS are the most numerous recovered to date and broaden what is known of this enigmatic animal in North America.

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MAPPING AND EXCAVATING A NEW CRETACEOUS CROCODILE (ARCHOSAURIA: GONIOPHOLIDAE) AT A LARGE SCALE URBAN DIG: THE ARLINGTON ARCHOSAUR SITE, NORTH CENTRAL TEXAS.

Roger Fry* and Derek J. Main, Scotese Museum of Paleontology, University of Texas at Arlington

The Arlington Archosaur Site (AAS) located in Arlington, Tarrant County, TX is a prolific fossil site that has produced the remains of a variety of Cretaceous vertebrates. The various orders of vertebrate fossils represented at the site range from dinosauria, crocodylian, and chelonian to elasmobranch and dipnoan, with crocodylian and chelonian being most represented. The site is geologically located within the Mid-Cretaceous Woodbine Formation (Cenomanian; 95 Mya). The environment of the Woodbine represented at the AAS is a coastal delta plain consisting of fine grained sediments (mudstone), rich with organic material, which overlies a peat bed. During the 2009 summer field season, a large (~7 m) Cretaceous crocodile (goniopholidae) was excavated from the basal peat bed in a hectic one week period. Due to the urban location of the site and its accessibility to the unauthorized individuals as well as the general public, an emergency excavation was organized in an unusual manner using the internet social networking site, Facebook. Utilizing the Arlington Archosaur Site Facebook group, a volunteer field team was assembled within 24 hrs to assist in the excavation of the crocodile. The excavation went around the clock, 24 hours a day, in what is now known as “Crocorama”. The site was mapped using Cartesian coordinates in a 5m x 2.5m grid system. Each recovered fossil was located and drawn in on the grid prior to its removal from the field. Each fossil was then wrapped and stored for transport with its coordinates clearly recorded on the package as well as on the site map content page. As the site expanded beyond the initial grid, other grids were developed by extending the coordinate system. Within the one week excavation over 60 vertebrate elements of a large Cretaceous crocodile were recovered from the site as well as several elements of an unidentified chelonian. The crocodylian elements recovered include: dorsal osteoderms, several vertebra, a humerus, a radius, plus cranial material including a dentary, a premaxilla and maxilla, a quadrate and numerous teeth. Currently the only known crocodile from the Woodbine Formation is *Woodbinesuchus* (Lee, 1997); therefore, the AAS “Crocorama” fossils may represent a new species.

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THE STRATIGRAPHIC POSITION OF THE FIRST UNITA C MICRO-MAMMAL COMMUNITY IN THE UINTA FORMATION, UINTA BASIN, NORTHEASTERN UTAH

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Mammal fossils from the Uinta Formation comprise the type fauna for the late middle Eocene Uintan North American Land Mammal Age. The Uinta Formation overlies the middle Eocene Green River Formation and is conformably overlain by the latest middle Eocene Duchesne River Formation (DRF) in Uintah County, Utah. The Uinta Formation is divided into three members: A, virtually non-fossiliferous; and B & C, which have yielded diverse assemblages of vertebrate faunas since 1870. Uinta C is primarily comprised of maroon, lavender and gray overbank mudstones and paleosols, with some sandy channel deposits. Channel sandstones are more common in the Uinta C/DRF transition zone where DRF channels interfinger with Uinta C mudstones. The top of the transition zone is defined by the horizon where interfingering Uinta C mudstones and DRF sandstones become homogenous DRF sandy channels. Micro-mammal remains were discovered in 2007 at Washington University locality 26 in a one-ton test bulk sample. They comprise the first known Uinta C micro-mammal fauna (Westgate et al., 2008; Burnes, et al, 2009; Harsh, et al., 2009). Stratigraphic sections measured in 2009 place the position of WU-26 relative to the top of the Uinta C strata exposed along the west end of Dead Man's Bench and also relative to the stratigraphic position of Uinta B/C mammal localities shown in Townsend, et al. (2006). WU-26 lies 237 meters above WU-11, the lowest mammal locality in the Uinta B/C sequence and 138 meters below the Uinta C/DRF boundary.

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ORIGIN OF INTRACLASTS FROM MUD CURLS ON THE ALGAL FLATS OF GALVESTON ISLAND STATE PARK, TEXAS

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Algal flats on the bay side of Galveston Island State Park, Texas, provide an opportunity to study the origin of intraclasts from desiccation sheets and mud curls. These intraclasts are similar to intraclasts found in the rock record at many locations and provide information about their origin. Algal flats at Galveston Island State Park are composed of laminated layers of fine-grained silt and clay-sized clasts that were bound together by cyanobacteria into thin laminated sheets. Desiccation cracks averaging about 1 mm in depth develop in the upper layer of the algal flat material as sediments dehydrate. As drying continues, these sheets contract, bow up and produce mud curls. Storm events break and disarticulate the mud curls and algal sheets from the surface layer of the algal flats producing intraclasts. Wind and water from storms transport the newly formed intraclasts to the low areas on the algal flats and nearby salt marshes and tidal channels. During transport some rounding of the intraclasts may occur. Some of the intraclasts deposited in salt marshes may be destroyed after deposition by burrowing organisms and root growth. Burial of the intraclasts occurs by sediment settling out of storm waters at the end of the storm event. Similar intraclasts have been found in the Kirkman Formation in central Utah and may have formed by the same processes during the Permian Period. This suggests that the intraclasts in the Kirkman Formation were deposited in a similar setting to those of Galveston Island Park.

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PROTEROZOIC SHEAR ZONE IN BURRO MOUNTAINS, NM, HINTS AT MAZATZAL KINEMATICS

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Field mapping in a Proterozoic shear zone (SZ) in the Burro Mountains, Wind Mtn. Quadrangle, NM, may shed light on kinematics of the Mazatzal orogeny. The SZ is developed primarily in variably metamorphosed and mylonitized Precambrian quartzofeldspathic gneisses, amphibolites and mica schists. The SZ is intruded by the 1.5 bya Burro Mtn. granite, which in most or all of this quadrangle is non-mylonitized and thus constrains the upper age of shearing. A variety of sense-of-shear indicators are present in the ductile shear zone, including button schist with well-developed mica fish flash; winged, rotated porphyroclasts; large sigmoidal amphibolite lenses (usually intrafolial within felsic gneisses and mica schists); s-folds at scales from small crenulations to outcrop size; asymmetric boudins; and small stacked sigmoidal mica lenses defining c-surfaces. All ductile fabric elements indicate sinistral shear with northward thrusting. This is consistent with northward directed accretion of a landmass approaching from the south (present coordinates) during development of this Proterozoic shear zone. Younger, non-mylonitized migmatite zones (perhaps associated with hot fluids from the Burro Mtn. granite or other intrusive bodies) cut the shear zone, as do numerous later brittle faults. There are apparently multiple generations and types of brittle faults, as indicated by fault truncations, small breccia zones and visible fault planes. Sub-horizontal to horizontal slickenlines on some of the fault planes indicate late strike-slip movement, with drag features and chatter marks suggesting right-lateral offset.

P450 **Geosciences**

A PRELIMINARY ANALYSIS OF LUNGFISH (DIPNOI) TOOTH PLATES FROM DRIEFONTEIN, SOUTH AFRICA

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As Dipnoi (lungfish) are the sister group to modern tetrapods, their study allows for an improved understanding of evolutionary trends in the transition from aquatic to terrestrial animals. The Driefontein site, located in the northern Main Karoo Basin, South Africa, contains a rare assemblage of Triassic microfossils including a large sample of lungfish elements. The sedimentary rocks at Driefontein are part of the upper Beaufort Group (Burgersdorp Formation) and biostratigraphic placement suggests an age ranging from the Early to Early-Middle Triassic (Olenekian). Surface collections have yielded a sample of 115 dipnoan tooth plates identified to the extinct family Ptychoceratodontidae. Specimens are identified by characteristics of the tooth plates, including the presence of denticles, and the number and morphology of ridge crests. Specimens are identified as pterygopalatine or prearticular, and either right or left, based on morphological features and orientations of the crest. Through comparisons to previously collected tooth plates from the northern Karoo

Basin and based on resemblances to specimens found in similarly aged strata elsewhere in the world, the Driefontein specimens are tentatively diagnosed to the genus *Ptychoceratodus*. The lack of known apomorphies for the preserved elements, in addition to wear and fragmentation of the majority of specimens prevents a more confident identification. Morphometric studies may define tooth plate development from juvenile to adult forms of *Ptychoceratodus*. Future work aims to determine the number of species represented in the Driefontein assemblage and to define better the apomorphies and ontogeny of tooth plate morphology for *Ptychoceratodus*.

P515 Geosciences

PALEOENVIRONMENTAL RECONSTRUCTION OF THE OLIGOCENE RIVERSIDE QUARRIES (BLUE LAGOON) CATAHOULA FORMATION, TEXAS

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Numerous leaf margin characters have been identified as evolutionary responses to specific environmental parameters such as mean annual temperature (MAT) and mean annual precipitation (MAP). In particular, a positive correlation is shown in modern environments between MAT and the relative proportion of plant species with untoothed leaf margins. By analyzing the relative proportion of these two leaf morphologies in fossil faunas, estimates of past temperatures are made possible. Here we use a univariate, ataxonomic method known as Leaf Margin Analysis (LMA) on a set of fossil leaves collected from the Catahoula formation in Walker County, East Texas. Results from our analysis suggest that the MAT for the Raymond Quarries Oligocene assemblage was 17.97°C at the time of deposition.

P357 Geosciences

HURRICANE IKE DAMAGE PATTERNS ALONG THE UPPER TEXAS GULF COAST

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The storm surge of Hurricane Ike caused significant amounts of damage to structures on the upper Texas Gulf coast. The spatial variation in the density and types of damages along the coast is significant, with greatest damage concentrated in certain areas instead of being equal everywhere. Despite differences in storm surge depth and wind speed, similarities in damage patterns were observed in different geographic areas. The relationships of differences and similarities in the topography of these areas were evaluated to draw parallels in their contribution to the observed structure damage. The proximity of structures to open Gulf waters, local lakes, streams, and levees appears to have an affect on the timing of peak inundation and the velocity of surge waters. Data from local flood and air pressure gauges, peak flood maps, and pre-storm topography are found to be important considerations in determining the impact of the surge on various geographic locations.

P589 Geosciences

POLYPHASE STRUCTURES AND PASSIVELY EMPLACED PLUTONS IN NORTHERN SIERRA DEL CARMEN, BIG BEND REGION, TEXAS

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Geologic mapping at 1:10,000 scale of a 60 km² area on and near Dagger Mountain in northern Big Bend National Park and adjacent Black Gap Wildlife Management Area reveals four deformation phases (D1 – D4) in Cretaceous rocks, as well as diverse passively emplaced intrusions. D1 folds are outcrop-scale penecontemporaneous folds in the Boquillas Formation. NNW-striking upright and overturned D2 folds and coeval thrust faults correlate with the primary Laramide deformation phase throughout the Big Bend region. The Dagger Mountain doubly plunging anticline and an adjacent doubly plunging syncline cored by a mafic sill are D2 Laramide structures within a Type 1 interference figure (Ramsay, 1967). Previously little-recognized gentle, map-scale, upright NE-trending D3 folds refolded map-scale D2 folds. Abundant mafic sills and other intrusions did not reorient adjacent outcrop-scale D2 folds. To the west, the South Persimmon Gap “laccolith” is a stack of felsic sills that inflated the overall thickness of the Aguja Formation but did not produce outcrop-scale or map-scale folds or faults. In contrast, forcefully emplaced laccoliths are scattered throughout the Big Bend region, including the Iron Mountain pluton, McKinney Hills laccolith, Aguachile fluorspar district plutons, Packsaddle Mountain laccolith, and Christmas Mountains dome. Late Cenozoic D4 NNW- and NW-striking high-angle faults offset felsic and mafic sills. D4 drag folds are localized near D4 faults. A grid of five tied cross-sections across Dagger Mountain shows that the Dagger Mountain D2 anticline may be a fault-propagation fold above a blind thrust.

P434 **Geosciences**

VIRTUAL FIELD TRIP OF THE WESTERN APPALACHIAN MOUNTAINS

Todd R. Webb*, Joseph M. Kruger, Lamar University, Beaumont, TX

Virtual field trips are ideal for geology courses at Lamar University because of its location near the Gulf Coast far from rocky outcrops. Time, money, and online courses restrict the number of field trips that can be taken by students. Therefore, any attempt to bring the field to the students is worthwhile. A field trip was taken by Lamar University professor, Dr. Kruger, from northwest Georgia to central Pennsylvania. Roadside geology books and geologic maps were used to locate outcrops and stops of geologic interest which were entered into a GPS. Notes on the outcrop or scenic view were recorded and photographs taken. At some locations, hand samples were collected and later photographed at various scales. The internet was used to search for geologic maps, aerial photographs, satellite imagery, and digital elevation models at various scales that covered the field trip area. Both raster and vector files were used. These data were combined with the photographs to yield a GIS database that can be viewed at various scales. As students zoom into and away from a field trip stop, the maps etc. switch on and off into more detailed or less detailed data sets respectively. When students click on a hot link of the stop, a choice of pictures of the outcrop and/or scenic views appear. The students also have a chance to view photos of individual hand samples, and close-ups of the hand samples, by clicking on hot links on the outcrop photos.

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DETERMINATION OF PROGRAMMED CELL DEATH IN *ALEXANDRIUM TAMARENSE* THROUGH CASPASE ACTIVITY AND ANNEXIN V LABELING

Rogers Brown, Texas Lutheran University, Seguin TX

The dinoflagellate *Alexandrium tamarense* is responsible for the harmful algal blooms known as red tides. My goal was to determine whether *A. tamarense* undergoes programmed cell death (PCD), a pathway in which a cell systematically disassembles and kills itself. For my experiments, we chose to determine whether *A. tamarense* exhibits any of the typical indicators of PCD such as increased caspase activity and the inversion of membrane phosphatidylserines. To determine if caspase activity can be induced in *A. tamarense*, we treated the dinoflagellates with staurosporine, a general kinase inhibitor. The cells were then broken up and incubated with a reagent that releases fluorescence when digested by caspase. Some of the cells were saved to see if they could be labeled with Annexin V, a fluorescent marker that binds to phosphatidylserines. The caspase assay plates were read in a fluorometer, and the Annexin V samples were examined under an epifluorescent microscope. The Annexin V staining proved successful in that we were able to stain *A. tamarense*, however we had difficulty finding cells that had been stained but not lysed. In addition, I applied the caspase assays and Annexin V / Sytox Orange staining to a larger nitrate-depletion experiment. It was determined that caspase activity was induced by staurosporine, and that increasing concentrations of staurosporine could further induce caspase activity.

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EFFECTS OF BUCKMINSTERFULLERENE NANOPARTICLES ON THE BACTERIA OF GALVESTON BAY

Nick K. Kubelka*, Texas Lutheran University, Seguin, TX and Robin Brinkmeyer, Ph.D., Texas A&M University-Galveston, TX

The aim of this research was to document the effects of fullerene nanoparticles in varying concentrations on samples of bacteria native to Galveston Bay. Water samples were plated from two different sites of interest on undiluted and 100x diluted DIFCO marine agar. Sixty-one bacterial colonies were isolated from full strength media and 40 from the diluted media. Amplified ribosomal DNA restriction analysis (ARDRA) was used to screen for 16S ribosomal RNA diversity using 8f and 1492f primers. Data obtained from the ARDRA analysis was analyzed via Bionumerics software to enumerate the degree of relatedness among bacterial isolates and representatives of each 'species' were sequenced. Twelve isolates were chosen for nanoparticle amendment experiments based upon their unique colony characteristics, ability to grow in the marine broth, and unique ARDRA fingerprints. Bacterial isolates were incubated in TSB media at 30°C, in the dark, using 96 well plates amended with C60 and C60(OH)₂₄ at concentrations of 1,5,10, and 20 ppm over a period of 72 hours. Growth was measured spectrophotometrically every 4-6 hours.

399 Marine Science

SALINITY RECOVERY IN THE LOWER LAGUNA MADRE OF TEXAS FOLLOWING HURRICANE DOLLY

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Hurricane Dolly made landfall as a Category 1 storm in south Texas on 23 July 2008 along an uninhabited stretch of South Padre Island. This hurricane produced 17.78 to 30.48 cm (7-12 in) of precipitation and a combined tide and storm surge of 0.61 to 1.22 m (3-4 ft). Surface measurements of water temperature, salinity, dissolved oxygen (DO), and %DO began along the Gulf Intracoastal Waterway (GIWW) one week following the storm (1 Aug 2008), and were subsequently made on 6 Aug, 12 Aug, 23 Aug, 23 Aug, 26 Sep, 2 Oct, 9 Oct, and 7 Dec 2008 in an effort to document recovery of water conditions to pre-hurricane conditions. The Arroyo Colorado (AC), the primary of two freshwater discharge channels into the Lower Laguna Madre (LLM) was the main source of hurricane-associated rainwater discharge. The area of the LLM north of a tidally-driven cross-channel (GIWW) flow did not achieve pre-hurricane water column values by 7 December 2008. Stations south of the cross-channel flow were near 35 PSU within two weeks of the hurricane passage. Salinity at the mouth of the AC was near zero one week after landfall and was near 20 PSU by 7 December 2008. Temperature was not a good indicator of restoration of normal water column conditions. There was a trend for DO and %DO to increase gradually following this freshwater event. Initial low DO and %DO values were likely associated with decomposition of seagrass detritus and macroalgae. Biological implications of this event will be discussed.

P436 Marine Science

A SURVEY OF BRITTLE STAR SPECIES AND INCIDENCE OF PREDATION ON TOBACCO CAYE, BELIZE

Cody Conway*, Michael Zarzosa*, and Ana Christensen, Lamar University, Beaumont, TX

In June 2009, a survey of brittle star populations (Echinodermata: Ophiuroidea) was conducted in the lagoon on the south end of Tobacco Caye, Belize. Three transects were run east-west on the first day and north-south on the second day. Individuals were collected from 0.5m² quadrat placed at approximately 2m intervals along the transect; a total of 10-15 quadrats were counted along each direction, depending on the geography of the lagoon. The survey information included type of habitat (open sand, small rubble, large rubble, or grass), species and number of arms regenerating. A total of 101 brittle stars representing 11 species were collected over the two day period. The most abundant species was *Ophiocoma echinata* (n = 37) and the second most was *Ophioderma cinereum* (n = 29); for most of the remaining species, less than 3 individuals each were collected. No brittle stars were collected from the open sand areas and the majority were collected from areas containing some rubble. Brittle stars experience high levels of sublethal predation. Of the 101 brittle stars collected 51% were regenerating at least one arm. The two most abundant species appeared to suffer approximately the same levels of predation (*O. echinata* = 55% and *O. cinereum* = 51%).

However, the results of tethering experiments appear to indicate that *O. echinata* is preferred over *O. cinereum* when offered each singly and in mixed species pairs. The primary predators in these experiments were juvenile parrotfish.

P458 Marine Science

A TECHNIQUE TO MORE ACCURATELY MEASURE METABOLIC RATES OF SEAGRASSES.

Analia Solis* and Hudson DeYoe, Biology Dept and Center for Subtropical Studies, University of Texas - Pan American, Edinburg, TX.

Seagrasses are critical components of many coastal ecosystems. It is important to be able to assess seagrass health and one approach is to measure their metabolic rates (respiration and photosynthesis). It is difficult to accurately measure seagrass metabolism using oxygen consumption or production measurement techniques due to air pockets (lacunae) that are found in all seagrass leaves. This oxygen reservoir confounds these measurements as lacunal oxygen can be respired by the leaf or can diffuse into the water. We have developed a simple protocol to address this problem by oxygen purging the water and a dark incubation period with seagrass to reduce the internal oxygen stores. We assess the effectiveness of this protocol to reduce internal leaf oxygen stores using freshly killed seagrass leaves. Finally, we compare metabolic rates determined with this new protocol to a more traditional light/dark bottle method.

P480 Marine Science

NUTRIENT LIMITATION OF PHYTOPLANKTON IN THE BRAZOS-SANTIAGO PASS, SOUTH PADRE ISLAND, TEXAS.

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Nutrients like nitrogen and phosphorus needed for photosynthesis. When there are inadequate amounts of nutrients primary production is limited. In order to determine which nutrient may limit phytoplankton primary productivity, we sampled the waters of the Brazos-Santiago Pass, Texas on 16 July 2009 and initiated a microcosm experiment to test the effects of addition of nitrogen (+N), phosphorus (+P), nitrogen and phosphorus combined (N+P), and urea, an organic form of nitrogen (+U), on phytoplankton primary production rates. Quadruplicate two liter samples per treatment were incubated for three days in a 7 m³ outdoor tank with constantly flowing seawater. Temperature during the experiment ranged from 25 to 31°C and water column salinity was 37 ppt. The N+P treatment yielded the highest photosynthetic rates (0.118 mg O₂ l⁻¹ hr⁻¹), followed by nearly the same rates in the +N and +P treatments (0.085 mg O₂ l⁻¹ hr⁻¹ vs. 0.079 mg O₂ l⁻¹ hr⁻¹, respectively). The control group average rate was 0.061 mg O₂ l⁻¹ hr⁻¹. The +U treatment had a net negative effect on photosynthetic rate, possibly as the stimulation of bacterial respiration due to urea

addition. The phytoplankton community in the Brazos-Santiago Pass was found to be co-limited by nitrogen and phosphorus in July 2009. Marine phytoplankton are typically thought to be nitrogen limited so our result was mildly surprising.

P482 Marine Science

POTENTIAL COMPETITIVE INTERACTIONS BETWEEN THE SEAGRASS *THALASSIA TESTUDIUM* AND THE ALGA *PENICILLUS CAPITATUS* IN A SUBTROPICAL TEXAS LAGOON.

Nicholas R. Jones*, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, Hudson R. DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas, and Joseph L. Kowalski, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, and Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas.

We investigated the possible competitive interactions between the seagrass *Thalassia testudinum* and the rhizophytic, siphonaceous alga *Penicillus capitatus* in the Lower Laguna Madre, Texas during July 2009. The study site was at the edge of a *Thalassia testudinum* gap where both species occurred. To examine the putative competitive interaction between *Penicillus* and *Thalassia*, we measured *Thalassia* shoot growth using the leaf-marking technique in areas with different *Penicillus* + *Thalassia* density ratios. Low density *Penicillus*-*Thalassia* quadrats contained <10 shoots while high density quadrats contained >10 shoots per quadrat. Triplicate 15-cm diameter *Penicillus* + *Thalassia* quadrats were compared to triplicate control quadrats with *Thalassia* alone. Significant differences in canopy height and leaf production rates (individual shoot and areal) in the low density treatments were found compared to control and high density plots, but no significant difference was detected in mean biomass of individual *Penicillus thalli*. There was no statistical difference in leaf turnover between treatments and the control, although the low density treatment had 20% greater turnover than the high density treatment and the control. This could be the result of a low number of replicate plots. There appears to be a degree of competition between *Thalassia testudinum* and *Penicillus capitatus* in *Thalassia testudinum* gaps. One factor which may moderate competitive interactions between these species is the ability of *Thalassia* to access a deeper sediment horizon with an extensive root system, as compared to *Penicillus*, which penetrates only the top few centimeters of sediment with a much less extensive rhizoid/holdfast system.

P481 Marine Science

PRIMARY PRODUCTIVITY IN THE LOWER LAGUNA MADRE, TEXAS, FROM PORT MANSFIELD TO THE GULF OF MEXICO

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American, Edinburg, Texas 78539

The Arroyo Colorado (AC) is a distributary of the Rio Grande into which agricultural runoff and treated wastewater drains to the coast. The AC is a primary source of nutrients of the Lower Laguna Madre (LLM) of Texas. Nitrogen and phosphorus are often the nutrients in greatest demand by phytoplankton. These nutrients are carried to the LLM in abundance by the AC. These nutrients enrich the water column and allow phytoplankton to increase rates of primary productivity and phytoplankton abundance. As phytoplankton abundance increases, oxygen concentration in the water column also increases. We used this inferential relationship between phytoplankton abundance and oxygen production to test the hypothesis that primary productivity near the AC would be greater compared to stations not influenced by the AC. Sampling occurred during a cruise of the R/V Katy on 21-22 July 2009. A series of five primary production experiments were made using the light/dark bottle technique. Ship-board incubations were 3 hrs or less and took place between 0900 and 1500 each day. We found that sites nearer the AC had primary production rates 100 times that compared to sites distant from the AC (0.1 mg O₂ l⁻¹ hr⁻¹ to 0.001 mg O₂ l⁻¹ hr⁻¹, respectively). Lowest rates were found in nearshore Gulf of Mexico waters (control reference station). The data strongly suggest that the AC nutrients are a major controller of phytoplankton primary productivity in certain areas of the LLM. It is suspected that macroalgal production and biomass mirror this pattern.

P437 **Marine Science**

THE EFFECTS OF PH AND HYPERCAPNIA ON THE RESPIRATION AND REGENERATION RATES OF *HEMIPHOLIS ELONGATA* (ECHINODERMATA: OPHIUROIDEA)

Bonnie Smith*, Lisa Stegall*, and Ana Christensen, Lamar University, Beaumont, TX

One of the effects of climate change that will adversely influence the marine environment and its inhabitants is increased carbon dioxide (CO₂) and a corresponding decrease in ocean pH. This study examined the effects of pH and hypercapnia (increased CO₂ levels) on the oxygen consumption rate and regeneration rate of the burrowing brittle star *Hemipholis elongata*. Animals were exposed to one of three pH treatments (8.1, 7.8 and 7.6) for a period of five weeks; the pH was maintained by bubbling CO₂ through the treatment tank. In each treatment there were 10 non-regenerating animals and 10 animals that are regenerating one arm. Once a week, oxygen consumption of the animals was measured using the closed chamber oxygen depletion method. At the end of the exposure study animals were weighed and those regenerating were measured for new growth. Hypercapnia and pH does not appear to adversely affect the oxygen consumption and regeneration rates of *H. elongata*. Animals exposed to pH 7.6 initially had a high respiration (week 1), but oxygen consumption dropped to levels exhibited by animals in the remaining treatments for the remainder of the study. When corrected for size, the portion of arm regenerated was not different between animals of the control treatment (pH 8.1) and pH 7.8. It is hypothesized that *H. elongata* is not affected by these factors, over the range studied, as these conditions may be routinely encountered in its natural environment.

P486 Marine Science

TRAWLING VERTEBRATES AND INVERTEBRATES: A DIVERSITY COMPARISON WITHIN THE LOWER LAGUNA MADRE, TEXAS.

Chloe Veron*, Daniella Diaz, Sebastian Garcia, Nicolas Jones, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, Hudson DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas, and Joseph Kowalski, The International Baccalaureate Program at Lamar Academy, McAllen I.S.D., McAllen, Texas, and Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas

We examined differences in the species composition of vertebrates and invertebrates between Port Mansfield and the Gulf of Mexico at Brazos-Santiago Pass during a cruise of the R/V Katy on 21 and 22 July 2009. We trawled the Gulf Intracoastal Waterway and near-shore Gulf of Mexico to compare biodiversity using the Simpson's diversity index (Ds). We hypothesized that higher salinity, an environmental stressor, would be more common at the Port Mansfield site and result in low species diversity. Unexpectedly, the highest number of vertebrate species were taken near Port Mansfield (Ds 4.73) which had the highest salinity of the trawl sites. The Brownsville Ship Channel had the highest diversity of vertebrates (Ds 6.36), while the site nearest the Arroyo Colorado, a freshwater source to the Lower Laguna Madre (LLM), had lowest vertebrate diversity (Ds 1.50) and no invertebrates were collected there. Greatest number of invertebrate species was at the Gulf of Mexico site (Ds invertebrates only 3.50). Atlantic croaker (*Micropogonias undulatus*) was the most abundant fish species in the trawls. Drift algae, which provides habitat and protection for organisms, were much more abundant at Port Mansfield than any other station and could be a reason why there was high vertebrate abundance and species richness at this location. The Arroyo Colorado site had the lowest biodiversity perhaps due to the more variable salinity at this site.

385 Science Education

DIFFERENTIATED INSTRUCTION IN MIDDLE SCHOOL SCIENCE CLASSROOMS

Diane L. Taylor and James Gentry, Tarleton State University

Beginning in the 2007-08 school year, all students in the United States will be required to demonstrate mastery of science standards, including students with disabilities. Given this requirement and the current focus on school accountability, it is important that science teachers be prepared to adequately teach all students in their classrooms. Consequently, it is important to provide science teachers with information about useful, research-based strategies that will help all students achieve success in the science classroom. Differentiated Instruction is an instructional concept that maximizes learning for ALL students—regardless of skill level or background. It is based on the fact that in a typical classroom, students vary in their academic abilities, learning styles, personalities, interests, background knowledge and experiences, and levels of motivation for learning. When a teacher differentiates instruction, he or she uses the best teaching practices and strategies to create different pathways that respond to the needs of diverse learners. This session will provide practical, data-driven strategies for middle school science educators to more effectively differentiate instruction for the students they teach.

Presenters will cover the four ways to differentiate instruction, which include focusing on the content, process, product or environment. Audience participation will be encouraged.

566 Science Education

USING THE JASON PROJECT'S "OPERATION INFINITE POTENTIAL" TO ENERGIZE SCIENCE STUDENTS

Westgate, James W.*1 D'Ann Douglas,² Larry Elliott³ and O'Brien Stanley.³ 1-Department of Earth and Space Sciences, 2- JASON Alliance for Southeast Texas, 3- Department of Communication, Lamar University, Texas State University System, Beaumont, TX USA 77710

The JASON Alliance for Southeast Texas is a non-profit science education organization whose mission is to bring the National Geographic Society's JASON Project hands-on science curricula to 4-8th grade students in southeast Texas and at the Texas School for the Deaf in Austin. More than 160 science teachers in Region V and at the School for the Deaf received a full day of hands-on training in the Operation Infinite Potential curriculum. Teachers were provided hard copies and on-line access to the teacher and student curriculum for their 11,000+ students, of which 56% are economically at risk. The Lamar University Departments of Communications and Earth & Space Sciences created a 30 minute video using experts on energy generation and use in Texas with local 8th grade student argonauts to supplement the curriculum. More than 7000 4-8th grade students attended a 12 day JASET "Operation Infinite Potential" event at Lamar University which included viewing the supplemental video and demonstrations on atmospheric energy by meteorologists from the National Weather Service office in Lake Charles, Louisiana. Interactive breakout sessions were hosted by the Texas General Land Office Oil Spill Response and Prevention Division, Texas Parks & Wildlife Coastal Fisheries, the Big Thicket National Preserve, the National Weather Service, Shangri La Botanical Gardens and Nature Center, Sea Grant, Jefferson County AgriLIFE Extension Service, ExxonMobil, Chevron, Valero and numerous individuals in engineering, science and medical professions in southeast Texas.

423 Science Education

ON-LINE STUDENT BASED DISCOVERY PROGRAMS IN ASTRONOMY

J. Patrick Miller, Hardin-Simmons University

The International Astronomical Search Collaboration (IASC) is an on-line education outreach program in astronomy. High school and college students make original discoveries of Main Belt asteroids (MBAs) and astrometric measurements of near-Earth objects (NEOs). The discoveries are reported to the Minor Planet Center (Harvard). The measurements are reported to the NASA Near-Earth Object Program (JPL). Provided at no cost, IASC ("Isaac") reaches more than 20 countries worldwide. Each year there are 12 search campaigns, each lasting 45 days and including 15 schools, for a total of 180 schools. The 24" and 32" telescopes at the ARI Observatory (IL) are used to gather images of NEO targets. These images are processed, then within hours distributed to the participating schools, each school getting its own target. After analyzing the images, discoveries are logged and followed-up the next night using the 24" telescope at the Sierra Stars Observatory (CA). During each campaign students discover 15 MBAs plus make 100 NEO measurements. On occasion, they will make an NEO confirmation

or virtual impactor observation. One school, Ranger High School (Ranger, TX), discovered a potentially-hazardous NEO in January 2009. Another school in November 2009, Tarrant County Community College, discovered a rare Mars-crossing asteroid. Currently IASC includes 25 schools from five countries in Africa, 10 schools in China, 30 in India, and 13 in Portugal. Schools also participate from Poland, Ireland, Puerto Rico, England, Germany, Switzerland, Italy, Israel, Austria, Russia, Japan, Brazil, United States, and others. IASC collaborates with Pan-STARRS (University of Hawaii) and with the NASA Wide-field Infrared Survey Explorer. It offers two separate programs that provide afterschool discovery search campaigns. The Chinese Academy of Science collaborates with IASC to provide a 60-cm telescope that will expand campaigns to over 100 schools in China.

493 Science Education

INTRODUCING EPIDEMIOLOGY: THE FIELD, PRIMARY LITERATURE AND GLOBAL IMPACT

Patricia J. Baynham, St. Edward's University, Austin, TX

Epidemiology is a sophomore level elective course in the Department of Biological Sciences at St. Edward's University whose focus is the analysis of disease in populations. In fall 2009, the course was modified to accentuate the recent literature of this field and provide a more global perspective. This was accomplished as students read and analyzed fourteen primary articles (five from non-US countries) and presented one of these papers (in pairs). Additionally, two epidemiologists (one non-US) addressed the class and students read *Infections and Inequalities*, by Paul Farmer whose focus is the pattern tuberculosis and HIV infection across the globe. Of the 29 students enrolled, two withdrew from the class and one did not complete an online survey. According to the 26 students completing the survey, they are more likely to retrieve and read primary scientific literature than before this course and feel very skilled and comfortable analyzing this literature. They feel they have a broad international perspective while rating their initial scope as not very broad and fell knowledgeable regarding international health issues as opposed to somewhat knowledgeable. Students also reported that their skill level in giving presentations and analyzing others' presentations had increased along with their knowledge of epidemiology as a field. While the Department of Biological Sciences at SEU exposes students to global issues and primary scientific literature in a number of courses the innovations in this epidemiology were successful in contributing to this curriculum.

511 Science Education

IMPLEMENTING A STUDENT-LED RESEARCH PROGRAM

Roberto B. Gonzales, Northwest Vista College, San Antonio, TX

Northwest Vista College has established a growing student-led research program, known as the STELLAR Project, designed to encourage community college students to pursue paths leading to careers in the STEM fields. Faculty mentors serve to guide students as they develop research skills and conduct experiments in fields related to neuroscience, molecular biology, environmental engineering, botany and zoology. Through grant funding from the U.S. Department of Education, and through coordination of existing institutional resources and services, a wide range of activities and student support services are now available to any student with an interest in science and engineering studies. Active hands-on research activities

serve to reinforce knowledge gained in the classroom. A low student-to-faculty ratio allows for enriched instruction and the personal faculty advising necessary to support student academic success. Faculty mentors also provide students with a solid scientific foundation as they transition to a four-year institution. This presentation will discuss how this program developed and has changed over the past three years, the activities and research projects generated during that time, as well as strategies and lessons learned that might be of use to other institutions interested in implementing similar activities.

579 Science Education

THE ATTRACTION OF POOR-QUALITY COLLEGE STUDENTS TO ONLINE, “LAB”-BASED FRESHMAN GEOLOGY COURSES: IT’S ABILITY TO DETERIORATE THE VIRTUAL CLASSROOM ENVIRONMENT AND BROADER PROFICIENCY AT UNDERMINING THE QUALITY OF HIGHER EDUCATION

Richard A. Ashmore* and Donald E. Owen, Lamar University, Beaumont, TX, and Stephanie Austin, Parsons Infrastructure and Technology, Honolulu, HI

The past few years have seen an explosion of online-based, higher education courses. Because of the success of newly organized, totally online “universities”, some traditional colleges and universities have begun to compete for this burgeoning new market. Although the low-overhead cost of online courses and additional government funding due to a “virtual” increase in enrollment is financially lucrative to college and university administrators, a common concern among faculty is the quality of education being delivered in these virtual classrooms. Faculty’s desire is simple: online courses should uphold the same academic standards and requirements as their identical offline (on-campus) counterparts. Having developed and taught 8 sections of freshman-level physical and historical geology lab-based online courses with a total of 432 students since January 2009, a detailed analysis of the academic histories of students taking these courses was conducted. The analysis revealed a significant number of these online students to be much less academically successful than their offline counterparts, suggesting these online students are significantly less prepared for college-level education. Most striking is the average percentage of probation and suspension students that signed-up for these online courses (21.5% Physical Geology; 11.7% Historical Geology) versus the offline courses (5.2% Physical Geology). Also, the desire of online students (less than 15% per class) to complain amongst themselves on online discussion boards, and, eventually, to faculty and administration about the “excessive rigor” of the online courses is very much greater in number than complaints issued by students in offline courses. This claim of “excessive rigor” is not substantiated, as the overall course average for all online Physical Geology students who have completed the entire course is 71.9% with no curve being applied. Every course, both online and offline, should undergo consistent evaluation to further enhance the teaching and learning environments within the course. The lure of a high profit margin for online courses is too great for many college and university administrators to resist, resulting in poorly educated students and debasement of faculty. Thus, without strong administrative support of faculty, a realistic understanding of the quality of the students taking these online courses, and an unwavering desire to maintain the same academic standards expected in offline courses and in higher education in general, the fate of quality online lab-based science education and all of higher education is in dire jeopardy of becoming an extension of public high school education

and a worthless post-secondary pseudo-educational endeavor.

591 Science Education

ANALYTICAL AND GEOMETRICAL SYNERGY IN PROBLEM SOLVING

John T. Sieben, Texas Lutheran University

In this presentation we will look at a couple problems that become more understandable to students when presented both analytically and geometrically. The talk will suggest that Maple and Geometer's Sketchpad have an important role to play in motivating students of mathematics.

530 Systematics and Evolutionary Biology

DYNAMIC CAMOUFLAGE IN FISH

T.L. Maginnis and M.E. Cummings, The University of Texas at Austin

Although many marine species are capable of camouflage, relatively little is known about dynamic camouflage in fish. In addition, studies have focused almost exclusively on spectral light, when polarized light is a key component of effective camouflage in marine environments. Here we present preliminary field and lab data on how well fish are able to match the spectral and polarized properties of their native habitats, as well as how these animals are controlling camouflage at the proximate level.

629 Systematics and Evolutionary Biology

SEXUAL VS. ASEXUAL REPRODUCTION IN A STICK INSECT: EVIDENCE FOR A COST OF MALES?

, Christopher Redmond University of Texas, Section of Integrative Biology, College of Natural Sciences

The presumable cost of asexual reproduction has been one of the fundamental evolutionary hypotheses for the evolution of sex. However, in *Megaphasma dentricus* (the giant walking stick of North America), there were not considerable differences between sexually and asexually reproducing females, suggesting support for the "all else being equal" assumption of Maynard Smith's "cost of males" hypothesis. Future work aims to explore how egg weight affects F1 fitness, as well as how parasite loads (e.g., the Red Queen Hypothesis) may affect this species in the long-term.

501 Systematics and Evolutionary Biology

ARE THE COLOR FORMS IN THE MOTTLED ROCK RATTLESNAKE (*CROTALUS L. LEPIDUS*) CONSEQUENT OF PREDATION?

Vincent R. Farallo* and Michael R. J. Forstner, Texas State University-San Marcos, Biology Department, San Marcos, TX

Questions regarding the origin and maintenance of color polymorphism are key topics of evolutionary biology. The mottled rock rattlesnake (*Crotalus l. lepidus*) exhibits striking levels of color polymorphism associated with two distinct substrate types separated by lowland

desert, a habitat not used by *Crotalus l. lepidus*. We hypothesized that selective predation on high contrast color and blotching patterns maintains the distinct races. To test this hypothesis a predation experiment using model snakes made of urethane foam was performed at 12 sites in the west Texas portion of the species' range. The sites were split between the two regions in which the contrasting races are found, including the eastern region composed primarily of light colored limestone and the western region composed primarily of dark volcanic rocks. Two color and two blotching treatments were used to mimic the two races, and the treatments were designated as high and low contrast based on the region they were placed. Models were left at sites for two weeks. The number/location of non-predator disturbances and avian attacks of models were recorded. The results clearly indicate that high contrast color models were attacked significantly more often; however there was no difference in the frequency of attacks on the different blotching treatments. Additionally, there were no significant differences in non-predator disturbances between the different color or blotching treatments. Predation attempts occurred significantly closer to the anterior end of models than did non-predator disturbances. These results are consistent with the hypothesis that color has been maintained by selective predation.

560 Systematics and Evolutionary Biology

A PHLYOGENETIC STUDY OF *ASPERGILLUS* AND OTHER RELATED FUNGI BASED ON MITOCHONDRIAL CYTOCHROME OXIDASE 1

Shaunte Abdin*, Olufisayo Jejelowo, and Hector C. Miranda, Jr.

Microorganisms are hypothesized to endure reasonably rapid rates of mutation in space due to microgravity and ionizing radiation. As an initial effort to test the relative rates to which certain genes evolve under space-like conditions, we reviewed the usefulness and reliability of mitochondrial cytochrome oxidase 1 (COI) gene in resolving the evolutionary relationships within *Aspergillus* and related fungi. Most recently, the 600 bp region of the 5' end of the COI gene was proposed to be the ideal marker for barcoding eukaryotes. However, several investigators have suggested potential problems associated with the use of COI gene as a universal marker for fungi, due to the presence of mobile introns across many fungal groups. The pervasiveness and pattern of occurrence of this observation have yet to be investigated thoroughly. Moreover, few fungal datasets have been analyzed by rigorous phylogenetic approaches. We are sequencing at least 10 species from ATCC, plus unknown cultures obtained from environmental samples. Phylogenetic analyses were conducted using Maximum Parsimony (MP), distance method using Neighbor-Joining, Maximum Likelihood (ML) and Bayesian statistics. Preliminary results showed no introns within the COI region among the *Aspergillus*, suggesting the potential usefulness of the gene to complement commonly used genes such as ITS.

490 Systematics and Evolutionary Biology

DEVELOPMENT OF MICROSATELLITE MARKERS FOR STUDYING POPULATION GENETICS OF THE COTTON RAT (*SIGMODON HISPIDUS*)

Jordan Sparkman* and Russell Pfau, Department of Biological Sciences, Tarleton State University, Stephenville, TX

DEVELOPMENT OF MICROSATELLITE MARKERS FOR STUDYING POPULATION

GENETICS OF THE COTTON RAT (*Sigmodon hispidus*) Jordan Sparkman*, Russell Pfau (Advisor), Department of Biological Sciences, Tarleton State University, Stephenville, TX. *Sigmodon hispidus*, commonly known as the cotton rat, can be found across the southern regions of the United States. This mammal has long been the subject of intense scrutiny, having been the focus of several ecological and genetic studies. Two of these investigations have revealed that *S. hispidus* consists of two distinct genetic lineages, eastern and western, which hybridize in the central U.S. In order to provide a clearer understanding of the nature of hybridization between these two lineages, we are developing DNA fingerprinting markers (microsatellites) that can be used with this species. The FIASCO technique was used to isolate and characterize microsatellite markers from throughout the genome. Briefly, *S. hispidus* DNA was subjected to enzymatic digestion and the resulting fragments were cloned and sequenced. DNA sequences were examined in order to identify quality microsatellite markers. Primers were designed so that markers could be amplified using the polymerase chain reaction. To date, eleven microsatellite markers have been fully developed and tested. Preliminary comparisons of genetic diversity between eastern and western lineages will be presented.

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THE HYBRID ZONE BETWEEN THE TEXAS RAT SNAKE AND BAIRD'S RAT SNAKE INFERRED FROM MICROSATELLITE AND MITOCHONDRIAL DNA DATA

David Rodriguez, Jeremy P. Weaver, Troy D. Hibbitts, Michael R.J. Forstner and Llewellyn D. Densmore III

We compared the mitochondrial DNA sequences as well as nuclear microsatellite allelic diversity of two species of rat snakes (*E. bairdi* and *E. obsoleta*) within the state of Texas. Cytochrome-b fragments as well as six nuclear microsatellite loci were analyzed for 23 *E. bairdi* and 33 *E. obsoleta*. Overall little intraspecific sequence divergence was found within *E. obsoleta* (0.1-0.5%) and only slightly higher divergence was found within *E. bairdi* (0.1-2.16%). Evidence for population structure was tested based on geographic and the recovered mtDNA haplotype clades. Significant structuring could be identified from the mitochondrial data, yet microsatellite analyses were not supportive of those units within the species. Admixture was detected using Bayesian assignment probabilities of the genotypes and incongruence between nuclear and mitochondrial species assignments was recorded. These results match suspect phenotypes in several cases. However, while there is admixing, gene flow between these two species remains strictly constrained to the zone of sympatry in a bimodal fashion and we conclude the evolutionary lineages remain intact and independently evolving.

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A PCR BASED STUDY OF A DYNAMIC HYBRID ZONE BETWEEN CHROMOSOMAL CYTOTYPES OF *PEROMYSCUS LEUCOPUS* IN NORTH TEXAS

Jodie Lovejoy, Midwestern State University

A long explored question in the sciences is taxonomic classification and the demarcations that underlie it. At what point does the accumulation of small generational changes warrant the distinction of a species? What events bring about such divergences, and perhaps more

interestingly, what events maintain the stability of gene pools? 'Species' as defined by the biological species concept is being challenged in light of information from studies that reveal molecular genetic distinctions such as karyotype and RFLP patterns. It has been proposed that the delineation of a species should include the consideration of stable genetic differences, such as chromosome morphology, rather than relying exclusively on reproductive isolation. These questions warrant detailed study of those organisms and populations that will give us greater insight into the evolutionary processes of speciation. *Peromyscus* is a commonly used model for questions in cytogenetics and evolution, particularly *P. leucopus*. This species has been characteristically divided into two chromosomal races (the northeastern and southwestern) distinguished by morphs of chromosomes 5, 11, and 20, although they freely breed to produce fertile hybrids along a zone through Oklahoma and Texas. RFLP analysis of mtDNA has revealed a pattern that appears to distinguish the southwestern from the northeastern population along the hybridization zone in central Oklahoma. Current research focuses on characterization of this RFLP in the Texas population of *P. leucopus*.

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EXAMINING POPULATION GENETIC EVIDENCE OF REPRODUCTIVE ISOLATION BASED ON HOST PLANT USE FOR THE JUNIPER HAIRSTREAK BUTTERFLY, *MITOURA GRYNEUS*, WITHIN TEXAS

Michelle Downey and Chris Nice, Texas State University-San Marcos

In ecological speciation, reproductive isolation (RI) may result when disruptive natural selection leads to specialization in resource use, restricting gene flow and facilitating differentiation among locally adapted populations. For specialized phytophagous insects, switches to novel hosts may lead to the formation of "host races," which are considered to be an early stage of the speciation process. The proposed research tests ecological speciation theory in a system of phytophagous insects in which divergence is ongoing. Experimental evidence of specialization and host race formation has been found for the juniper hairstreak butterfly, *Mitoura gryneus*, on different *Juniperus* species, in the form of female oviposition preference and increased larval performance on natal hosts. To address the hypothesis that gene flow is limited based on host plant specialization, molecular techniques and analyses were employed to characterize genetic variability within and among *M. gryneus* populations that are associated with different hosts in nature. Analysis of molecular variance (AMOVA) indicated substantial differentiation among host-associated populations, consistent with the hypothesis that positive assortative mating based on female preference for the natal host restricts gene flow among host races. Populations that have sympatric host associations (*J. ashei* and *J. pinchotii*) were analyzed to test the hypothesis that two host races are present within these populations. Overall results provided evidence of genetic differentiation indicating RI among host races, including within areas of host plant sympatry. This examination of an ongoing speciation event allows insight into the factors that initiate, maintain and promote differentiation.

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MOLECULAR IDENTIFICATION AND PHYLOGENETIC SYSTEMATICS OF *ASPERGILLUS* AND RELATED FUNGI BASED ON ITS GENES

Tiarra Spencer¹*, Olufisayo Jejelowo and Hector C. Miranda, Jr.

Because of the importance of fungi to space biology, medicine and the environment, appropriate molecular markers that can discriminate between strains and species of fungi with high fidelity and resolve their evolutionary relationships are needed. There have been major difficulties in obtaining a reliable barcode for fungi, mainly due to the natural inhibitors of the fungal genome that hinder the process of polymerase chain reaction (PCR) and DNA sequencing. The internal transcribed spacer (ITS) gene has been recently proposed as an ideal barcode in fungal species identification. We are currently evaluating the rates and patterns of substitution, and the utility of the gene to discriminate strains and species, and infer the phylogeny of *Aspergillus*. We obtained samples of known species from ATCC and unidentified cultures from environmental samples, extracted DNA, performed amplification of DNA by using PCR, and conducted phylogenetic analysis using various optimality criteria. The ITS region was able to discriminate among species unambiguously, and was able to identify a taxa potentially new to science.

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MORPHOMETRIC AND LAMELLAR VARIATION IN THE MEXICAN LAND SNAIL *HOLOSPIRA ORCUTTI* (GASTROPODA: PULMONATA: UROCOPTIDAE)

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The genus *Holospira* (Von Martens, 1860) is a group of xeric pulmonate land snails with cylindrical shells ranging from Mexico to the southwestern United States. One of the most distinctive characteristics of the genus is the presence of four ridges or lamellae within the penultimate whorl: superior, basal, axial and parietal. This study was undertaken to determine what lamellar variation, if any, was present within a localized population of holospirids such as *Holospira orcutti*, known only from the type locality near Paredon, Coahuila, Mexico. Preliminary investigations indicate some diversity in the internal structures: Forty-two specimens of *H. orcutti* were sectioned with a Dremel tool and the internal lamellae were examined. Of the 42 specimens, 20 (47.6%) were found to have an additional (fifth) small ridge between the axial and basal lamellae. 21 specimens (50%) had the normal four lamellae and no interlamellar ridge. In October 2009, thirty topotypes were sent to the high-powered X-ray computer tomography lab at the University of Texas in Austin for CT scanning, a noninvasive form of sectioning. The resulting scans were measured with an imaging program and the data subjected to principal components analysis to determine the amount and significance of the variation existing in the lamellar folds of the penultimate whorl in *H. orcutti*. The implications of this lamellar variation on the current generic/ subgeneric status of the taxon *Holospira* will be discussed.

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MORPHOLOGICAL VARIATION BETWEEN WESTERN SLIMY SALAMANDERS, *PLETHODON ALBAGULA*, OF THE INTERIOR HIGHLANDS AND EDWARDS PLATEAU.

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The western slimy salamander, *Plethodon albagula*, is a species of lungless salamander with two very disjunct ranges; one is on the Edwards Plateau of Central Texas and the second is in the Interior Highlands of Arkansas, Missouri, and Oklahoma. Recent studies demonstrated that Central Texas *P. albagula* include multiple mitochondrial clades, many of which are also morphologically distinct from one another. Given this unexpected diversity within the Edwards Plateau, even greater differences between the Edwards Plateau and Interior Highlands populations seem probable. We examined morphological variation between Edwards Plateau and Interior Highlands populations of *P. albagula*. Multivariate statistical analyses reveal that Interior Highlands and Edwards Plateau slimy salamanders are morphologically distinguishable. These analyses indicate the need for additional genetic studies to determine whether there are multiple currently unrecognized species within *P. albagula*.

620 Systematics and Evolutionary Biology

SPERM STORAGE AND METAPOPOPULATION DYNAMICS MAY EXPLAIN THE MAINTENANCE OF A VERTEBRATE GYNOGENETIC SPECIES

Gompert, Zach; Aspbury, Andrea; Gabor, Caitlin; Nice, Chris

The long term maintenance of unisexual organism is paradoxical because the advantages of asexual reproduction are all immediate (no cost of producing males and therefore exponential growth) but the long term costs are substantial (accumulation of deleterious mutations and lack of genetic recombination to respond to environmental changes). Unisexual species are therefore predicted to be short-lived and are rare. Vertebrate gynogenetic females are even rarer. They arose from hybridization events and sexually parasitize their parental species, because although they mate with parental males, no syngamy occurs. Gynogenetic lineages therefore depend on the parental species for their maintenance over time and live in sympatry with at least one parental species. Given how closely related gynogens are to their hosts, it is predicted that competition for resources will be substantial, and the asexuals may competitively exclude their host from resources and eventually cause their own extinction given that they reproduce at a faster rate. Here we employ a simulation model to test the hypothesis that metapopulation dynamics and sperm storage aid the maintenance of gynogenetic lineages even when they cause the local extinction of their hosts. Sperm storage, modeled under different colonization rates, influences patch occupancy and contributes to the persistence of the unisexual species.

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ANALYSIS OF A SUB-FOSSIL LEOPARD SKELETON FROM THE KOANAKA HILLS, BOTSWANA

Jacqueline Knight, Timothy L. Campbell, and Patrick J. Lewis, and Montie L. Thies, Sam Houston State University, Huntsville, TX.

The genus *Panthera* represents a relatively young member of the family Felidae, the family containing most extant large cats. Species in this genus include the leopard (*P. pardus*), lion (*P. leo*), tiger (*P. tigris*), and the jaguar (*P. onca*), some of the largest terrestrial predators in their respective ranges. Leopards are also the primary accumulating agents in cave deposits for prey weighing between 10–40 kg. Leopards frequently make use of cave recesses where they impact the taphonomy of fossil-bearing deposits. The earliest leopard fossils are reported

from Laetoli, Tanzania at ca. 3.5 my. Historically, leopards ranged through northern and sub-Saharan Africa, the Middle East Asia Minor, and large parts of Asia. Although still found throughout parts of their historic range, their numbers have been dramatically reduced due to anthropogenic factors. Here we report on a sub-fossil leopard skeleton collected from a cave in the Koanaka Hills of the Ngamiland Province, Botswana. Preliminary analysis indicates that the skeleton is 70-85% complete with representatives of all major skeletal elements present. Based on the lack of full ossification of the cranial sutures and fusion of the epiphyseal plates on the long bones, the specimen is interpreted as juvenile to subadult. Juvenile leopard remains are rare and further analysis of this specimen will help us better understand important aspects of leopard biology and ontogeny.

P496 Systematics and Evolutionary Biology

CHALLENGES OF CURATING SMALL FOSSIL ANIMALS

Micky Labbe*, Patrick J. Lewis, Sam Houston State University, Huntsville, TX, and Eileen Johnson, Museum of Texas Tech University, Lubbock, TX

Curating small animal fossil assemblages presents many challenges. The main concerns for curating microfauna are long term preservation, space, cost, and accessibility for research. Microfauna present a space issue for institutions with limited space. While the fossils are small, relative to macrofauna, to protect and organize them requires more relative space and materials per unit of fossil volume. The method of organization also has to take into account a way to catalogue the fossils and make sure they are accessible for later analysis and research. They are generally too small to have numbers or tags affixed to them. Poor methods of fossil curation can leave valuable specimens damaged. Discoloration, shrinkage, expansion, and brittleness are among the problems caused by using the wrong consolidants and adhesives. Long term packaging also must be reversible. A popular method of storing small fossils is to use book wax to place the fossil on a pin head and then stick the pin in cork. This method requires a lot of space to be allocated, and limits the ability of researchers to examine the materials. Book wax now is increasingly hard to find and other glues and waxes have had minimal success. This situation, combined with cork off gassing, has made this method less preferred but still in use with a lack of other options. This research will, therefore, examine other current methods of curating microfossils in a manner that allows for long term preservation and utility while addressing concerns over cost and space.

P369 Systematics and Evolutionary Biology

NESTING BEHAVIOR OF THE SAND WASP, *MICROBEMBEX MONODONTA* (HYMENOPTERA: BEMBECEINAE) IN CENTRAL TEXAS

Veronica Lopez*, Allan Hook, St. Edward's University, Austin, TX

The sand wasp, *Microbembex monodonta* was studied from 11 May - 4 June, 2009 at Pedernales Falls State Park in Blanco Co., Texas. This wasp nested in open sandy areas along the river, and provisioned nests progressively with dead and dying insect prey. This wasp utilized seven orders of insect prey, and the most common prey taken (73%) were fire ant reproductives (primarily queens). This is the first record of any solitary wasp using fire ants as prey. Data was also obtained on nest digging and closure behavior, nest architecture, provisioning rates, prey weights and parasite interactions. Results compare well with other

studies on this species outside of Texas.

P638 Systematics and Evolutionary Biology

PHYLOGENETIC ANALYSIS OF HEAT SHOCK PROTEINS IN GLASSY-WINGED SHARPSHOOTER (*HOMALODISCA VITRIPENNIS*)

Henry L. Schreiber IV*, Daymon A. Hail, Blake R. Bextine, University of Texas at Tyler, Tyler, TX, Wayne G. Hunter, USDA-ARD Fort Pierce, Fort Pierce, FL

The glassy-winged sharpshooter *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae) is the major vector of *Xylella fastidiosa*, the causal agent of Pierce's disease of grapes. Due to the importance of the *H. vitripennis* in transmission and spread of *X. fastidiosa*, a cDNA library was constructed from adult and fifth-instars *H. vitripennis*, resulting in 5,906 expressed sequence tags (ESTs). After quality scoring, 4,445 sequences underwent assembly which produced a set of 2,123 sequences that putatively represented distinct transcripts. BLASTX analysis identified 4 significant homology matches to heat shock proteins, (HSP) which are the focus of this study. The overall importance and function of HSPs lie in their ability to maintain protein integrity and activity during stressful conditions, such as extreme heat, cold, drought, or other stresses. Phylogenetic analyses using these 4 HSP sequences provided further support of transcript by the identification of specific motifs. This study shows that highly conserved genes like HSPs are a viable alternative to ribosomal DNA in elucidating phylogenetic relationships.

P639 Systematics and Evolutionary Biology

PHYLOGENETIC RELATIONSHIPS OF GLASSY-WINGED SHARPSHOOTER (*HOMALODISCA VITRIPENNIS*) POPULATIONS

Adam L. Booth, Sharon A. Andreason, Blake R. Bextine, University of Texas at Tyler, Tyler, TX

The phylogeny of the glassy-winged sharpshooter (GWSS), *Homalodisca vitripennis*, was evaluated by single nucleotide polymorphisms (SNP) analysis of representatives from California, Texas, and Florida populations. Expressed Sequence Tags (ESTs) were used to choose genes of interest and design corresponding primers. The genomic Beta-1 Tubulin gene was chosen as well as the mitochondrial genes cytochrome oxidase subunit III and NADH dehydrogenase subunit II. Results suggest that California and Texas populations are more closely related than the Florida population. Understanding phylogenetic relationships of GWSS populations can help better prepare agriculturalists against invasion of the insect.

P637 Systematics and Evolutionary Biology

ZOT GENE AS A NOVEL TARGET FOR POPULATION PHYLOGENY OF *X. FASTIDIOSA*

Henry L. Schreiber IV*, Blake R. Bextine, University of Texas at Tyler, Tyler, TX, Lisa D. Morano, University of Houston-Downtown, Houston, TX

Multiple subspecies of the phytopathogenic bacterium *Xylella fastidiosa* exist which are pathogenic to distinct plant hosts, such as grapes, oleander, almonds, and citrus. Previously, DNA sequence analysis of the mopB and gyrB genes has been used to separate *X. fastidiosa*

strains into their subspecies groups. In this study, DNA sequence analysis of the Zot gene was used to corroborate the genetic variation found between three Texas strains of *X. fastidiosa*: a grape strain, a weed strain, and an oleander strain (BAN POL 055, GIL BEC 628A, and MED PRI 025 respectively). This approach provided variable gene sequences that allow for categorization of *X. fastidiosa* at the population level. The *X. fastidiosa* gene that encodes the zonula occludens toxin (Zot) is homologous to the Zot found in *Vibrio cholerae*, which is involved in tight junction modulation and disruption between host cells. The results of the analysis of this gene were consistent with the phylogeny found using the more conserved mopB and gyrB genes at the subspecies level and can be used to differentiate populations within subspecies. The analysis of these variable genes and gene regions provide additional opportunities for new diagnostic and disease management techniques.

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NESTING BIOLOGY OF *TACHYSYPHEX TERMINATUS* (HYMENOPTERA: CRABRONIDAE) AT PEDERNALES FALLS STATE PARK, TEXAS

Madeline Orf* and Allan Hook, St. Edward's University

Tachysiphex terminatus was studied from 11-29 May at Pedernales Falls State Park, Blanco Co., Texas. Wasps mass provisioned subterranean nests with nymphal grasshoppers (several spp.). Nest burrows were relatively short and shallow and possessed from one to three cells (brood chambers). Data was obtained on nest structure as well as provisioning rates, prey type, prey weight, and number of prey per cell. The chrysidid wasp, *Hedychridium fletcheri* was observed entering a number of nests and is most likely a parasite of this wasp. Miltogrammine fly parasites were also present but no cells were parasitized. One brood cell contained an adult mermithid nematode which had just emerged from one of the prey items. In general our results compare well with previous studies although in Central Texas this wasp makes fewer cells per nest.

P559 Systematics and Evolutionary Biology

MOLECULAR CHARACTERIZATION OF A FUNGAL COMMUNITY USING ITS AND COI

Sherrin Raju* Shaunte Abdin, Tierra Spencer, Ayodotun Sudipe, O. Jejelowo and H. C. Miranda, Jr, Texas Southern University

Recent inventory of global fungal diversity suggested that known and described species of fungus represent less than 10% of their actual diversity. Proper fungal identification and classification are important because of the impact of fungi to medicine and the environment. We obtained samples from Texas Southern University and regrew them in pure cultures. As baseline information to test the validity of our DNA sequencing protocol, we obtained 10 taxa from ATCC and sequenced the Internally Transcribed Sequences (ITS) and the mitochondrial oxidase 1 (COI) genes to test their utility as barcode and phylogenetic markers. Alignments were done using GeneiousPro and phylogenetic analyses were conducted using Maximum Parsimony (MP), distance methods, Maximum Likelihood (ML) and Bayesian analysis.

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THE INFLUENCE OF SIZE ON THE INSECT COMMUNITY OF GIANT RAGWEED STEMS

Richard J. W. Patrock, St. Edward's University, Austin, TX

Giant ragweed is a fast growing invasive annual widely distributed through the United States, Canada and northern Mexico. It is considered an important weed because of its competitive habits in non-disturbed and mesic habitats, as well as its bounteous production of allergenic pollen. Plants may grow as high as 5 meters in a season and while they are fed on by many insect herbivores, none are observed to have significant impacts on its growth. In fact, the opposite may be the case; stem-boring insects are thought to reduce herbicide effects by preventing vascular translocation of these poisons. This study examines the life-history of the stem-boring insect community of ragweed in Central Texas in relationship to plant size and stem characteristics. The insect community is partitioned by height with lepidopteran gallers and borers found predominately in the top region of the plant while the Long Horn beetle *Hippopsis lemniscata*, was found boring almost exclusively near the root line. In between these two was the most abundant of the herbivores, *Lixus scrobicollis*. I measured egg punctures of this weevil and related these numbers according to their height on the plant, the stem sizes occupied by larval galleries; the numbers and species of the parasitoid community associated with these weevils and survivorship and size of the overwintering adults. *Lixus* was largely confined to the intermediate stem sizes of the larger plants and larger stem sizes of smaller plants. Plant size appeared to influence the distribution of the weevils more than the obverse.

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INSECT SURVEY OF THREE ARTIFICIAL ECOLOGICAL ZONE GARDENS

Karin L. Nilsen* and Christopher M. Ritzi, Department of Biology, Sul Ross State University

Seventy-four samples for entomological orders were in three artificial ecological zones (limestone, grassland and juniper/pinyon) within the Sul Ross State University garden complex behind the Warnock Science Building. Samples were taken between July to late October 2009. Two of the gardens were visited twice while the last garden was visited three times. Collection of vouchers of observed insects in the gardens were keyed to family. With the collected orders identified, a Shannon Weaver statistics test was conducted to determine diversity index of the gardens. Diversity was found to be highest in the limestone zone, followed by the juniper/pinyon zone, and finally with the lowest diversity in the grassland zone. Max Diversity was found to be highest in both the grassland and limestone zones, followed by the juniper/pinyon zone. The range of specimens collected in each ecological zone was as expected. Although there was a perceived difference in the collection of specimens, there was no real significant difference between the diversity of the limestone and juniper/pinyon gardens. The Shannon Weaver diversity calculations suggest that there was a larger diversity index in the juniper/pinyon and limestone garden then that of the grassland. A list of taxa collected per habitat will be presented.

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DARK V PALE: HOW BODY COLOR AND TEMPERATURE MAY IMPACT MALE *BEMBEVINUS NEGLECTUS* WASP BEHAVIOR ON SOIL SURFACES

Laura Auchterlonie*, Allan Hook, Richard Patrock, St. Edward's University, Austin, TX

Bembecinus neglectus male wasps exhibit a body color polymorphism that varies from a black or yellow, with that of yellow individuals ranging from a dark to a pale shade. Their color is hypothesized to influence their tolerance to high surface and air temperatures because of the black body effect. The purpose of the study was to investigate how rising air and surface temperatures influenced the amount of time males spent on the soil surface. Male and female *Bembecinus neglectus* wasps were observed at a sandy nesting site at Pedernales Falls State Park in Blanco County, Texas from 11 May to 1 July, 2009. The air temperatures at the study site ranged from 19° C to 35° C and surface temperatures ranged from 31° C to 68° C. Results from this study indicated that as surface temperatures increased both yellow and pale males were found to spend less time on the sand (Yellow: $R^2 = 0.46$, $p = 0.0001$; Pale: $R^2 = .34$, $p = .0003$). Yellow males appeared to be affected more by high surface temperature than pale males. An abiotic factor that also substantially affected male behavior patterns was periods of heavy rainfall. As all females are black their digging behavior in relationship to air and surface temperature was also addressed briefly in this study as a behavioral contrast to that of the males under similar temperature conditions.

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THE TEXAS ECOLOGICAL SYSTEMS MAPPING PROJECT

Amie Treuer-Kuehn, Texas Parks & Wildlife Department

Abstract --- Texas Parks and Wildlife Department and other state, federal and non-governmental partners are updating the 1984 Vegetation Map of Texas. NatureServe's Ecological System Mapping System is being used to describe vegetation communities. The project is approximately 40 percent complete, with much of the Edwards Plateau, Llano Uplift, Cross Timbers, Blackland Prairie, Post Oak Savannah, and West Gulf Coastal Plain being substantially complete. Ecological Systems are mapped using remote sensing techniques combined with modeling using abiotic data. Ground verification data has been collected from 5000+ sites. Overall mapping accuracy exceeds 80%. Ecological Systems Database has four times the thematic resolution and five times the spatial resolution of the 1984 data with more extensive ground verification.

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TOWARDS A NEW METHOD FOR QUANTIFYING PHYSICAL CLUTTER IN FOREST EDGES

Thomas W. Pettit* and Kenneth T. Wilkins, Baylor University, Waco, TX

Bat ecology has long searched for a simple, repeatable method of quantifying physical clutter. Most researchers use qualitative visual estimations of canopy closure or clutter levels in addition to other forestry metrics (diameter at breast height, DBH; stem densities; etc.). We

are investigating a method for quantifying and visualizing vegetation structure in forest edges and canopies using a canopy analysis device, and working towards relating that structure to bat activity levels. Bat activity was sampled in 12 different locations in the mixed aspen-fir alpine forest of north-central Utah over several weeks using Anabat SD1 bat detectors. Vegetation was sampled by instantaneous leaf area index (LAI) in the same 12 locations using an LAI-2000 canopy analysis device, in addition to several of the more-traditional forestry metrics. We created visualizations of the subsequent vegetation profiles and evaluated correlations between these and local bat activity. Bat activity correlated well with the abruptness of edge structure, as well as with some vegetation profiles. We believe that further refinement of the method should provide more detailed information for better understanding of the relationship between forest edge structure and bat activity.

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DEMOGRAPHICS OF AN URBAN WATER SNAKE POPULATION: MARK-RECAPTURE OF *NERODIA ERYTHROGASTER* ON THE UNIVERSITY OF TEXAS AT AUSTIN CAMPUS

Travis J. LaDuc*, Christopher J. Bell, The University of Texas at Austin, Austin, TX and Greg B. Pauly, University of California, Davis, CA

Numerous species are faced with increasing urbanization of habitat. We examine habitat use and population structure of blotched water snakes, *Nerodia erythrogaster*, in an extremely urbanized setting—a small, perennial creek that flows through the University of Texas at Austin campus. This population of *N. erythrogaster* is particularly interesting because it occupies a heavily urbanized environment with available habitat often <10 m wide. Not only is this snake population located on a large university campus (~50,000 students), but these snakes live in a watershed that drains a large portion of north Austin, potentially making these snakes more vulnerable to local stochastic changes (e.g., floods). To study the population structure of *N. erythrogaster*, we have used a mark-recapture survey protocol with PIT tags to mark every snake found along an 800 m length of creek as it runs through campus. Since we began our project in July 2006, we made 19 survey trips, marking a total of 62 individuals. We recaptured 18 of these marked snakes a total of 34 times, providing some remarkable data on growth as well as movement, and we conservatively estimate there may be another 20 sub-adult or adult snakes yet unmarked in this stretch of the creek. Prospects for long-term continuation of this study are excellent and will focus on detailing growth patterns and population dynamics, as well as gathering detailed data on habitat use and home range. We recently initiated a radio-telemetry component of this project, thus further providing unique educational opportunities for our diverse undergraduate student body.

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DIETARY AND HABITAT NICHE OVERLAP AMONG FOUR SNAKE SPECIES IN EASTERN TEXAS

Matthew D. Broxson* and Richard T. Kazmaier, West Texas A&M University, Canyon, TX

Abstract: Much research has addressed niche characteristics of individual species of snakes, but few studies have examined niche overlap among species. We investigated overlap in the dietary and habitat dimensions of the realized niche of four snakes at Gus Engeling Wildlife

Management Area, Anderson County, Texas, in 2007-2008. We used a standardized road cruising circuit throughout the area to capture snakes, and capture locations were incorporated into a GIS to characterize habitat associations. For diet, we examined fecal samples collected from Western Rat Snakes (*Pantherophis obsoleta*, n = 34), Copperheads (*Agkistrodon contortrix*, n = 90), Cottonmouths (*A. piscivorus*, n = 22), and Pigmy Rattlesnakes (*Sistrurus miliarius*, n = 28) to identify contents to the lowest taxonomic level possible. We then regrouped food items into broader taxonomic categories, such as families and orders, to allow characterization of the diet at multiple scales. Niche overlap was compared between pairings of species using Pianka Indices for five aspects of niche: diet, soil type, macrohabitat, canopy, and moisture. In general, Cottonmouths displayed the most partitioning of the habitat dimension. However, Pigmy Rattlesnakes partitioned soil type differently than the other species. For diet, Copperheads, Cottonmouths and Pigmy Rattlesnakes displayed a high degree of niche overlap relative to Western Ratsnakes. These results do support the idea that although these species do display a high degree of niche overlap along some dimensions, coexistence is possible by diversifying other niche dimensions.

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A DEMOGRAPHIC STUDY OF THE *KINOSTERNON FLAVESCENS* IN WEST TEXAS

Lucia DeLaRosa, Steven Platt, Sul Ross State University

The yellow mud turtle (*Kinosternon flavescens*) is a small, semi-aquatic kinsternid turtle that typically inhabits permanent and temporary ponds in southwestern deserts of North America (Iverson, 1929a). *Kinosternon flavescens* are widely distributed within the United States occurring from New Mexico northwards to northwestern Illinois, Iowa, southwestern Missouri, northern Nebraska, south through Texas and southern Arizona. *Kinosternon flavescens* occurs in a variety of habitats such as vernal ponds, mud holes, farm ponds and tanks, but typically shows a preference for ephemeral water bodies (Mahmoud, 1969). This species has been well studied in the Midwestern United States: However, little is known regarding populations in the arid southwest and in particular, little ecological research has been conducted on *K. flavescens* in Texas. Herein I report the results of a demographic study of *Kinosternon flavescens* conducted in west Texas.

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ARTIFICIAL LIGHT AND NOCTURNAL ANURAN CALLING BEHAVIOR IN NORTHERN MICHIGAN VERNAL POOLS

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Artificial lighting affects the physiology of nocturnal anurans; however, its effects on their behavior are still largely unknown. The goal of this study was to determine if artificial lighting significantly affects male anuran calling behavior. Using the North American Amphibian Monitoring Program (NAAMP) protocol, seven vernal ponds in northern Wisconsin and Michigan were surveyed under a lit (800 lux) condition using a high intensity floodlight and an unlit condition (0.00001-0.1 lux). Seven anuran species were detected during these surveys, but only *Pseudacris c. crucifer* and *Hyla versicolor* were heard often enough for statistical testing. Significantly fewer *P. c. crucifer* and *H. versicolor* called during lit surveys than unlit

surveys. Abiotic weather variables also accounted for some of the calling variance. Future conservation efforts directed towards anurans should address the potentially harmful effects of artificial night lighting on calling behavior.

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COMPARATIVE STUDY OF THE STRUCTURE OF AVIFAUNA EAST AND WEST SIDES OF CERRO

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The Cerro "El Potosí" is the highest point of the Sierra Madre Oriental. Its ecological characteristics, physiographic, geological differences in substrate, and geographic isolation generate a variety of microclimates. These result in a high degree of endemism and the establishment of an alpine type of vegetation that is unique in its floristic and physiognomic patterns. Over 2 years we conducted monthly field trips to generate a database of the avifauna of Cerro "El Potosí" in order to analyze changes in species composition generated by fires that occurred backwards to 10 years ago. We compared the structure of the avifauna communities on the east and west sides of Cerro "El Potosí" using the Jaccard similarity index. The current wealth of the area is 108 species whereas only 87 species had been catalogued previously. The study area is very important for migratory birds as the greatest richness patterns occurred in the summer and winter. Indications of significant disturbance included observations of *Geococcyx californianus* at an altitude of 3636 m, in an area cleared by fire, while *Toxostoma curvirostra* was observed at 3339 m, well above its normal altitudinal range. *Loxia curvirostra* was a new record for the state of Nuevo León. One observed species of unusual interest is *Rhynchopsitta terrisi*, which is on the IUCN Red List of Threatened Species also on NOM-059-ECOL-2001 and was found feeding in the area around the year.

510 **Terrestrial Ecology and Management**

PRELIMINARY ANALYSES OF POPULATION STRUCTURE AND REPRODUCTIVE SUCCESS OF URBAN GREAT-TAILED GRACKLES

Beverly L. Cochran*, Texas A&M University, College Station, TX and Jeffrey G. Kopachena, Texas A&M University-Commerce, TX

Great-tailed grackles (*Quiscalus mexicanus*) have dramatically extended their range in the United States. They form large roosts and breeding colonies in urban areas. Many cities in Texas are faced with the perennial issue of managing these flocks, and most cities have had little success. Texas A&M University-Commerce, Texas A&M University, and the Texas AgriLife Research and Extension Urban Solutions Center in Dallas are collaborating to develop an Integrated Pest Management (IPM) plan for great-tailed grackles in urban settings. To begin with, baseline data need to be collected on colony characteristics and the reproductive biology of this species in urban settings. In 2009, data were collected from 201 chicks at 289 nests at an urban breeding colony in northeast Texas. Out of 61 trees of eight species, grackles preferentially chose live oaks and Callery pears for nesting. Mean clutch size was 2.89 and fledging success was 1.76. Apparent cases of infanticide were widespread and the sex ratio of nestlings just prior to fledging was skewed towards females (67%), indicating

that infanticide is directed towards males. In contrast to other studies, many grackles in this colony were triple-brooded, suggesting greater success in urban populations.

386 **Terrestrial Ecology and Management**

ECOLOGY OF BAT COMMUNITY IN PINEY FORESTS OF SOUTHEASTERN TEXAS

Anica Debelica* and Kenneth Wilkins, Baylor University, Waco, Texas

Because of the presence of old tall trees, and relatively mild climate, Sam Houston National Forest (SHNF), Texas, offers suitable habitat for multiple bat species throughout the year. A community of many species is expected to exhibit complex interactions which likely are further complicated by the presence of both sexes, reproductive states, and ages because members of these various subgroups have different energetic needs and may behave differently. For these bats to minimize direct competition within such a complex community, I expect to see evidence of resource partitioning in diet, foraging, and roosting areas. During summer 2009, I conducted a pilot study to explore the complexity of the forest-dwelling bat community and to investigate resource partitioning. I netted six nights at a single pond, using a triple-high net. Captured bats were identified to species, sexed, measured, and examined for reproductive state. Feces were collected for detailed dietary study. Insects were collected to be used as reference for the dietary and bat activity study. I captured 114 individuals belonging to 8 species and noticed variation in demographics of the bat community during the summer. In addition, we noticed differences in emergence times between sub-adults and adults as well as among the species present at the pond. Differences in community structure and emergence times suggest that even though the bats are feeding in the same area, they might be partitioning their resource temporally, but further data collection and statistical analysis are needed in order to confirm these observations.

548 **Terrestrial Ecology and Management**

USE OF ANTHROPOGENIC FOOD SOURCES BY WHITE-WINGED DOVES

Alayne Fronimos*, John Baccus, Michael Small, Joseph Veech, Texas State University, San Marcos, TX.

Over the last 50 years, the distribution of white-winged doves (*Zenaida asiatica*) has expanded northward and increasingly included urbanized areas. We examined how this invasion into urban habitat might be facilitated by anthropogenic food sources, namely bird feeders. Thirty feeder trays were set up in the summer of 2009 (15 in San Antonio, TX, 15 in San Marcos, TX) in yards of residential homes or businesses and city parks where white-winged doves were known to occur. Five feeders were set up each week (one per site), alternating weeks between each city, for a total of six weeks. The feeders were observed each day for a period of 30 min. and behavioral interactions were recorded using a digital video camera for detailed analysis. Feeder usage was measured as a percent of the total observation time each species was present at a feeder, and we logged how often one species displaced another and how often species shared the feeder. We also documented a wing-raising threat posture that varied by dove species and quantified its characteristics. White-winged doves, grackles, and house sparrows spent the most time at feeders. There appeared to be a size-based hierarchy of displacements with all birds yielding to white-winged doves and grackles. It was

also found that when threatening others, white-winged doves raised the wing opposite their opponent, rather than the same side, like mourning doves, possibly to display their white wing marking.

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DEN SITE SELECTION OF RINGTAILS (*BASSARISCUS ASTUTUS*) IN WEST CENTRAL TEXAS.

Andrew R. Tiedt and Robert C. Dowler, Angelo State University, Department of Biology
Beginning August 2008, efforts were made to determine den site preference of the ringtail (*Bassariscus astutus*) in west central Texas. Since that time fourteen ringtails (9F:5M) were captured and radio-collared on the study areas of the Knickerbocker and Tweedy ranches, located near Knickerbocker, in Tom Green County, Texas. Diurnal resting sites were located via radio-tracking. Ringtails were found to be using owl nest boxes at the study site in addition to natural dens. A total of 245 den sites have been located, with 105 being unique. Thirty-two instances have been recorded of co-occupancy of a den site by at least two ringtails. Dataloggers were used to characterize thermal profiles of known den sites and controls from October 2008-October 2009. Preliminary thermal profiles, in conjunction with radio-tracking, provided an opportunity to characterize possible thermal preferences in den sites.

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ECOLOGY OF POCKET GOPHERS (*GEOMYS*) IN ARKANSAS

Matthew B. Connior*, South Arkansas Community College, El Dorado, AR and Thomas S. Risch, Arkansas State University, Jonesboro, AR

Two species of pocket gophers, *Geomys bursarius* and *Geomys breviceps*, occur in Arkansas, and are also found in Texas. *G. bursarius* are considered a “species of greatest conservation need” within Arkansas due to its restricted range; however, *G. breviceps* occur throughout central and southern Arkansas. We used radio telemetry to investigate spatial use and life-history characteristics of *G. bursarius*. In addition, we trapped both species of pocket gophers and excavated nests to collect reproductive data. Home range size of *G. bursarius* could be predicted by the females’ body masses but not by that of the males. Home ranges of *G. bursarius* were significantly larger for females in the winter/early spring versus late spring/summer possibly due to food availability and the reproductive season. The majority of mature male *G. bursarius* become reproductively active beginning in December and extending through April. A single *G. bursarius* nest was excavated containing three neonates. Average post gestation litter size for *G. breviceps* was 1.3 (n = 9). The common occurrence of reproductively active adults and nests containing litters during March and April suggests that the peak of reproduction occurs directly before and during this time in Arkansas. Mortality factors of pocket gophers included predation, floods, and agricultural equipment.

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RESPONSES OF SMALL MAMMALS TO FIRE IN A TALLGRASS BLACKLAND PRAIRIE

Kenneth T. Wilkins*, Brianna N. Kirchner, David A. Sergeant, and Nicholas S. Green,

Department of Biology, Baylor University, Waco, TX

The effects of fire on vegetative cover and the small-mammal community were examined in a remnant tallgrass prairie in east-central Texas. The objective of the study was to determine the nature of the response of rodent species to fire, thereby allowing designation of species as fire-negative, fire-positive or fire-neutral. An 8-month pre-burn baseline was developed before the prescribed burn, then monitored for 8 months following the burn. Vegetation sampling confirmed drastic reduction of cover by the fire in the grassland sections of the prairie. Mammal sampling revealed that relative abundances of cotton rats (*Sigmodon hispidus*) and pygmy mice (*Baiomys taylori*) decreased significantly after the fire, while deer mice (*Peromyscus maniculatus*) increased markedly. Relative abundances of *S. hispidus* and *P. maniculatus* returned to pre-burn levels in 8 months. Numbers of captures of other native rodent species (fulvous harvest mouse, *Reithrodontomys fulvescens*; hispid pocket mouse, *Chaetodipus hispidus*; white-footed mouse, *Peromyscus leucopus*) were too few to allow statistical assessment of fire effects. Correlation of rodent abundances to vegetative cover revealed the importance of litter to cotton rats and pygmy mice, and while these 2 species demonstrated a significant aversion to bare ground, amount of bare ground correlated significantly with densities of deer mice. This is the first report of fire effects on this community of rodent species, whose distribution in the tallgrass blackland prairie ecosystem of North America is restricted only to north-central and east-central Texas.

P380 Terrestrial Ecology and Management

ECTOPARASITES OF *MUS MUSCULUS* AROUND ALPINE, TX, WITH NOTES ON THE ECTOPARASITES ASSOCIATED WITH OTHER RODENT SPECIES

Sheryl Bitner and Christopher M. Ritzi, Biology, SRSU

Ectoparasites from three species of rodents *Mus musculus*, *Peromyscus leucopus*, and *Peromyscus maniculatus* were surveyed in the Trans-Pecos region of Texas. These rodents were trapped using museum special snap traps around Alpine and Sul Ross State University properties, and stored under refrigeration until later examination. Rodents were washed and visually checked for ectoparasites in the lab. Ectoparasites recovered were then mounted, identified, and recorded for statistical analysis. The most prevalent ectoparasites recovered for *Mus musculus* included *Myocoptes musculinus*, *Radfordia affinis*, and *Glycyphagus hypadaei*, while the dominate ectoparasite for both *Peromyscus* species was *Hoplopleura hesperomydis*.

P611 Terrestrial Ecology and Management

EFFECTS OF CLIMATOLOGICAL VARIABLES ON EMERGENCE TIME OF BATS AT OLD TUNNEL WILDLIFE MANAGEMENT AREA, TEXAS

Margaret Collins, Dana Spontak, Michael Small, John Baccus, Texas State University-San Marcos

Old Tunnel Wildlife Management Area is inhabited by approximately three million Brazilian free-tailed bats, *Tadarida brasiliensis*, and 3,000 cave myotis bats, *Myotis velifer*. This study investigated what climatic factors significantly influence time of emergence in bats at OTWMA from 1999 to 2007. Multiple abiotic factors seem to affect timing of nocturnal

activities at OTWMA, particularly temperature and humidity.

P477 Terrestrial Ecology and Management

EFFECTS OF TEMPERATURE AND VEGETATIVE GROWTH ON RESPIRATION FROM AN ALKALINE CLAY SOIL IN CENTRAL TEXAS

James McCann* and William Quinn, St. Edward's University, Austin, Texas

The world's soils have the capacity to store large amounts of carbon, and can serve as an effective global sink for the carbon that terrestrial plants remove from the atmosphere via photosynthesis. The release of that carbon through soil respiration, and the factors that affect it, are not completely understood. This research sheds light upon two factors that affect the release of CO₂ from a clay soil in central Texas. From our preliminary data, it is not clear that either factor, temperature or vegetative growth, has a major role affecting short-term changes in respiration from this soil, a Greenvine Clay. Because of its high shrink/swell capacity, other factors such as soil aeration due to cracking may play a larger role than either of the other two variables. Precipitation regime may also play a more important role, and the potential investigations of many variables are being considered.

P569 Terrestrial Ecology and Management

EFFECTS OF THE INVASIVE SHRUB *LIGUSTRUM JAPONICUM* (OLEACEAE) UPON PLANT SPECIES DIVERSITY WITHIN AUSTIN, TEXAS, USA

Scott D. Catone*, and William J. Quinn, St. Edward's University, Austin, Tx

Non-native, invasive plant species have long been shown to threaten, and ultimately reduce, biodiversity within ecosystems. One of these species, *Ligustrum japonicum*, has locally begun to gain notoriety as an invasive pest. This hardy, opportunistic shrub exhibits highly adaptive characteristics of invasion, occupying niches typically dominated by regional species such as *Juniperus asheii*. This pilot study utilized a Simpson's Diversity Index to contrast a series of plots within a stand of successfully established *L. japonicum*. Three sites, in varying stages of treatment, were examined along riparian zones within Blunn Creek Nature Preserve (Austin, TX). This work was performed to determine the influence that *L. japonicum* may create on the biodiversity of flora native to the Edwards Plateau region. As a pilot study, the resulting data creates a framework for future research- ideally in the form of a longitudinal study.

P408 Terrestrial Ecology and Management

MOLECULAR IDENTIFICATION OF COYOTE SCAT

Jessica Lyon* and David L. McCulloch, Department of Biology, Collin College, Plano, TX

The adaptability of wildlife to urban environments is well documented. While the use of natural areas and parks is not unexpected, surprisingly residential areas can make up a large portion of a wild animals urban habitat use. Viewing wildlife in an urban setting can be a worthwhile experience; however for cohabitation to be successful it is important that there be minimal conflict with humans. This can be difficult in multi-use landscapes that are inhabited

by both people and predators. It is critical that wildlife managers be able to conduct surveys that accurately reflect these populations. Large urban mammals are low in density, occupy fragmented habitats, and as secretive species are difficult to detect. More traditional survey methods may not be appropriate or adequate, especially if there is public opposition to the trapping and handling of animals. Noninvasive genetic sampling has proven especially useful under these conditions. Sampling such as this typically involves the use of PCR-amplified DNA extracted from hair or scat. In this study a 234 bp segment of cytochrome b was amplified from mtDNA extracted from the scat of urban coyotes (*Canis latrans*). The PCR product was digested using the restriction endonucleases AseI, BamHI, DdeI, and HpyCH4V. The resulting gel fragment patterns permitted the identification of coyotes from their scat. This protocol can also be used to identify other urban predators such as dog, gray fox, cat, bobcat, and cougar.

Late Breaking Research

ASSESSMENT OF ENVIRONMENTAL ESTROGENS IN THE GALVESTON BAY WATERSHED

Zuri Dale*^a, Katoria R. Tatum-Gibbs^a, Bobby L. Wilson^a and Renard L. Thomas^{b, a}, Department of Chemistry/Environmental Toxicology Program, Texas Southern University, Houston Texas 77004, ^b College of Pharmacy and Health Sciences, Texas Southern University, Houston, Texas 77004

Given the number of pharmaceuticals, steroids, and other organic compounds that make their way into wastewater, there is great concern about wastewater treatment plant effluents that are released into the ecosystem. Thus, the primary goal of this study was to investigate the potential presence of environmental estrogens (EEs) in the lower Galveston Bay Watershed. The research objectives were to assess the concentration of EEs in the lower Galveston Bay Watershed, specifically San Jacinto River System and the Trinity River System, and to investigate the EE contribution of three wastewater treatment plants (WTPs) with outflow dumping into Buffalo Bayou. This water quality assessment discovered estrone, ethinyl estradiol and estriol throughout the Lower Galveston Bay Watershed in concentrations that pose a significant ecological concern to Galveston Bay ecosystems. The second research objective was to assess the potential impact of the EEs discovered in the watershed through cellular viability studies of *Poeciliopsis lucida* hepatocellular carcinoma cell line and Rainbow trout gonadal cell lines (PLHC-1 and RTG-2 respectively). The viability study showed increased cellular viability for both cell lines exposed to EE concentrations similar to concentrations found in the watershed. Thus, it was concluded that these potentially harmful compounds in the watershed could adversely affect the environmental health of the Galveston Bay Ecosystem. Furthermore, the high levels of ethinyl estradiol and estrone in Lake Houston is of great concern, because Lake Houston is the source of 75 % of drinking water for the city of Houston.

Late Breaking Research

REPEATED DOSE RESPONSE IN PROSTATE CANCER CELLS SHOWS RESISTANCE TOWARDS DASATINIB

Shamail Allen*¹, Dr. Timothy J. McDonnell², Dr. Gary Gallick² ¹Department of Biology, Texas Southern University, Houston, TX, ²The University of Texas Graduate School of Biomedical Sciences at Houston, M.D. Anderson Cancer Center, Houston, TX

Increased activity of the Src family of protein tyrosine kinases (SFK) is associated with progressive stages of prostatic cancer tumors and is important in growth of bone metastases. Few therapeutic treatments show efficacy against late stage prostate cancers. Thus, determining if Src inhibitors in clinical trial affect this process is very important. In this study we used Dasatinib, which is a small molecule SFK/Abl kinase inhibitor. We examined effects of Dasatinib towards Src in an *in vitro* dose response, using prostate cancer cells (PC3) and Lncap Cells. Dasatinib works by blocking Src's binding site where phosphate is normally regulated; therefore stopping the process of phosphorylation of Src. However, many tumors that initially respond to therapy become resistant. As yet, we do not know if Dasatinib-resistant prostate cells exist. Therefore, we repeatedly added Dasatinib to prostate cancer cells and examined the effects. Our current research will be a more relevant process of determining if repeated exposure to dasatinib causes changes in cells that lead to resistance, or selects for pre-existing resistant cells. There are certain answers that need to be answered if prostate cancer cells do become resistant. If the prostate cancer cells do become resistant we want to investigate the "how" and the "why" cells respond in this matter. Currently, it can be concluded that Dasatinib is an effective therapeutic treatment that inhibits Src but it may be possible that cells will become resistant to treatment.

Late Breaking Research

EFFECTS OF METAL EXPOSURE ON NORMAL OSTEOBLAST CELL DEVELOPMENT USING PRIMARY TEETH AS A BIO-INDICATOR OF EXPOSURE

Terrell Gibson*¹, Bobby Wilson², Renard L. Thomas³ ¹Environmental Toxicology Program, Texas Southern University, Houston, Texas ²Chemistry, Texas Southern University, Houston, Texas 77004 ³Health Sciences, Texas Southern University, Houston, Texas

Recent studies have identified the existence of trace metals sequestered within the teeth of adults and children. The analysis of metal concentrations within these teeth could serve as an indicator of metal exposure due to environmental risk factors and/or dietary habits. Thus, this research will perform a comparative study of the levels of trace metals in deciduous teeth with the correlated demographics of the sample sources. The correlated data will provide valuable information to what urban factors pose significant risk of trace metals exposures. Secondly, determined levels of metal exposure will be studied *in vitro* with osteoblast cells to determine the metal toxicities to human bone structures.

Thus far, deciduous and adult teeth were gathered from a variety of dental offices located in Austin, Texas, cataloged, and analyzed by Inductively Coupled Plasma Mass Spectrometer (ICP-MS). Alarming concentrations of aluminum ranged from 7.676 ug/g tooth to 653.2 ug/g were found. Of equal concerns were the concentrations of lead (206), lead (207), and lead (208). These isotopes of lead were found to be in concentration of 2.741 ng/g to 17.19 ug/g, 39.53 ng/g to 16.95 ug/g, and 9.47 ng/g to 17.41 ug/g, respectively. Significant levels of titanium, chromium, manganese and copper were also found.

The broader impact of this project is to correlate trace metals exposures of urban children with the urban environmental risk factors to develop valuable human bioindicator from potential environmental risk of the urban environment.

Late Breaking Research

PROSPECTING FOR HYBRIDS: MOLECULAR AND MORPHOLOGICAL EVIDENCE OF HYBRIDIZATION IN THE GRASS SUBSPECIES COMPLEX *DICHANTHELIUM ACUMINATUM*

Rick Hammer*, Hardin-Simmons University, Abilene, TX

Dichanthelium acuminatum, commonly called “panicgrass”- is a subspecies complex of grasses common to much of North America with the range of the taxa extending into northern South America. Determination of the number of taxa to include in the complex has been problematic. Taxonomic treatments over the last 100 years have included anywhere from 8 to 170 taxa in the complex. The most recent treatment, for the Flora of North America, recognized 10 subspecies. The difficult and confusing taxonomy is the result of extensive morphological variation found among members of the complex. Some taxonomists have proposed that autogamy and hybridization are a common means that account for much of the morphological variation and thus the taxonomic difficulty encountered. The present study was undertaken as an attempt to document hybridization among members of the complex and of the genus, given its likely evolutionary role. A major impetus for this work was the discovery of a “ready-made” molecular marker in *Dichanthelium acuminatum* subsp. *lindheimeri* from DNA sequence data from the nuclear *waxy* (GBSSI) gene. A PCR-RFLP based marker was designed to assay for the haploid presence of subsp. *lindheimeri* in a given *Dichanthelium* genome. Field surveys were conducted to locate *Dichanthelium acuminatum* subsp. *lindheimeri* and other *Dichanthelium* species occurring sympatrically, and where found, tissue samples were collected along with the entire plant as a voucher. PCR-RFLP analysis of the collected tissue samples revealed two putative *Dichanthelium* hybrids which were later confirmed as such with DNA sequencing and with preliminary morphological data.

Late Breaking Research

P SHIFT IN BACTERIAL COMMUNITIES OF SEDIMENT FROM A SOUTHEAST TEXAS BRACKISH MARSH DUE TO SEAWATER INUNDATION: A SIMULATION OF HURRICANE IKE STORM SURGE IMPACTS

Christina C. Rainey, Hunter E. Keeney, and Matthew P. Hoch, Lamar University, Beaumont, TX

Hurricane Ike made landfall in Southeast Texas on 13 September 2008 and the associated storm surge inundated coastal marshes for about ten days. Hurricane storm surge can devastate marsh vegetation by physical scour and salinity stress, and it may also impact microbial communities and the biogeochemical processes of marsh sediments due to increased osmotic stress and sulfate supply. An experimental simulation of Hurricane Ike’s inundation of a brackish marsh was used to test how flooding and sea salts affect sediment microbial communities. Replicate sediment cores were treated by flooding for 10 days with 0.5 m of seawater or distilled water, and third set of replicate cores were kept moist as a control. DNA was extracted from sediments and then portions of the 16S rRNA genes of all *Eubacteria* and specifically sulfate reducing bacteria (SRB) of the delta-*Proteobacteria* were amplified by polymerase chain reaction (PCR) and analyzed by denaturing gradient gel electrophoresis (DGGE). Subsequent cluster analysis of bacterial community DGGE fingerprints reflected unique shifts in treatments relative to controls, especially for sediment

collected from 5-10 cm depths in cores. Seawater impacts on microbial communities were distinct from those of the freshwater treatment; thereby, sea salts and not simply anaerobic conditions due to flooding selected a community distinct from the control. Sulfur biogeochemistry impacts were apparent from the SRB community change and enhanced sulfide production in the seawater treatment. Enhanced SRB activity in low salinity marshes inundated by hurricane storm surge may contribute to vegetation loss or slow recovery due to sulfide toxicity.

Late Breaking Research

P DEFYING THE RED QUEEN HYPOTHESIS? ASEXUAL MOLLIES ARE NOT MORE SUSCEPTIBLE TO PARASITE INFECTION THAN SEXUALLY REPRODUCING MOLLIES

Adrian Silva*, Leopoldo Garza* and Brian L. Fredensborg, UTPA

Ecological theory predicts that the evolution and maintenance of sex is driven by a selective advantage of maintaining a high genetic diversity to be able to evolve in response to a changing environment, predators and parasites (termed the Red Queen Hypothesis). While the Red Queen Hypothesis has been demonstrated among invertebrates it has rarely been addressed among vertebrates where very few asexual species exist. In this study, we compared the parasite fauna of two closely related mollies. *Poecilia formosa* exclusively reproduces asexually while *P. latipinna* only reproduces sexually. We specifically addressed two questions: 1) Does the asexually reproducing *P. formosa* have more parasites than the sexually reproducing *P. latipinna*? 2) Do parasites have a stronger negative effect on the fitness of *P. formosa* compared to *P. latipinna*? We collected a minimum of 20 specimens of each species by seining in five irrigation canals in the Rio Grande Valley in the fall of 2009. The numbers of three parasite species with a presumably strong negative effect on host fitness were compared between the two species (metacercariae of *Centrocestus formosanus*, *Diplostomum* sp. (eyefluke), and an unidentified digenean metacercariae). We found no difference in the number of *Diplostomum* sp. and the unidentified metacercariae between the two fish species. Contrary to our expectations, we found more *C. formosanus* metacercariae in the gills of *P. latipinna* compared to *P. formosa*. There was no relationship between the number of parasites found and the body condition index of the two species. Our results therefore do not support the Red Queen Hypothesis. Ongoing research is investigating the susceptibility to parasite infection using experimental infection challenges.

Late Breaking Research

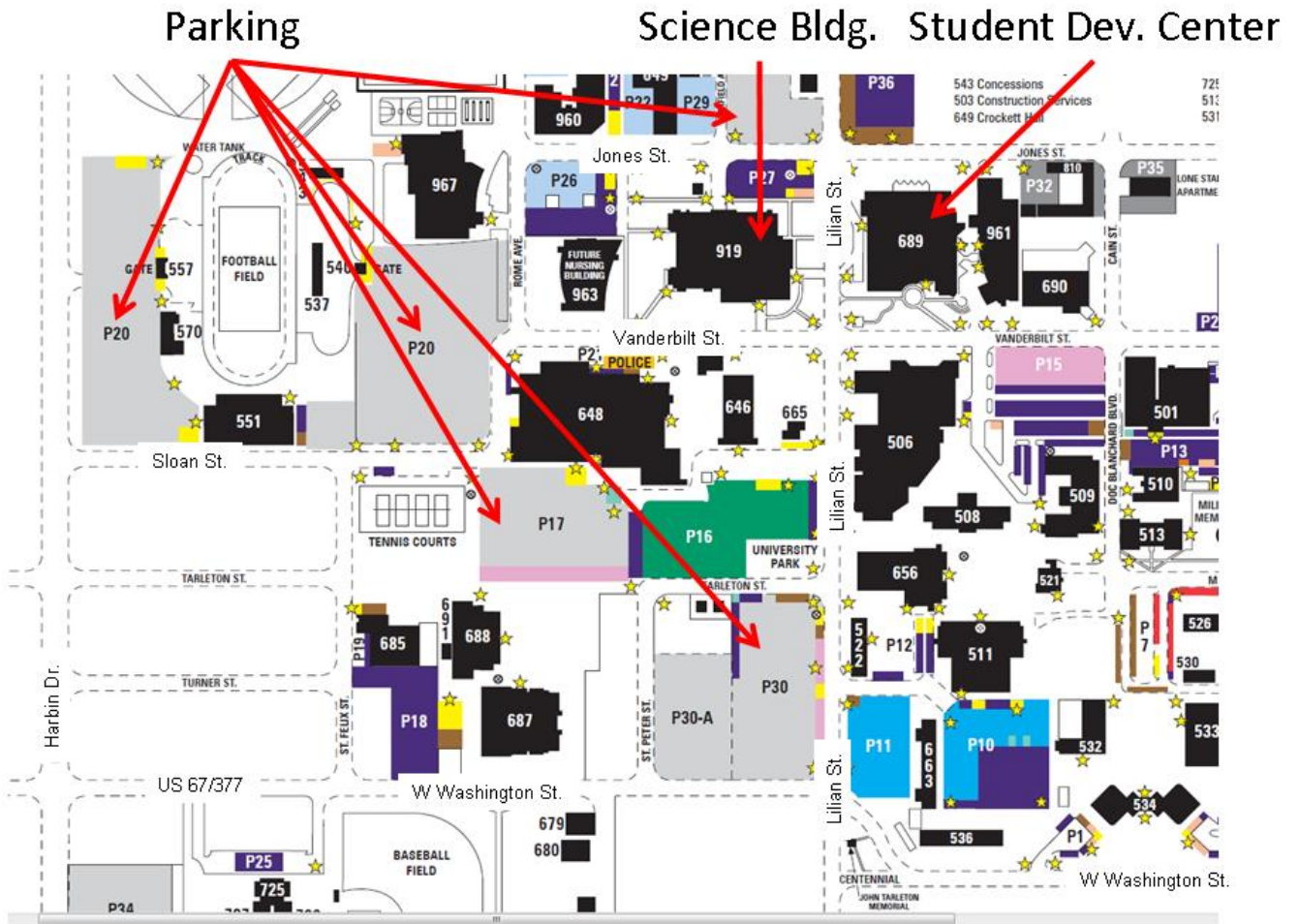
P WHAT DO PINES PREFER: SAND OR CLAY?

Nikolaas Van Kley*, Christ Episcopal School, Nacogdoches, TX, James Van Kley, Stephen F Austin State University, Nacogdoches, TX

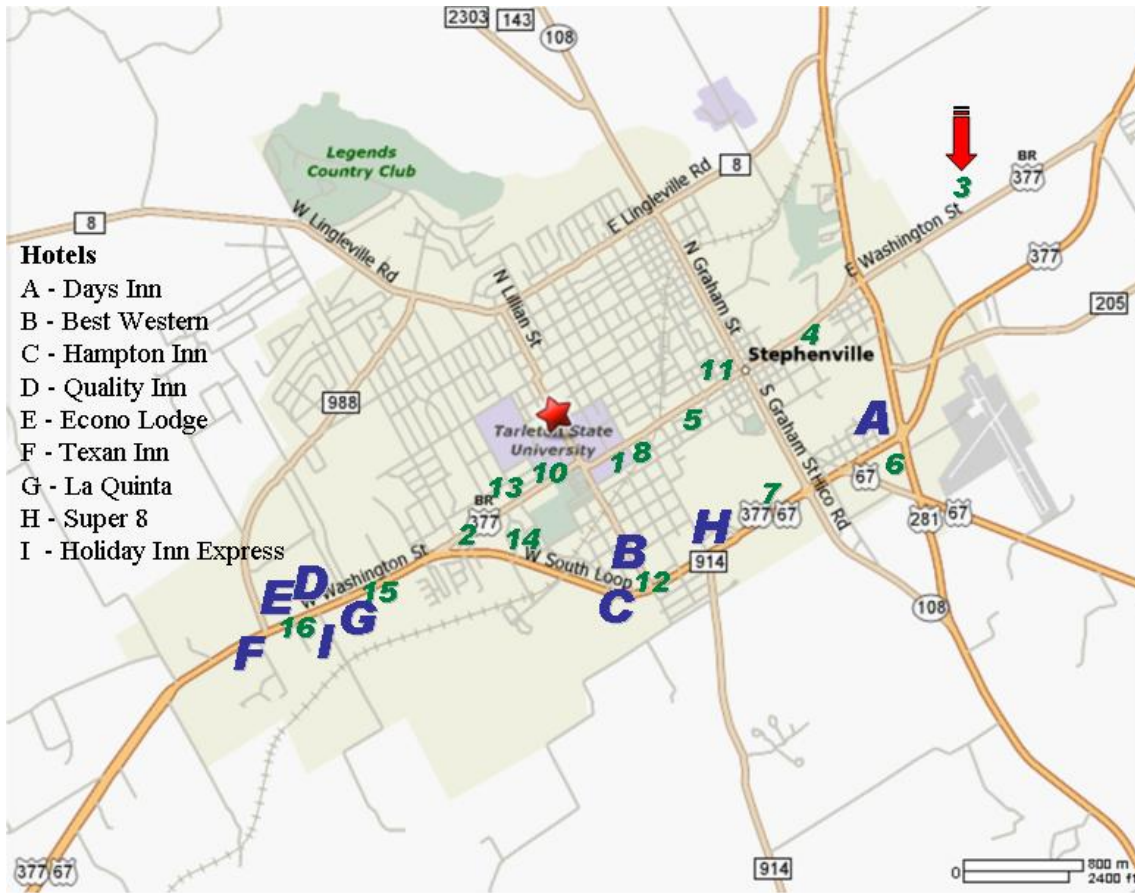
Historically, hardwood-dominated upland forests in east Texas were often restricted to clayey soils while most other upland sites were pine-dominated or mixed stands. This study investigates whether pine dominance on a natural forested upland area on the SFA campus known as "Hunt's woods" is greater for sandy soils than for clay. Portions of this property are mapped as the clayey "Trawick" soil while much of the remainder is the sandy "Teneha" soil. For each soil type a random transect was established and the basal area (BA) of pines and hardwoods determined by the Bitterlich variable plot method at 11 points at

20m intervals. Relative basal area (RBA) was calculated for pines and hardwoods for both soil types and compared using a T-test. Pine RBA from the sandy Teneha soil ranged from 47%-92% and hardwood RBA was 8%-53%. Pine RBA from the clay Trawick soil was only 0%-29% while hardwood RBA was 71%-100%. A T-test indicated that the mean pine RBA on the Teneha soil was significantly different from that of the Trawick soil. We conclude that for this this property, hardwoods indeed dominate on clay while high pine BA is associated with the the sandy Teneha soil.

Tarleton State University Campus Map



Stephenville City Map and Restaurant Guide



- Hotels**
- A - Days Inn
 - B - Best Western
 - C - Hampton Inn
 - D - Quality Inn
 - E - Econo Lodge
 - F - Texan Inn
 - G - La Quinta
 - H - Super 8
 - I - Holiday Inn Express

- Restaurants**
- 1 - Montana Bar & Grill
 - 1 - McDonald's
 - 2 - Pizza Hut
 - 2 - Santa Fe Taco
 - 3 - Agave Bar & Grill
 - 4 - Jake & Dorothy's Cafe
 - 4 - Reynaldo's (Mexican)
 - 5 - Don Nico's (Mexican)
 - 6 - Hard 8 BBQ
 - 7 - Mascorro's (Mexican)
 - 8 - Subway
 - 10 - Dairy Queen
 - 11 - Rockin' P Bar & Grill
 - 12 - Bull Nettle Bar & Grill
 - 12 - Peacocks (American)
 - 12 - Pizza Place
 - 13 - Arby's
 - 13 - China King
 - 13 - Mi Familia (Mexican)
 - 13 - Quiznos
 - 14 - End Zone Pizza
 - 14 - Fiddle Creek Steakhouse
 - 14 - Grumps (burgers etc.)
 - 15 - Kentucky Fried Chicken
 - 15 - Taco Bell
 - 15 - Chili's
 - 15 - Jack in the Box
 - 16 - Pastafina Italian
 - 16 - CiCi's Pizza
 - 16 - Whataburger
 - 16 - Cotton Patch (American)
 - 16 - Chicken Express

Numbers on map indicate general, not exact, locations

= Banquet location ("City Limits/Agave")

Notes

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