

SCHEDULE OF EVENTS

DATE	TIME	ACTIVITY	LOCATION
THURS 3/3/11	4:00 pm – 8:00 pm	REGISTRATION AND CHECK-IN	JBWN Lobby
	6:30 pm – 8:30 pm	TAS SOCIAL	3 rd Floor, Mabee ABC Ragsdale Center
	7:30 pm – 8:30 pm	STRATEGIC PLANNING WORKSHOP	Ragsdale Center, Lucas Room
	7:30 pm – 8:30 pm	GRAD SCHOOL 101 PANEL PRESENTATION	Ragsdale Center, Jones Auditorium
FRIDAY 3/4/11	7:30 am - finished	REGISTRATION, CHECK-IN, EXHIBITORS & BREAKFAST	JBWN Lobby
	9:00 am – 5:00 pm	SPECIAL SYMPOSIUM: THE ROLE OF ENGINEERING IN THE LIBERAL ARTS	JBWN 206
	9:00 am – 10:15 am	ORAL PRESENTATIONS SESSION #1	JBWN or Moody Hall
	10:15 am – 11:00 am	POSTER PRESENTATIONS SESSION #1	Maloney Room, Main Building
	11:00 am – 12:15 pm	ORAL PRESENTATIONS SESSION #2	JBWN or Moody Hall
	12:30 pm – 1:30 pm	LUNCH & BUSINESS MEETING (which starts at 1)	3 rd Floor, Mabee ABC Student Center
	1:45 pm – 2:30 pm	POSTER PRESENTATIONS SESSION #2	Maloney Room, Main Building
	2:30 pm – 3:45 pm	ORAL PRESENTATIONS SESSION #3	JBWN or Moody Hall
	3:45 pm – 5:15 pm	SPECIAL OPPORTUNITY: THIS IS YOUR BRAIN ON NEUROSCIENCE – CHECK IT OUT!!	JBWN 204
	4:30 pm – 5:10 pm	SECTION CHAIRS MEETING	JBWN 205
	4:15 pm – 5:00 pm	POSTER PRESENTATIONS SESSION #3	Maloney Room, Main Building
	5:15 pm – 6:15 pm	DISTINGUISHED TEXAS SCIENTIST LECTURE: DR. GEORGE KATTAWAR	Ragsdale Center, Jones Auditorium
	7:00 pm	ANNUAL BANQUET AND AWARDS PRESENTATION	BOB BULLOCK MUSEUM

Polarized Light in Nature

Professor George W. Kattawar
Department of Physics and Astronomy
Texas A&M University
TAS Distinguished Texas Scientist-2011

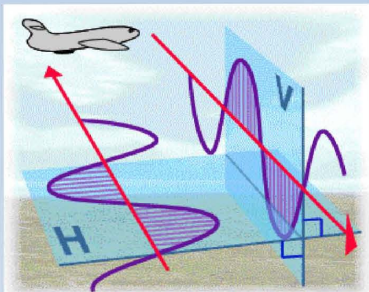


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115th Annual Meeting

March 1 - 3, 2012

Sul Ross University

Alpine, Texas

THESE PEOPLE DESERVE A BIG CHEER!

PROGRAM COMMITTEE:

Dr. Ben Pierce, TAS President
 Dr. Pati Milligan, TAS Webmaster
 Mr. Clint Burks, Husband of Program Chair
 Ms. Diane Hyatt, TAS Secretary
 Dr. Cathy Early, Awards Committee Chair
PLUS ALL 16 TAS SECTION CHAIRS

SPECIAL EVENT PLANNERS:

Dr. Veronica Acosta, University of Incarnate Word
 Dr. Russell Frohardt, St. Edward's University
 Dr. Fay Guarraci, Southwestern University
 Dr. John Sieben, Texas Lutheran University
 Dr. Lorne Davis, Texas Lutheran University

STUDENT AWARDS:

Dr. Don Harper, Research Awards
 Dr. Lynn McCutcheon, Collegiate Academy
 Dr. David Marsh, Collegiate Academy
 Dr. Ray Mathews, TOES Award
 Dr. Elise Campbell, Mathematics Award
 Dr. Jim Collins, Graduate Student Awards
 Dr. Jason Locklin, Graduate Student Awards

ON-LINE REGISTRATION:

TAS Executive Secretary Dr. Andrew Kasner

WORKSHOP & FIELD TRIP PLANNERS:

Marsha May, TPWD
 Dr. Chris Baker, SFASU, Geosciences
 Dr. LaRell Nielson, SFASU, Geosciences
 Mitch Robinson, Wild Basin Reserve
 Dr. Bill Quinn, St. Edward's University
 Dr. Damon Waitt, Lady Bird Johnson Center

St. EDWARD'S NATURAL SCIENCE FACULTY:

Bold = Additional service or recognition to TAS
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 BRO. RICHARD CRITZ, CSC, Assistant to the Dean
 LAURA MUNOZ, Administrative Coordinator
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DR. PATRICIA BAYNHAM, Associate Professor, Biology
 DR. JOEL BERGH, Post Doctoral Associate, Biology
 DR. MEGAN BOULLETTE, Biology Instructor, Biology
 DR. LISA GOERING, Assistant Professor, Biology
DR. OSVALDO HERNANDEZ, Assistant Professor, Biology
DR. ALLAN HOOK, Professor, Biology
DR. PETER KING, Associate Professor, Biology
 DR. JIMMY MILLS, Professor Emeritus, Biology
 DR. FIDELMA O'LEARY, Associate Professor, Biology
DR. BILL QUINN, Professor, TAS Past President, Biology
 DR. ANDREW WOODWARD, Visiting Assistant Professor, Biology
 DR. HENRY ALTMILLER, Professor, Chemistry
 DR. EAMONN HEALY, Professor, Chemistry
 DR. MARY KOPECKI-FJETLAND, Associate Professor, Chemistry
 DR. CANDACE LAWRENCE-ZERINGUE, Post-Doc, Chemistry
DR. J.D. LEWIS, Professor, Chemistry
 DR. DONALD WHARRY, Post-Doc Associate, Chemistry
 DR. LAURA BAKER, Professor, Computer Science
 DR. JOHN CAMDEN, Assistant Professor, Computer Science
DR. MICHAEL KART, Assistant Professor, Computer Science
 DR. JAMES MCGUFFEE, Associate Professor, Computer Science
 DR. MICHAEL OTTEN, Assistant Professor, Computer Science
 DR. DAVID WRIGHT, Associate Professor, Computer Science
 BRO. ROMARD BARTHEL, C.S.C., Professor Emeritus, Mathematics
 DR. JASON CALLAHAN, Assistant Professor, Mathematics
 DR. EDWARD EARLY, Assistant Professor, Mathematics
 DR. CAROL GEE, Assistant Professor, Mathematics
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 DR. JEAN MCKEMIE, Professor, Mathematics
 DR. DAVID NAPLES, Associate Professor, Mathematics
 DR. MICHAEL SACLOLO, Associate Professor, Mathematics
 DR. RICHARD KOPEC, Professor, Science
 MICHAEL SCIOLI, Instructor, Science
 DR. PAUL WALTER, Assistant Professor, Science

VENDORS:

University of Texas Pan American
 McBain Systems – microscopes
 Texas Parks & Wildlife Department

STUDENT PANELISTS:

Alex Hall, Southwestern University
 Stacy Stoops, Sam Houston State
 Milly Lee, Texas A&M
 Taylor Jones & Anna Frankel, TCU

With deep appreciation for your dedication to the success of the Texas Academy of Science,

Dr. Romi L. Burks, 2011 TAS Program Chair
 2011-2012 TAS PRESIDENT

**Letter from the President of the Texas Academy of Science
Dr. Benjamin A. Pierce**

Welcome to the 114th Annual Meeting of the Texas Academy of Science! This meeting, held on the campus of St. Edward's University in Austin, promises to be one of our biggest and best meetings ever. We have almost 200 oral presentations and 150 poster presentations in 14 different areas of science, from anthropology to physics to terrestrial ecology. Reflecting our mission of helping to prepare young Texas scientists, approximately 260 of the oral and poster presentations—76%—are being made by graduate and undergraduate students. In addition, Dr. John Sieben has organized a special symposium on "The Role of Engineering in the Liberal Arts." It will be a great time to meet old friends and colleagues, make new contacts, and hear about the latest advances in Texas science.

At this meeting, we kick off a year-long effort to develop a strategic plan for the Texas Academy of Science. The nature and practice of science are changing rapidly, and our Academy also must change to continue its success. This strategic planning process begins with this meeting and you can participate in several ways.

First, I hope you will take time to attend a special workshop on the future of the Texas Academy of Science held on Thursday evening. At this workshop, we will solicit your thoughts and ideas about how the Academy can be more effective in the future. Second, complete the brief survey on TAS that is available in the registration area. This survey, which takes only a few minutes to complete, will provide important information about the role and success of TAS. Third, sign up to be a member of one of the strategic planning committees. Each of these committees will work over the summer and fall to provide goals and recommendations for specific areas of Academy work. With input from the workshop, survey, and committees, we will develop a set of long-range goals and action steps that will be presented to the membership at next year's annual meeting in Alpine. Major scientific meetings such as this one do not happen by accident. A tremendous amount of planning has gone into making this meeting a success and many people have played a role. We are especially indebted to the Program Chair of this year's meeting, Romi Burks and the Local Host, Cindy Naples, along with all the faculty, students, and staff at St. Edward's University who have contributed in many ways. Have a great weekend!

Ben Pierce
President, Texas Academy of Science





STATE OF TEXAS
OFFICE OF THE GOVERNOR

Greetings:

As Governor of Texas, I am pleased to welcome everyone to Austin for the 114th annual meeting of the Texas Academy of Science.

The 21st century continues to usher in a landmark era of ingenuity and scientific exploration, demanding an increasingly specialized workforce capable of building on the progress that has been achieved. Texas' workforce must be continually renewed and refined through education if we want to maintain our edge and compete for jobs. For more than a century, the Texas Academy of Science has done just that — taking bold steps to realize the full potential of young Texans by awarding thousands of dollars in research grants.

I commend the scientists and educators present for their dedication to our students, and I join you all in congratulating tonight's award recipients: Dr. George Kattawar for the Distinguished Texas Scientist Award and Martha McLeod for the Texas Outstanding Educator Award. Together, you represent the best of the Lone Star State.

To those who traveled to be here, I hope you enjoy your stay in our capital city. From historic landmarks to beautiful scenery, Austin has something for everyone to enjoy.

First Lady Anita Perry and I send best wishes for an enjoyable and memorable evening.

Sincerely,

A handwritten signature in black ink that reads "Rick Perry". The signature is written in a cursive, flowing style.

Rick Perry
Governor



ST. EDWARD'S UNIVERSITY

OFFICE OF THE PRESIDENT

March 4, 2011

Dear Scientists,

On behalf of the entire St. Edward's community, I welcome you to the 114th meeting of the Texas Academy of Science. As a charter member of the Academy, St. Edward's University is honored to host the largest meeting of the Academy to date. Hosting this important annual meeting celebrates a historic collaboration between the Academy and St. Edward's, two organizations that are dedicated to fostering scientific research, education and service.

Thank you for your active support of the Academy. You should be especially proud of the way in which you are developing the next generation of scientists in Texas through mentoring, substantial financial support and volunteer work. You have earned the gratitude of our society.

This meeting is also an occasion to honor the Texas Outstanding Educator and the Distinguished Texas Scientist. This year's winner of the Texas Outstanding Educator award is Martha McLeod, a science teacher at the Fulton Learning Center in Rockport, Texas. George W. Kattawar, professor of physics and astronomy at Texas A&M University, has been selected as Texas Scientist of the Year. Congratulations to both of them.

In closing I want to add my personal thanks for your dedication to the sciences and to educating future generations of scientists in the state and beyond. Your work is of crucial importance to providing the kind of research, service and education upon which the future of Texas and the nation will be built.

Sincerely,

George E. Martin, Ph.D.
President

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**2011 Texas Distinguished Scientist
Dr. George W. Kattawar**



George W. Kattawar, is an internationally renowned expert in optics and a Professor of Physics & Astronomy and a member of the world-renowned Texas A&M Institute for Quantum Science and Engineering (IQSE). He earned his bachelor's of science degree from Lamar University with highest honors and received both his master's of science and PhD degrees from Texas A&M University on a National Defense and Education Act Fellowship. Before coming to Texas A&M, he held positions at Los Alamos Scientific Laboratory, Esso Production Research and the University of North Texas.

His research interests span the gamut of optics and applied physics and have resulted in significant contributions in such diverse areas as biomedical optics, radiative transfer in planetary atmospheres, ocean optics, cloud property studies related to global warming, invisibility cloaking using metamaterials, ultrashort laser propagation in water, anthrax detection, and camouflage in cephalopods. In addition to being the author or co-author of nearly 200 publications in scholarly journals, he is co-inventor on three patents with two more pending.

A fellow of the Optical Society of America since 1976, he was elected to two, three-year terms on the National Research Council's Committee on Recommendations for U.S. Army Basic Scientific Research and served as a major consultant to the U.S. Navy for several secret projects related to national defense. In 2009 he was selected to serve on the External Advisory Board of the Stevens Institute of Technology charged with assessing their physics and engineering programs. In 1981 he received the Amoco Foundation Award for distinguished teaching, and in 1990 he won a Teacher/Scholar Award. He is a former associate editor of the Journal of Geophysical Research: Oceans and the Journal of Transport Theory and Statistical Physics.

In addition to chairing the Texas A&M Department of Physics and Astronomy's Graduate Admissions Committee for more than 30 years, he served as the College of Science representative on a committee chosen in 1982 by newly appointed President Dr. Frank Vandiver to create a faculty senate at Texas A&M.

**2011 Outstanding Texas Educator
Martha Elizabeth Fiedler McLeod**



Childhood background – in her own words

I was born and raised in the deep brush country of South Texas on a farm/ranch. There were 8 of us kids; we grew up with older parents of German descent (my dad's mother and my dad's paternal grandfather came over to the U.S. as German immigrants). I was #7 in the line-up. That had its advantages and disadvantages.

My dad worked from sunrise to sunset every day of the week except for Sundays. He instilled in his children a strong work ethic that I abide by even now. My mom did an outstanding job of basically taking care of all of us on her own 20 miles from the nearest town while my dad worked. That was a time before disposable diapers and color TV. Somehow they got everything done. Neither of my parents went to college. My dad had to drop out of school around the 6th grade to help his parents on their farm (my dad was the oldest son in a family of 9 and his dad was severely injured in a farming accident when my dad was around 7 years old). Even so, their love of knowledge and learning was reflected onto all of us. I can remember my mother reading books to us in the evenings before bedtime while we waited for my dad to get home. Both my parents were quite intelligent people and were always reading on their own to increase their understanding of economics, history, politics, etc.; my dad would even help me with algebra homework although he never had formal schooling in it. Both of them instilled in us a love, respect, and appreciation for the natural world around us and all of the creatures in it. Our parents never hesitated to pull off on the side of the road for us to observe, identify, and admire blooming wildflowers or a hawk perched up on the highlines.

My educational journey: I graduated from Cotulla High School in 1984 as valedictorian of my class. I was student body president; alternate to the state tennis tournament; I was a starter on the volleyball team that made it to the state semi-finals. After high school, I went on to graduate from Texas A&M University with honors with a bachelor's degree in animal science. It was here that I met my husband, Scott. My daughter Katrina was born while I was still in school. After graduation, Scott got transferred to the Panhandle area to work for the USDA. I decided to pursue teacher certification in biology. I took an additional 60 hours at West Texas State University – TAMU where I maintained a perfect 4.0 GPA.

After College

After Scott graduated from the TPWD game warden academy, we were transferred to Rockport in 1992 and have lived here ever since. I have taught science every year at various grade levels (2nd grade up to 6th grade). It is my true love of the subject that keeps me going year after year. At times, teaching science seems more like a hobby than a job as my little ducks, quail, and chickens hatch out in the classroom incubator and the students squeal with excitement to handle and observe them. Toiling around with plants is another hobby for me. I decided a few years ago it was easier to plant nectar-producing plants rather than putting out hummingbird feeders. So I learned all I could about landscaping and gardening and put that knowledge into creating gardens here at school with the kids. This "kills 2 birds with 1 stone": the wildlife benefit and so do the kids.

Recent Honors and Awards:

2010

*Finalist for Presidential Award for Excellence in Math and Science Teaching

*School recycling project was state finalist for Texas Commission on Environmental Quality Environmental Excellence Awards in the Youth category

2009

School gardens were put on the official "Hummer Home Tour" during the community's annual Hummer/Bird Celebration in both 2009 and 2010

2008

School gardens are certified as official "Wildscapes" by Texas Parks & Wildlife and as a "Wildlife Habitat" by the National Wildlife Federation

2007

Fulton 4-5 Learning Center Teacher of the Year

Aransas County ISD Elementary Teacher of the Year

Region 2 Elementary Teacher of the Year

Elementary education teacher award for environmental conservation by the San Patricio Soil and Water Conservation District

2011 Fellows of the Texas Academy of Sciences

Dr. Richard J. Wilson Patrock

Dr. Richard Patrock earned a B.S. in Natural Resources (Integrated Pest-Management) from the University of California in Berkeley, CA in 1978. He later went on to complete a M.S in Entomology and Nematology from the University of Florida in 1986 and a Ph.D. in Zoology at the University of Texas in Austin, TX in 1995.

Patrock spent several years as a Post-Doctoral Fellow and Assistant Research Scientist at UT Austin and 2 years at Universidad Nacional De Quilmes in Argentina studying the biological control of the red imported fire ant using *Pseudacteon* phorid flies. He was also an instructor and lecturer at UT Austin for over a decade and has served as a Visiting Assistant Professor at Southwestern University in Georgetown, TX and St. Edward's University in Austin, TX. He has published 15 peer-reviewed articles since 2002 and authored or coauthored several presentations at regional and international scientific meetings, including several invited talks in Mexico. Patrock frequently presents at the Texas Academy of Science and has served as the Chair of the Terrestrial Ecology and Management section since 2009.

Dr. J.D. Lewis

Professor of Chemistry

St. Edward's University



Dr. J.D. Lewis earned a B.S in Chemistry from Texas Lutheran College in 1969 and a Ph.D. in Physical Chemistry in 1974. He next served as a Post-Doctoral Associate (1974) and Visiting Assistant Professor (1974-1975) at the University of Nebraska in Lincoln, NE. In 1975 he returned to Texas to teach at St. Edward's University in Austin, TX where he has since served as Division Chair (1980-1989) and Dean (1990, 1997).

Lewis's research focuses on spectroscopic studies of the effect of intramolecular hydrogen bonding and other interactions on the molecular geometry of aliphatic and aromatic alcohols. He has involved numerous undergraduates in his research, many of whom have gone on to present their results at regional and national meetings. Lewis has been a part of the Texas Academy of Science since the 1980's and his students have been doing presentations at TAS meetings since the 1990's. Because of the benefit to himself and his students to learn about research in science fields beyond a single discipline, he has worked tirelessly at St. Edward's to provide funds to support student participation in TAS meetings.

2011 Fellows of the Texas Academy of Sciences



Dr. P. Raelynn Deaton

Assistant Professor of Biology

Sam Houston State University

Dr. Raelynn Deaton earned a B.A. in Biology from Berea College, Berea, KY in 1995. In 2001, she earned an M.S. in Biology from the University of New Orleans, New Orleans, LA where her thesis research focused on the effects of predation on substrate choice in the naked goby,

Gobiosoma bosc. She went on to complete a Ph.D. in Zoology at the University of Oklahoma (2006) where her dissertation research focused on the mechanisms of sexual selection in a livebearing fish in a coercive mating system (western mosquitofish: *Gambusia affinis*).

While Deaton continues to investigate sexual selection in livebearing fish, she is also interested in fish ecology, population genetics, speciation and conservation biology. She is currently working on population dynamics and food web ecology of two endangered fish species in a west Texas Spring, mechanisms of reproductive isolation and genetic structure of isolated populations in a species of moquitofish endemic to Texas springs, and conservation genetics of box turtles and the effects of urbanization on box turtle mortality and population genetic structure. At SHSU Deaton has acquired over \$650,000 in external support. She has published 14 peer-reviewed articles (with 2 more currently in revision), authored 18 presentations (not including student presentations she has coauthored) at regional and international scientific meetings, and mentored 3 MS students (7 others in progress) and numerous undergraduate students, including 7 NSF Research Experience for Undergraduates (REU) students.

Deaton's commitment to the Academy includes serving as the advisor for the SHSU collegiate chapter of TAS since 2009 and serving as the Vice Chair (2008-2010) and Chair (2010-present) of the Aquatic Sciences section.

BOARD OFFICERS 2010-2011

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2011 Program Agenda

Codes indicate the following:

- U Undergraduate (Collegiate) student Academy member
- G Graduate student (Collegiate) Academy member
- NS Non Student (Senior) Academy member

DISCLAIMER

Despite efforts of the editors, some errors and misspellings may be found in the program. Every attempt was made to correct obvious errors.

Developing the Beginning Engineering Student Within the Context of a Liberal Arts University

Sponsored by a Grant from the W. M. Keck Foundation

Purpose: to enrich, enliven, and encourage the pre-engineering programs offered in science departments in the liberal arts environment of small colleges and universities

9:00 – 9:15 am Welcome: Dr. John T. Sieben

9:15 – 10:15 am - Defining and Distinguishing Engineering As a Unique Intellectual Discipline
Dr. Billy V. Koen, Professor Emeritus, University of Texas, Author of Discussion of THE Method, Oxford U. Press

-----10:15 Break; 10:30 – 11:00 TAS Poster Session I-----

11:00 – 11:45 am - How Can Engineering Enrich the Education of a non-STEM student?
Dr. Nathan Huntoon, Director of Innovation Gymnasium, Director Skunk Works, SMU

11:45 am – 12:30 pm - Who is the Proto-Engineer? Demographic Trends in Engineering
Dr. A. Dean Fontenot, Director of the Texas Tech T-STEM Center

-----12:30 Lunch & 1:45 – 2:30 – TAS Poster Session II-----

2:30 – 3:15 pm - Current Trends in the Curriculum of Engineering
Dr. César O. Malavé, Ph. D., P.E., Assistant Director of TEES, TAMU

3:15 – 3:45 pm - Skills and habits that will serve the 3/2 transfer student.
Mr. Ron Peevy, Director, Recruiting and Cooperative Education, Lamar University

-----3:45 – 4:00 pm Break-----

4:00 – 4:30 pm - What Works and What Doesn't in Implementing a 3/2 Pre-Engineering Program
Dr. Lorne Davis, Texas Lutheran University

4:30 – 5:15 pm - A Roundtable Discussion on the Future of Early Engineering Education, with questions from the floor
Moderator: Dr. John Sieben, Texas Lutheran University

Schedule

4:00 PM	Thursday Registration	JBWN Lobby
6:30 PM	TAS Welcome Social	Student Center
7:30 PM	TAS Strategic Planning Workshop	Lucas Room - Ragsdale Center
7:30 PM	Grad School 101 Panel	Jones Auditorium
7:30 AM	Friday Registration	JBWN Lobby
7:30 AM	Exhibitors	JBWN Lobby
7:30 AM	Breakfast	JBWN Lobby

Oral Presentation Session I

Anthropology - JBWN 202

9:00 AM	NS	858	The implications of a modern snail assemblage for archaeological research Steve A. Tomka*, Barbara A. Meissner, Center for Archaeological Research, University of Texas at San Antonio
9:15 AM	NS	899	Exploring chemical indicators of the use of the land snail <i>Rabdotus</i> as a food resource in prehistoric Texas Raymond Mauldin*, Antonia Figueroa, Cynthia Munoz, University of Texas at San Antonio, San Antonio, TX
9:30 AM	G	785	Documenting stable carbon isotopic composition of bone collagen in modern leporids as a guide to past environments Stephen Smith*, Robert Hard, Raymond Mauldin, and Cynthia Munoz, Department of Anthropology and Center for Archaeological Research, University of Texas San Antonio
9:45 AM	G	803	Exploring diagenetic alteration in stable isotopic signatures in bone collagen

Patricio Villanueva*, Cynthia Munoz, and Raymond Mauldin, University of Texas San Antonio, Geology and Anthropology)

- 10:00 AM G 845 **Changes in Karankawan subsistence patterns following Spanish contact**
Kelley Denham*, The University of Texas at San Antonio, San Antonio, TX

Biomedical - Moody 202

- 9:00 AM U 669 **Culberson County, Texas: The unreported county in regards to cancer occurrence**
Dianna D. Marin* and Christopher M. Ritzi, Department Of Biology, Sul Ross State University, Alpine, Texas
- 9:15 AM U 718 **Organic acids in barbeque marinade inhibit the growth of *Salmonella enterica* in chicken**
John Taylor Gabriel*, Dr. Andrew Woodward, Dr. Patricia Baynham
- 9:30 AM U 731 **The effect of skin surface area on arm tactile perception**
Madalyn Mendoza*, Roberto B Gonzales, Northwest Vista College, San Antonio, TX
- 9:45 AM U 786 **Silencing the call to arms: Loss of the drug efflux regulator MexI severely impairs production of *Pseudomonas aeruginosa* quorum signal PQS**
James V. McCann*, Carolina Corkill, Stephen Wells, Marvin Whiteley, and Megan L. Boulette, St. Edward's University Department of Biological Sciences, Austin, Texas
- 10:00 AM U 689 **Bioactive coatings with BMP-2: stage 1**
Marziya Hasan*, Texas Lutheran University, Seguin, TX and Stefanie Crumlett Shiels, University of Texas at San Antonio, San Antonio, TX

Botany - JBWN 102

- 9:00 AM U 719 **Analysis of plant diversity on the Weston Ranch, Guadalupe County, Texas, over a four year survey**
Rogers Brown*, Nicole Switzer, Alan Lievens, Mark Gustafson, Texas Lutheran University, Seguin, TX
- 9:15 AM U 883 **Spring baseline floral inventory of Hancock Hill, Brewster County, Texas**
Joshua S. Rousselow*, James C. Zech, Sul Ross State University, Alpine, Texas
- 9:30 AM NS 720 **A newly discovered evergreen swamp forest in Central Cambodia**
J. Andrew McDonald*, The University of Texas - Pan American, Edinburg, Texas, Ida Theilade and Lars Schmidt, Department of Forest and Landscape, University of Copenhagen, Nednmark, and Phourin Chhang, Forestry Administration, Phnom Penh, Cambodia
- 9:45 AM G 953 **Distribution patterns of rare South Texas flora**
Samantha Garcia*, Andrew McDonald, and Teresa Patricia Feria
- 10:00 AM G 1020 **Possible causes for the distribution of *Heliotropium tenellum* (Boraginaceae) in central Texas cedar glades**
Anna K. Boeck*, O.W. Van Auken, University of Texas at San Antonio, San Antonio, TX

Chemistry and Biochemistry - JBWN 222

- 9:15 AM U 835 **A kinetics study of Cytochrome C and Cytochrome C Oxidase**
Maria Williams*, Texas Southern University Houston, Texas Dr. Francis Millett, Dr. Lois Geren, Dr. Jeffrey Havens, Mrs. Marilyn Davis, University of Arkansas Fayetteville, Arkansas
- 9:30 AM U 756 **Purification and characterization of a 4T1 murine breast cancer cell cytotoxin from *Withania somnifera***
Tonia Perez, Rosemary Ribera, Timothy Ballinger*, Patrick Hernandez, Trevor Burrow, Regan Waters, Adam J. Reinhart and Gary O. Gray, Wayland Baptist University

- 9:45 AM U 728 **DDT degradation catalyzed by iron macrocyclic complexes**
Kema Richards*, Dwayne Rawlins, Jianguo Shao and Christopher Hansen, Midwestern State University, Wichita Falls, TX
- 10:00 AM U 896 **Intramolecular and intermolecular hydrogen bonding in very dilute solutions of diols**
Zachry Theis*, Morgan L. Baima, Beverly Pappas, Amanda H. Flores, Mary Tran, and J.D. Lewis, Department of Chemistry, St. Edwards's University, Austin, TX 78704

Freshwater I - JBWN 205

- 9:00 AM NS 1017 **Water and watershed stewardship in the Texas Hill Country: Innovative multiple approaches and stakeholders at the Llano River Field Station**
T.L. Arsuffi* (Llano River Field Station-TTU), M. Dominguez, Texas AgriLife Extension Service, Corpus Christi, TX and Z. Thomas (Llano River Field Station, Texas Tech University, Junction, TX 76849).
- 9:15 AM G 964 **Reproductive assessment across several isolated spring populations of *Gambusia geiseri***
Janalyn West*, Rachel Martin, Joseph Reeve and Raelynn Deaton, Sam Houston State University, Huntsville, TX.
- 9:30 AM G 998 **Determining how common carp (*Cyprinus carpio*) affect aquatic ecosystem dynamics in a warm water northeastern lake**
Chris Kroll* (SHSU), Jessica Sanchez (SHSU), David Legget (SHSU), Jeffery Wozniak (SHSU TRIES)
- 9:45 AM NS 921 **Feasibility of robust feedback control laws for size specification of freshwater fish populations**
Dale B. McDonald*, Midwestern State University Wichita Falls, TX
- 10:00 AM NS 864 **Bioassessment of Lake Mexia, Limestone County**
Adam Whisenant*, Texas Parks and Wildlife Department, Tyler, TX and Wilson Snyder, Texas Commission on Environmental Quality, Waco, TX.

Freshwater II - JBWN 209

- 9:00 AM G 1013 **Using benthic invertebrate abundance to determine the efficacy of wetland management practices**
Jessica L. Sanchez*, Christopher W Kroll, David Leggett, Sam Houston State University, Huntsville, Tx and Jeffrey R Wozniak, Texas Research Institute for Environmental Studies, Huntsville, TX
- 9:15 AM U 936 **Disturbing environments: Nutrient enrichment negatively impacts water stressed *Pomacea insularum* hatchlings**
Megan E. Rice* and Romi L. Burks, Southwestern University, Georgetown, Texas
- 9:30 AM U 872 **Incredible, edible eggs: Predation of apple snail (*Pomacea insularum*) eggs by a native riparian predator, the red-eared slider (*Trachemys scripta elegans*)**
Allyson L. Plantz* and Romi L. Burks, Southwestern University
- 9:45 AM U 903 **Seasonal and spatial variability of bacteria levels in the Lower Rio Grande**
Jessica M. Montemayor* and Hudson DeYoe. Dept Biology and Center for Subtropical Studies. University of Texas – Pan American, Edinburg, TX.
- 10:00 AM G 909 **Native macrophyte restoration in the San Marcos River, San Marcos, Texas**
Rachel L. Bormann* and Robert D. Doyle, Baylor University, Waco, Texas, and Mara Alexander, U.S. Fish and Wildlife Service, San Marcos, Texas

Geosciences - Moody 304

- 9:00 AM G 1002 **Vulnerability of the Carrizo-Wilcox aquifer in central Texas**

- 9:15 AM U 800 Dana D. Squires*, Texas State University, San Marcos, TX
Field study of the Susan Peak Oil Field, eastern shelf of the Permian basin, Tom Green County, Texas
 Robert L. Raney* and Joseph I. Satterfield, Angelo State University, San Angelo, TX.
- 9:30 AM NS 930 **A water budget and analysis of water chemistry for the Pine Canyon Watershed, Big Bend National Park, Texas**
 James W. Ward*, Angelo State University San Angelo, TX and Kevin Urbanczyk, Sul Ross State University, Alpine, TX
- 9:45 AM U 721 **Correlation of Dakota sandstone and lower Mancos shale in the San Juan basin, northwestern New Mexico**
 Nicolas Brandes*, Lamar University, Beaumont, TX Donald E. Owen, Lamar University, Beaumont, TX, Charles F. Head, ConocoPhillips, Farmington, NM, Joseph R. Kruger, Lamar University, Beaumont, TX
- 10:00 AM U 911 **Permian strata of the San Angelo area contain systematic fracture sets**
 C. Ruben Sayavedra* and Joseph I. Satterfield, Angelo State University, San Angelo, TX

Marine I - JBWN 243

- 9:00 AM NS 841 **The effects of freshwater discharge on the Lower Laguna Madre following landfall of hurricane Alex, July 2010**
 Joseph Kowalski*, and Hudson DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas.
- 9:15 AM U 692 **Arsenic exposure and the efficacy of shoreflies (*Diptera: Ephydriidae*) and tiger beetles (*Coleoptera: Cicindelidae*) as bioindicators of the Laguna Madre, Texas**
 Alondra Hernandez*, Amanda Cavazos, and Frank Dirrigl, Jr., Department of Biology, The University of Texas-Pan American
- 9:30 AM U 686 **Effects of exopolymeric substances (EPS) on engineered nanoparticle transport (EN) into marine phytoplankton cells Phase I: Dissolution kinetics of quantum dots in aquatic systems**
 Jessica Spurgin*, Saijin Zhang, Kathleen A. Schwehr, and Peter H. Santschi, Texas A&M University at Galveston, Galveston, Texas 77551 USA
- 9:45 AM U 1021 **T-tide harmonic analysis and model validation: Ashdod, Hadera and Tel Aviv, Israel**
 Jared Granberry* and Ayal Anis, Department of Marine Science, Texas A&M University-Galveston, Galveston, TX and Ayal Anis, Department of Oceanography, Texas A&M-University, College Station, TX
- 10:00 AM NS 974 **Nature of water exchange processes at the Aransas Pass tidal inlet, TX, observed by simultaneous currents and water property measurements**
 Dong-Ha Min*, The University of Texas Marine Science Institute, Port Aransas, TX

Marine II - JBWN 247

- 9:00 AM NS 709 **Processed waste water: Potential tool for promoting oyster reefs in high-salinity waters**
 Sammy Ray*, Antonietta Quigg, Ayal Anis, Texas A&M University at Galveston, Galveston, TX and Lalise Mason, Scenic Galveston, Galveston, TX
- 9:15 AM NS 789 **Protecting Texas seagrasses from wastewater discharges**
 Cindy Contreras*, Jennifer M. Bronson, Patricia L. Radloff, Ph.D., and Adam Whisenant, Water Resources Branch, Texas Parks and Wildlife Department, Austin, TX.
- 9:30 AM NS 764 **Post-hurricane Alex effects of phytoplankton primary production of the Lower Laguna Madre**

Hudson DeYoe* and Joseph Kowalski. Center for Subtropical Studies,
University of Texas – Pan American, Edinburg, TX.

- 9:45 AM NS 695 **Shellfish restoration headwinds: Parasites and predators**
Ray, Sammy M.*, Texas A&M University Galveston

Physics - Moody 206

- 9:00 AM U 741 **Distribution of energy within interference patterns**
William Ware*, Nick Lanning, Brandon St. John, Cristian Bahrim,
Department of Physics, Lamar University, Beaumont, TX 77710-10046
- 9:15 AM U 832 **Using electrical properties to predict geometry of quartz nanopores**
Corey Williams*¹, Jessica Koehne² ¹Texas Southern University,
University Research Center (URC), Houston, Texas ²NASA Ames
Research Center, Moffett Field, California
- 9:30 AM G 935 **Energy transfer between filament-forming laser beams in liquid methanol**
B.D. Strycker*, M. Springer, C. Trendafilova, X. Hua, M. Zhi, A.A.
Kolomenskii, H. Schroeder, J. Strohaber, H.A. Schuessler, G.W.
Kattawar, A.V. Sokolov
- 9:45 AM G 1041 **How ephalopods use optics to camouflage**
Meng Gao*, Yu You, Sergio Dagach, and George W. Kattawar,
Department of Physics and Astronomy, Texas A&M University, College
Station, TX
- 10:00 AM U 1069 **Mathematical Model of the Late Heavy Bombardment Period (Early Solar System)**
Jeffrey W. Davis*, Hardin-Simmons University

Systematics Evolution - JBWN 107

- 9:00 AM NS 673 **Maternal care in *Santinezia serratobialis* (Opiliones: Cranaidae) in Trinidad**
Allan W. Hook*, St. Edward's University
- 9:15 AM U 679 **The effects of advanced maternal age on the spacing of dorsal respiratory appendages in *Drosophila melanogaster***
Jenna Rozacky* and Lisa M. Goering,, St. Edward's University Austin,
TX
- 9:30 AM G 846 **The use of microsatellite markers to determine population structure of feral pigs, *Sus scrofa*, in west central Texas**
Diane Irby Beckham*, Stephanie McNabb, and Andrea B. Jensen,
Hardin-Simmons University, Abilene, TX
- 9:45 AM G 897 **A test for congruence among mitochondrial, AFLP, and microsatellite markers**
Julie A. Parlos*, Robert J. Baker, Texas Tech University, Lubbock, TX

Terrestrial Ecology - JBWN 122

- 9:00 AM G 971 **Multiple captures of *Reithrodontomys fulvescens* and *Baiomys taylori* may indicate short-term, not long-term pair-bonding**
Nicholas S. Green*, Laura Beard, Kenneth T. Wilkins, Baylor
University, Waco, TX and Cathleen N. Early, University of Mary
Hardin-Baylor, Belton, TX
- 9:15 AM G 775 **An ecological study of the Southern Plains woodrat (*Neotoma micropus*) on the Bar SR Bar Ranch in Alpine, Texas**
E. Lance Chambers* and Steven G. Platt, Sul Ross State University,
Alpine, TX
- 9:30 AM G 694 **Differences in structure of the bat community in managed and unmanaged Southeastern pine-hardwood forests and the role of ecomorphology**
Anica Debelica*, Cory Hanks, Tommy Pettit, and Kenneth T. Wilkins.
Department of Biology and Graduate School, Baylor University, Waco,
TX.

- 9:45 AM G 966 **Denning ecology of the American hog-nosed skunk, *Conepatus leuconotus***
Wesley A. Brashear*, Angelo State University, San Angelo, TX, Adam W. Ferguson, Texas Tech University, Lubbock, TX, C. Eric Pomposelli, Robert C. Dowler, Angelo State University, San Angelo, TX.
- 10:00 AM U 900 **Problematic predator: Coyote (*Canis latrans*) predation, competition, and dispersal**
Joe W. Quick* and Wendi K. Moran, Hardin-Simmons University, Abilene, TX
- 10:15 AM Break I with refreshments** **JBWN Lobby**
- 10:15 AM Poster Session I** **Maloney Room - Main Bldg.**

Oral Presentation Session II

Anthropology - JBWN 202

- 11:00 AM U 746 **GIS in archaeology**
Chris R.L. Davis*, Texas State University
- 11:15 AM NS 794 **The Burris Site: An initial attribute analysis of the lithic material from 41VT41**
Jason B. Perez*, University of Texas San Antonio
- 11:30 AM NS 918 **Lithic reduction features of South Texas: Identification, analysis and interpretation**
Christopher W. Ringstaff*, Texas Department of Transportation
- 11:45 AM NS 745 **Paleoindian/Archaic transitions in Texas**
Britt Bousman*, Anthropology, Texas State University
- 12:00 PM NS 904 **Prehistoric use of the natural landscape in Pecos County, Texas: An examination of archaeological survey observations**
Jon J. Dowling* and Bruce Darnell, Ecological Communications Corporation
- 12:15 PM G 697 **Identification of economically significant plant species in the free state, South Africa: An archaeological-ethnobotanical approach**
Senna Thornton-Barnett*, Texas State University

Cell and Molecular Biology - JBWN 226

- 11:00 AM U 806 **Early developmental signaling molecule, beta catenin, is expressed during regeneration in the california blackworm, *Lumbriculus variegatus***
Christopher M. Diaz*, Jaqueline Cortez, Gabriel J. Leal, and Veronica G. Martinez Acosta, Department of Biology, University of the Incarnate Word, San Antonio, TX 78209
- 11:15 AM U 787 **Dorsal appendage spacing as a result of mRNA abundance in *Drosophila melanogaster***
Alyssa Ghant*, St. Edwards University
- 11:30 AM U 825 **Quantitative analysis of phenotypic variation of anterior-posterior patterning in *Drosophila melanogaster***
Austin Lewis*, Lisa Goering, Saint Edward's University, Austin, TX
- 11:45 AM G 957 **Characterizing the expression pattern and transcriptional control of a neuropeptide receptor in *Drosophila* embryos**
Michael J. Cashin* and Amaris R. Guardiola, Angelo State University, San Angelo, TX
- 12:00 PM U 716 **Brassinolides promote the gravitropic response of maize roots by disrupting actin filament organization**
A. Gravelle1, J. Nakashima2, K. Palanichelvam2, E.B. Blancaflor2, 1 Biological Sciences Department, Midwestern State University, Wichita Falls, TX (AEG). 2 Plant Biology Division, The Samuel Roberts Noble Foundation, Ardmore, OK (AEG, JN, KP, EBB).
- 12:15 PM U 831 **Effect of simulated microgravity on the reproduction on *Caenorhabditis elegans***

NM Alaniz, BS; BM Wilson*; FH Abdel-Rahman, Ph.D, Texas Southern University

Chemistry and Biochemistry - JBWN 222

- 11:15 AM U 726 **Synthesis, electrochemistry and spectroscopic characterization of 2,3- and 3,4- manganese(II) tetrapyrroldiopyrazine complexes**
Halima Sani*, Pinkal Patel, Christopher Hansen and Jianguo Shao, Midwestern State University, Wichita Falls, TX
- 11:30 AM U 879 **New pH sensor based on ionomer/carbon nanoparticle composite film: Extension of detection into the very strong acidic environment**
Nameera Baig*, Tuan Tran, Dr. Mian Jiang, Dr. Byron Christmas-University of Houston Downtown
- 11:45 AM U 923 **Novel sensor for tartrate based on nickel oxide moieties with carbon transducer**
A'Tondra Gilstrap*, Michael Giles, Desiree Wilson, Jose Ventura, Mian Jiang, Larry Spears - University of Houston-Downtown, Department of Natural Sciences, One Main, Houston, Texas 77002
- 12:00 PM U 926 **New Sensor for Potassium Ion**
Preeti Choudhary*, Jarrett Kitchen, Heather Lightsey, University of Houston-Downtown, Houston Texas 77002.
- 12:15 PM U 942 **Photochemistry of cyclic sulfite esters**
Rick C. White and Jacob Broadway*, Sam Houston State University

Computer Science - Moody 206

- 11:00 AM U 798 **The deployment of Wayland Baptist University's first computational cluster**
Jarrod Alford*, Wayland Baptist University, Plainview, TX.
- 11:15 AM U 878 **Computational thinking and its value in computer science studies**
Kassandra Perch*
- 11:30 AM G 680 **An ontological approach to manufacturing supplier discovery**
Christian McArthur*, Farhad Ameri, Texas State University-San Marcos, San Marcos, TX
- 11:00 AM NS 783 **The design of digital recursive filters for the analysis of heart rate variability**
John A. Ward*, Department of Clinical Investigation, Brooke Army Medical Center, Fort Sam Houston, TX

Conservation Ecology - JBWN 247

- 11:00 AM NS 743 **Monthly surface abundance, population size and movement of the Georgetown salamander, *Eurycea naufragia*, in two springs of central Texas**
Benjamin A. Pierce*, Ashley E. Wall, Alexander S. Hall, and Kira D. McEntire, Southwestern University, Georgetown, TX
- 11:15 AM NS 788 **A general habitat suitability model for the endangered Houston Toad (*Bufo houstonensis*) from remote sensing data**
Naveen K. Mahato* & Michael R. J. Forstner, Department of Biology, Texas State University-San Marcos
- 11:30 AM G 856 **Is bigger always better? Mate selection in the Houston toad (*Bufo houstonensis*)**
Melissa C. Jones*, Michael R. J. Forstner, Texas State University - San Marcos, San Marcos, TX and James R. Dixon, Texas A&M University, College Station, TX
- 11:45 AM G 867 **Short-term effects of fire on juvenile amphibians in a southern USA pine forest**
Donald J. Brown*, John T. Baccus, Michael R. J. Forstner, Texas State University-San Marcos and D. Bruce Means, Coastal Plains Institute, Tallahassee, FL

- 12:00 PM G 752 **Reproductive patterns of Texas River Cooter (*Pseudemys texana*) and Red-Eared Slider (*Trachemys scripta elegans*) at Spring Lake, Hays County, Texas**
Ivana Mali*, Thomas R. Simpson, Francis L. Rose, Texas State University-San Marcos, TX
- 12:15 PM G 802 **The importance of light levels and herbivory on the growth of a rare Texas endemic: The Bracted Twistflower (*Streptanthus bracteatus*)**
Wendy J. Leonard* and O.W. Van Auken, The University of Texas at San Antonio

Environmental Science I - JBWN 205

- 11:00 AM U 734 **Potential distribution of *Cactoblastis cactorum* to south Texas and northern Mexico**
Simon del Alto*, Brenda Garcia* Patricia Feria, University of Texas-Pan American, Edinburg, TX
- 11:00 AM G 771 **The effects of climate change on distribution of the invasive grass *Panicum maximum***
Cynthia I. Garcia*, Teresa P. Feria, Andrew McDonald, The University of Texas - Pan American, Edinburg, TX
- 11:30 AM G 1040 **Advancement of water treatment using carbon nanotubes**
Adetoun Aboaba-Oyinlola*, Dr. Bobby Wilson and Dr. Renard Thomas, Texas Southern University
- 11:45 AM G 949 **Relationship between foliar concentrations of arsenic and spectral reflectance by foliage of common sunflower, *Helianthus annuus***
Yuridia Patricia Gandy*, Kenneth Rod Summy, Elamin Ibrahim, Jason Parsons, Michael Persans, University of Texas-PanAmerican, Edinburg, TX.
- 12:00 PM G 1007 **Modeling the spatial relationship of riparian shade distribution as it relates to aquatic species distribution within the San Marcos River**
Kristina Tower*, Texas State University
- 12:15 PM G 751 **Characterization of nutrient load in the Arroyo Colorado and drains**
Paul J. Duke*, Hudson DeYoe, University of Texas-Pan American, Edinburg, TX

Environmental Science II - JBWN 209

- 11:00 AM U 837 **Assessment of environmental estrogens in the Galveston Bay Watershed**
Zuri Dale*, Katoria R. Tatum-Gibbs, Bobby L. Wilson and Renard L. Thomas, Texas Southern University, Houston, TX
- 11:15 AM U 1044 **Cuticle nails as potential bioindicators of trace metal exposure using Inductively Coupled Plasma Mass Spectrometry**
Nathaniel Carter*, Terrell Gibson, Bobby Wilson, Renard L. Thomas, Texas Southern University, Houston, TX
- 11:30 AM NS 912 **Assay of the *mer* operon as an indicator of bioavailable mercury in marine environments**
Venis Graham, Courtney Schroeder and Kirk Cammarata*, Texas A&M University - Corpus Christi, Corpus Christi, TX.
- 11:45 AM G 888 **Activation of pro-inflammatory transcription factor by modeled microgravity and high-energy particle radiation**
Anita Lewis*, Sarah Munyu, Olufisayo A. Jejelowo, Ayodotun Sodipe, Shishir Shishodia, Texas Southern University, Houston, TX

Botany - JBWN 209

- 12:00 PM NS 1005 **Plants for human health: Stable isotope approaches to assess the Vitamin A value of biofortified Golden Rice and high beta-carotene maize**
Michael A. Grusak*, USDA-ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX
- 12:15 PM NS 1012 **Lichens of the Weston Ranch, Guadalupe County, Texas**

Alan W. Lievens*, Mark P. Gustafson, Texas Lutheran University,
Seguin, TX, and Shirley C. Tucker, University of California at Santa
Barbara, Santa Barbara, CA

Geosciences - Moody 304

- 11:00 AM NS 963 **New geoscience BS degree at Angelo State University**
Joseph I. Satterfield*, James W. Ward, Andrew B. Wallace, and Grady
Price Blount, Angelo State University, San Angelo, TX
- 11:15 AM NS 934 **Deposition, orogeny, erosion: The geologic story of Pedernales Falls
State Park, Texas**
R. LaRell Nielson* and Chris A. Barker, Stephen F. Austin State
University, Nacogdoches, TX
- 11:30 AM NS 979 **Classic geology at Enchanted Rock: A physical geology course in a
single outcrop?**
Chris A. Barker* and R. LaRell Nielson, Department of Geology,
Stephen F. Austin State University, Nacogdoches, TX
- 11:45 AM U 1043 **Bison antiquus and B. latifrons from the latest Pleistocene Nueces
River Valley, South Texas**
Robert Walls*, Jon Baskin, and Ronny Thomas, Department of
Biological and Health Sciences, Texas A&M University-Kingsville,
Kingsville, Texas 78363
- 12:00 PM G 870 **Fossil turtles from the Devil's Graveyard Formation of Southwest
Texas: Large terrestrial turtles and a geographic range extension for
carettochelyid turtles**
Robert W. Burroughs, Christopher J. Bell, Ashley E. Latimer, and E.
Christopher Kirk*. Jackson School of Geosciences and Department of
Anthropology, University of Texas at Austin
- 12:15 PM G 1035 **A review of the Goniopholidae and new crocodile fossils recovered
from the Woodbine formation at the Arlington Archosaur Site**
Derek J. Main* and Rachell Peterson, University of Texas Arlington

Marine Science - JBWN 243

- 11:00 AM NS 844 **Green sea turtle (*Chelonia mydas*) assemblages in Texas' Lower
Laguna Madre**
Tasha L. Metz* and André M. Landry, Jr., Texas A&M University at
Galveston
- 11:15 AM G 820 **Estimating incidence of multiple paternity of Kemp's ridley sea
turtles on South Padre Island, Texas**
Anna Frankel*, Dean Williams, Texas Christian University
- 11:30 AM G 891 **Cloning & sequencing housekeeping genes towards the development
of molecular stress response markers in seagrasses**
Stephanie Dovalina* and Kirk Cammarata, Texas A&M
University-Corpus Christi, Corpus Christi, TX.
- 11:45 AM G 941 **Unique assemblages of epiphytic bacteria on seagrasses from an
estuary and a hypersaline lagoon on the South Texas Coast**
Valerie Chilton*, Kirk Cammarata, Texas A&M University - Corpus
Christi
- 12:00 PM Marine Science Section Meeting JBWN 243**

Science Education - JBWN 102

- 11:00 AM U 1061 **Draw-A-Scientist-Test [DAST]: A psychological analysis of shifting
gender roles and stereotypes of the scientist**
Kelsey Abbott*, Angela Aukes, Kirsten Barnett, and Wendi Moran;
Hardin-Simmons University
- 11:15 AM U 1058 **Get SMaRT: Introduction of Science and Math Achiever Teams**
Meredith Liebl*, Kate Roberts, Suzanna Pukys and Romi Burks. Office
of Civic Engagement and Department of Biology, Southwestern
University

- 11:30 AM U 882 **Bacteria discovery laboratory increases secondary student content knowledge but not career goals**
Veronica Lopez*, Dr.Patricia Baynham, St.Edward's University, Austin, TX
- 11:45 AM NS 929 **Mixed Up: Confusing language in science and math**
S. West*, Tx State University – San Marcos and S. Browning, University of Houston – Clear Lake
- 12:00 PM NS 1050 **Building a national collaboration- Students' attitudes about science after GK-12**
Kristina Dame and Julie Westerlund*, Texas State University- San Marcos

Systematics and Evolution - JBWN 102

- 11:00 AM G 996 **Phylogeographic variation in the cottonmouth, *Agkistrodon piscivorus*, using AFLP and venom protein profiles**
Jason Strickland*, Loren K. Ammerman, and J. Kelly McCoy
Department of Biology, John Osterhout Department of Chemistry, Angelo State University, San Angelo, TX 76909
- 11:15 AM G 739 **A molecular approach to the phylogenetic position of the naked bat, *Cheiromeles (Chiroptera: Molossidae)***
T. Marie Tipps*, Dana N. Lee, Loren K. Ammerman, Angelo State University, San Angelo, TX
- 11:30 AM G 668 **Rapid evolution of female polymorphism in an invasive damselfly**
Eben J. Gering*, Section of Integrative Biology, The University of Texas at Austin
- 11:45 AM G 737 **The comparative osteology, phylogeny, and biogeography of lepidosirenid lungfish**
Katharine E. Criswell*, Jackson School of Geosciences, The University of Texas at Austin, Austin, TX
- 12:00 PM G 860 **A reassessment of the tetrapod assemblage at the base of the Late Triassic sequence of Texas, and revised diversity and age estimates of the Otis Chalk localities**
Michelle R. Stocker*, The University of Texas at Austin, Austin, TX

Terrestrial Ecology - JBWN 122

- 11:00 AM U 678 **Volatilization of bornyl acetate, camphor, and bornyl acetate from *Juniperus ashei***
Joshua Conner* and Janis K. Bush, University of Texas at San Antonio
- 11:30 AM U 768 **Artificial lighting and nocturnal anuran calling behavior in Michigan and Central Texas**
Alexander S. Hall*, Southwestern University, Georgetown, TX
- 11:15 AM G 906 **A preliminary survey of reptiles, amphibians, and small mammals in invasive saltcedar (*Tamarix* spp.) monocultures in Presidio County, Texas**
Karin L. Nilsen, Steven G. Platt, and Christopher M. Ritzi, Sul Ross State University
- 11:45 AM NS 725 **The impact of saltcedar biological control on a non-target species, *Tamarisk aphylla***
Anne Marie Hilscher* and Christopher M. Ritzi, Sul Ross State University, Alpine, TX
- 12:00 PM NS 774 **The efficacy of different herbicides with varying doses on the weed flora associated in direct seeded rice under puddle condition**
Shilpa Koushik*, B.L. Chandrakar and Sandeep Sharama, Indira Gandhi Agricultural University, Raipur(C.G.), India, Akash Kumar Kaushik, Stephen F. Austin State University, Nacogdoches, TX
- 12:15 PM NS 982 **Creating a successful citizen science program to detect and report invasive species**
Travis Gallo* & Damon Waitt, the Lady Bird Johnson Wildflower Center at the University of Texas at Austin

12:30 PM	Lunch	Mabee ABC
12:30 PM	Student Visit with Outstanding Teacher and Scientist	TBD
1:00 AM	TAS Business Meeting	TBD
1:45 PM	Poster Session II	Maloney Room - Main Bldg.

Oral Presentation Session 3

Anthropology - JBWN 202

2:30 PM	NS	954	Land of the Tejas: Identity and interaction in Texas A.D. 1300-1700s John W. Arnns*, Archeological Studies Program, TxDOT	
2:45 PM	G	809	The linguistic etymology of a Mayan hieroglyph: Determining the origin of <i>ajaw</i> Kevin McKinney*, Texas State University-San Marcos, San Marcos, TX	
3:00 PM	G	790	Pre-Hispanic resource use and household production strategies at San Estevan, Belize Antonia L. Figueroa* and Sarah M. Wigley, University of Texas San Antonio	
3:15 PM	G	674	Virtually reconstructing Mayan architecture: Discoveries of virtual artifacts Leah McCurdy*, University of Texas at San Antonio	
3:30 PM			Anthropology Section Meeting	JBWN 202

Biomedical - Moody 202

2:30 PM	U	833	Diruthenium complexes as a potential anticancer agent Destinee Stroud*, Texas Southern University, Houston, TX; Jamie Dooley- Renfro, Texas Southern University; Tuan Phan, Texas Southern University; Bobby L. Wilson, Texas Southern University	
2:45 PM	G	887	Structure, mechanism and anticancer potential of the isothiocyanate diruthenium complex (3,1)Ru₂(F3ap)₄(NCS)₁ Sarah Munyu*, Anita Lewis, Emmanuel Obi, Tuan Phan, Olufisayo A. Jejelowo, and Shishir Shishodia, Department of Biology, Texas Southern University, 3100 Cleburne Street, Houston, Texas 77004	
3:00 PM	U	834	Transcription factor NF-κB mediates high energy radiation induced activation of Cox-2, MMP-9, and IκBa Emmanuel Obi*, Sarah Munyu, Anita Lewis, and Shishir Shishodia Texas Southern University, 3100 Cleburne Street, Houston, Texas, USA, shishodias@tsu.edu.	
3:15 PM	G	876	Unexpected modulation of <i>Yersinia pestis</i> virulence following exposure to low shear forces Abidat Lawal*, Olufisayo Jejelowo, and Jason A. Rosenzweig Texas Southern University Dept. of Biology and the Center for Bionanotechnology and Environmental Research	
3:30 PM	G	1048	Impact of TiO₂ metallized carbon nanotubes (TiO₂- CNT) on regenerative bone Edidiong C. Obot*, Renard L. Thomas, Bobby L. Wilson, Alamelu Sundaresan, Texas Southern University, Department of Chemistry	
3:45 PM			Biomedical Section Meeting	Moody 202

Botany - JBWN 243

2:30 PM	G	958	Subspecific classification of <i>Phoradendron serotinum</i> (Viscaceae): Development of microsatellite markers for assessment of population genetic structure Angela K. Hawkins*, Texas A&M University, Sam Houston State University, Christopher P. Randle, Justin K. Williams, Brandi C. Cannon, Alan D. Archambeault, Amber M. Faust Sam Houston State University	
2:45 PM	G	928	Foliar scent production in <i>Matelea reticulata</i> and <i>Matelea edwardsensis</i> (Apocynaceae)	

Johann Souss* and David E. Lemke, Department of Biology, Texas State University, San Marcos, TX.

- 3:00 PM NS 945 **Morphology and anatomy of emergent and submersed stems and leaves of three aquatic Acanthaceae: *Justicia americana*, *Hygrophila polysperma* and *Nomaphila stricta***

David E. Lemke*, Department of Biology, Texas State University, San Marcos, TX

- 3:15 PM G 698 **Abiotic and biotic factors affecting first year seedling growth and survival in *Acer grandidentatum*, Bigtooth Maple**

Terri. L. Nelson Dickinson* and O. W. Van Auken, University of Texas at San Antonio, San Antonio, TX

- 3:30 PM NS 840 **Gametophyte development in *Anemia mexicana* from spores of different ages**

Joan E. Nester-Hudson* and Emily Amenta, Sam Houston State University, Huntsville, TX

3:45 PM **Botany Section Meeting**

JBWN 243

Cell and Molecular Biology - JBWN 226

- 2:30 PM NS 826 **A role for autophagy in endosymbiont maintenance**

Sara Jahanziri, Shadi Zamanipour, Joseph Chambers, Collin Thomas* Collin College, The Center for Advanced Studies in Mathematics and Natural Sciences, Plano, Texas

- 2:45 PM U 847 **Analysis of β -Lactam resistance mediated by the AmpC/AmpR region in a set of *Pseudomonas aeruginosa* clinical isolates**

Kelly Hurless*, St. Edward's University, Austin, TX, USA, Dr. Robert A. Bonomo, Research Service, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Department of Pharmacology, Molecular Biology and Microbiology, Case School of Medicine, Cleveland, OH, USA, Dr. Patricia Baynham, St. Edward's University, Austin, TX, USA, Kristine Hujer, Research Service, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Cleveland, OH, USA

- 3:00 PM U 707 **Effects of hyperosmolarity on the growth of two environmental isolates of *Vibrio vulnificus***

Jarrad McAdams*, Texas Lutheran University, Seguin TX, Zachary Jones, Nicolas Perez, Nick Aboud and Dr. Gregory Buck, Texas A&M University at Corpus Christi, Corpus Christi TX

- 3:15 PM G 722 **Bacterial community dynamics in poultry litter treated with *Bacillus subtilis* spp. studied by dgge and 454 pyrosequencing**

Akash Kumar Kaushik*, Alexandra Martinova Van-Kley, Joey Bray, Armen Nalian, Stephen F. Austin State University, Nacogdoches, TX

- 3:30 PM U 750 **The effect of acute dose charge particle radiation on expression of DNA repair genes in mice**

Christina Randall*, Muhammad Akram Tariq, Honglu Wu, Nader Pourmand, Olufisayo Jejelowo

3:45 PM **Cell and Molecular Biology Section Meeting**

JBWN 226

Chemistry and Biochemistry - JBWN 222

- 2:30 PM G 967 **Dinoflagellate bioluminescence: Cloning of luciferase genes and purification of luciferase-containing organelles of *Pyrocystis fusiformis***

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

- 2:45 PM NS 984 **Computational quantum chemistry: Applying numerical methods to the hydrogen atom as a system sufficiently simple for an undergraduate spreadsheet experiment**

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

- 3:00 PM NS 908 **Vibrational and UV/Vis spectra of 9,10-dihydrobenzo(a)pyren-7(8H)-one and 7,8,9,10-tetrahydrobenzo(a)pyrene: An experimental and computational study**
Kefa K. Onchoke, Stephen F. Austin State University
- 3:15 AM NS 849 **The Moore-Penrose pseudo-inverse matrix for quantitation of mixtures**
Benny E. Arney, Jr.*, Sara Townsend, Charli Baker, Sam Houston State University, Huntsville TX
- 3:30 PM Chemistry & Biochemistry Section Meeting JBWN 222**

Conservation Ecology - JBWN 247

- 2:30 PM G 948 **Seasonal and reproductive den site fidelity in the American hog-nosed skunk, *Conepatus leuconotus*, in Texas**
C. Eric Pomposelli*, Wesley A. Brashear, and Robert C. Dowler, Angelo State University, San Angelo, TX
- 2:45 PM G 723 **Molecular genetic analysis of African lion (*Panthera leo*)**
Martha McKeon Lyke*, University of Texas at San Antonio, San Antonio, TX
- 3:00 PM G 1016 **Analyzing urine as a tool to understand interbreeding between wild red wolf (*Canis rufus*) females and wild coyote (*Canis latrans*) males**
Wendi K Moran*, Sasha R.X. Dall, Matthew R. Evans, David J. Hosken, University of Exeter, UK
- 3:15 PM G 863 **Building a predictive energy model for ocelots in Texas**
Jennifer M. Korn*, Michael E. Tewes, Feline Research Center, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX; and David G. Hewitt, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX
- 3:30 PM Conservation Ecology Section Meeting JBWN 247**

Environmental Science - JBWN 205

- 2:30 PM U 843 **Global warming and the spread of dengue in south Texas**
Audrey R. Ochoa*, Dr. Feria, Dr. Vitek, University of Texas Pan American, Edinburg, TX
- 2:45 PM G 836 **Bio-assessment of human health from chronic metal exposure in the urban environment**
Terrell Gibson*, Alamelu Sundaresan, Bobby Wilson, Renard L. Thomas, Texas Southern University, Houston, TX
- 3:00 PM G 712 **Comparison of the soil chemistry and the microbial communities in the rhizospheres of native and non-native grasses of the lower Rio Grande valley**
Jacqueline Valencia*, J. Andrew McDonald, Sergio Cepeda, Kristine L. Lowe, University of Texas - Pan American, Edinburg, TX
- 3:15 PM G 672 **The effects of carbon dioxide and air pollution on milkweed species (*Asclepiadaceae*) and monarch butterfly larvae and adults (*Danaus plexippus*)**
Terri Matiella*, Dr. Janis Bush, TheUniversity of Texas at San Antonio
- 3:30 PM G 1047 **Studies of single-walled carbon nanotubes and oxidative stress**
Siobhan Tarver*, Renard L. Thomas, and Bobby Wilson, Texas Southern University, Houston, TX, and Govindarajan Ramesh, Norfolk State University, Norfolk, VA
- 3:45 PM U 767 **Spread of Chagas disease in North America due to climatic change**
Edgar A. Casillas*, Teresa P. Feria and Brian L. Fredensborg., The University of Texas - Pan American, Edinburg, TX
- 4:00 PM Environmental Science Section Meeting JBWN 205**

Freshwater Science - JBWM 209

- 2:30 PM G 962 **Correlating climatological data with community basking trends among Waco Creek turtles (*Pseudemys*, *Trachemys*, and *Graptemys*)**
Jeff Bardwell*, Richard Duhrkopf, Baylor University, Waco, TX
- 2:45 PM G 990 **The effects of abiotic and biotic factors on male fitness across disjunct populations of the largespring Gambusia, *Gambusia geiseri***
Richard H. Lewis*, Sam Houston Sate University
- 3:00 PM G 955 **Effect of parasites on reproductive investment in three species of livebearing fishes (Family Poeciliidae)**
Stacy B Stoops, Autumn Smith and Raelynn Deaton, Sam Houston State University, Department of Biological Sciences
- 3:15 PM NS 701 **Gregarine parasitism of Texas dragonflies: A vaiable system with excellent research opportunities**
Jason L. Locklin*, Temple College, Temple, TX and Darrell S. Vodopich, Baylor University, Waco, TX.
- 3:30 PM G 977 **Distribution and physical habitat characteristics of *Hygrophila polysperma* along the San Marcos River Hays County, Texas**
Casey R. Williams*¹, Dr. Alan Groeger². 1. Texas State University-San Marcos, Aquatic Resources. 2. Texas State University-San Marcos, Aquatic Biology Department

3:45 PM Freshwater Science Section Meeting

JBWN 209

Geosciences - Moody 304

- 2:30 PM G 761 **New southern African rodent niche models for use in taxonomic habit indices**
Timothy L. Campbell*, Texas A&M University, Patrick J. Lewis, Justin K. Williams and Monte L. Thies, Sam Houston State University
- 2:45 PM NS 702 ***Mahgarita cf. m. stevensi* in the middle Eocene Laredo formation: Oldest record of a cercomoniine primate in North America**
James Westgate*, Dept. of Earth & Space Sciences, Lamar University, Texas State University System, Beaumont, TX and Vertebrate Paleontology Lab, Texas Natural Science Center, University of Texas-Austin; Dana Cope, Dept. of Sociology and Anthropology, College of Charleston; & Christopher Beard, Vertebrate Paleontology Section, Carnegie Museum of Natural History.
- 3:00 PM NS 1014 **Edwards plateau, Texas cave deposits—results and questions**
Ernest Lundelius*, Dept. Geol. Sci., 1 University Station C1100, University of Texas at Austin,

3:15 PM Geosciences Section Meeting

Moody 304

Mathematics - Moody 206

- 2:30 PM NS 677 **Applications of Jensen's Inequality**
Elsie M. Campbell*, Angelo State University, and Dionne T. Bailey*, Angelo State University, jointly
- 2:45 PM U 749 **Hat guessing games**
James Reid*, Angelo State University, San Angelo, TX
- 3:00 PM G 687 **The Lorenz System and the Butterfly Effect**
Jesus F. Hermosillo*, Sul Ross State University
- 3:15 PM G 762 **Digital nonlinear controller design: Backstepping with cancellation and domination**
Jeff Langston*, Dr. Chunjiang Qian, The University of Texas at San Antonio, San Antonio TX, and Dr. Michael Frye, University of the Incarnate Word, San Antonio, TX

3:30 PM Mathematics Section Meeting

Moody 206

Science Education - JBWN 102

- 2:30 PM NS 890 **Beginning teacher induction and mentoring**
L. Fuller and S. West, Texas State Univeristy
- 2:45 PM NS 916 **Teaching scientific method: Keeping an eye on color**

- Patricia Ritschel-Trifilo*, Hardin-Simmons University
- 3:30 PM G 902 **Correlated Physics & Math**
Jessica Hart* and Dr. Sandra West, Texas State University, San Marcos, TX
- 3:15 PM G 901 **Angling for water quality: Using a recreational approach to increasing environmental literacy, aquatic stewardship, and science learning of teachers and students in under-served major metropolitan areas of Texas**
Zack Thomas*, Tom Arsuffi, Texas Tech University-Junction, Junction, TX
- 3:30 PM NS 924 **Ecological restoration of the headwaters of the San Antonio River: Integrating science across the university**
Bonnie McCormick*, Alakananda Chaudhuri, William Thomann, University of the Incarnate Word, San Antonio, TX

3:45 PM Science Education Section Meeting

JBWN 102

Terrestrial Ecology I - JBWN 122

- 2:30 PM NS 915 **A Long-term and landscape view of tropical and imported fire ants in the South Texas brush country**
Richard Patrock* and Lawrence Gilbert, Brackenridge Field Laboratories, University of Texas at Austin
- 2:45 PM NS 910 **Introduction of the tamarisk leaf beetle (*Diorhabda* spp.) as a saltcedar (*Tamarix*) biocontrol agent along the Rio Grande in Presidio County, Texas**
Christopher M. Ritzi*, Anne Marie Hilscher, Sul Ross State University, Alpine, TX and Andrew Berezin, Wharton County Community College, Sugar land, TX
- 3:00 PM G 724 **The prevalence and abundance of endoparasites and ectoparasites in domesticated cattle: A study of parasitism on the Eastern Edwards Plateau**
Alice L. Harris* and Christopher M. Ritzi, Sul Ross State University, Alpine, TX
- 3:15 PM G 1032 **Cow fecal arthropod community succession in pasture and forest habitats**
Ian Wright*, University of Texas at Austin, Austin, TX

Terrestrial Ecology II - JBWN 107

- 2:30 PM G 898 **Use of urban bird feeders by white-winged doves (*Zenaida asiatica*) in Texas**
Alayne B. Fronimos*, John T. Baccus, Michael F. Small, Joseph A. Veech, Texas State University, San Marcos, TX
- 2:45 PM G 862 **Nestling growth and mortality of urban great-tailed grackles (*Quiscalus mexicanus*)**
Beverly L. Cochran*, Texas A&M University, College Station, TX and Jeffrey G. Kopachena, Texas A&M University-Commerce, Commerce, TX
- 3:00 PM NS 717 **Establishment of Clay-colored Thrush (*Turdus grayi*) in the Lower Rio Grande Valley of Texas**
Tim Brush*, University of Texas-Pan American, Edinubrg, TX, and Mark H. Conway, Harlingen, TX
- 3:15 PM G 859 **Diversity, abundance, and associated habitat use of coastal marsh avian communities following the storm surge of Hurricane Ike**
Alicia Rodriguez* and Jim Armacost, Lamar University, Beaumont, TX

3:30 PM Terrestrial Ecology Section Meeting

JBWN 107

Break II with Refreshments

4:15 PM Poster Session 3

Maloney Room. All presenters be present

Section Meetings

3:30 PM	Anthropology	JBWN 202
3:45 PM	Biomedical	Moody 202
3:45 PM	Botany	JBWN 243
3:45 PM	Cell and Molecular Biology	JBWN 226
3:30 PM	Chemistry and Biochemistry	JBWN 222
12:00 PM	Computer Science	Moody 206
3:30 PM	Conservation Ecology	JBWN 247
4:00 PM	Environmental Science	JBWN 205
3:45 PM	Freshwater Science	JBWN 209
3:15 PM	Geosciences	Moody 304
3:30 PM	Mathematics	Moody 206
3:30 PM	Physics	Moody 206
3:45 PM	Science Education	JBWN 102
12:15 PM	Systematics	JBWN 107
3:30 PM	Terrestrial Ecology	JBWN 107

Special Event

3:45 PM	Special Event: This is your Brain on Neuroscience - Check it out	JBWN 204
4:30 PM	Section Chairs Meeting	TBD
5:00 PM	Take down posters	Maloney Room - Main Bldg.

Distinguished Texas Scientist

5:15 PM	Polarized Light in Nature - Dr. George W. Kattawar	Jones Auditorium
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Texas Academy of Science Awards Banquet

7:00 PM	TAS Awards Banquet	Bob Bullock Museum
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List of Posters - See Program at a Glance for Particular Judging Sessions

Anthropology

- NS P857 **Controlled and bonfire firing experiments of ceramics made of local clays**
Steve A. Tomka*, Lori Barkwill Love, Center for Archaeological Research, University of Texas San Antonio

Biomedical

- U P685 **An observational study of physical fitness and academic achievement in third through sixth grade students in Seguin, Texas**
Jessica Giattino*, Texas Lutheran University, Seguin, TX
- U P715 **Antimicrobial properties of cinnamon and chili seed essential oils against *Salmonella enterica* on whole minimally processed strawberries**
Carlos F. Mendoza* and Patricia J. Baynham, St. Edward's University
- U P1068 **Bioinformatics of gene clusters**
Shamail Allen*, Olufisayo Jejelowo, Madhan R Tirumalai and George E Fox2 1Dept Biology, Texas Southern University and Dept Biology & Biochemistry, Univ. Houston, Houston, TX 77204-5001
- U P838 **Biosensors: Immobilization of Avidin on Nanoporous Alumina**
Jessica Koehne*, Paolo Actis, Adam Seger, Boaz Vilozny, Olufisayo Jejelwo, Meyya Meyyappan, Nader Pourmand
- U P765 **Creation of a HER2/NEU expressing MDA 231 stable line**

Felicia Glick*, Hardin-Simmons Univeristy, Abilene, TX, Malaney Lopez, McMurry Univeristy, Abilene, TX, Priyanka Gupta, Receptor Logic, Abilene, TX, Ben Johnson, Hardin-Simmons University, Abilene, TX, and Jon Weidanz, Texas Tech University School of Pharmacy, Abilene, TX

Botany

- U P880 **A comparative study of buoyancy duration in *Carya aquatica*, *Carya illinoensis*, and *Carya × lecontei* seeds**
Gretchen E. Kroh*, Jessica R. Svoboda*, St. Edward's University, Austin, TX; Larry J. Grauke, USDA ARS Pecan Breeding & Genetics, Somerville, TX; and Michael A. Grusak, USDA-ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX
- U P881 **A comparison of root iron reduction capabilities in *Carya aquatica*, *Carya illinoensis*, and *Carya × lecontei***
Jessica R. Svoboda*, Gretchen E. Kroh*, St. Edward's University, Austin, TX; Larry J. Grauke, USDA ARS Pecan Breeding & Genetics, Somerville, TX; and Michael A. Grusak, USDA-ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX
- U P782 **Effects of grazing and soil nutrients on the competition between *Prosopis glandulosa* (Fabaceae) and *Buchloe dactyloides* (Poaceae)**
Jewell Lee M. Cozort* and Janis K. Bush, The University of Texas at San Antonio
- U P950 **Evidence of hybrid speciation in *Iris nelsonii***
Joshua Fugette*, Noland Martin, Sunni Taylor, Texas State University, San Marcos, TX.
- U P747 **Impact of non-native privet (*Ligustrum* spp.) on regeneration of native oaks (*Quercus* spp.) in William Cameron Park, Waco, TX**
Marcus Keck*, Andra Nava, and Susan Bratton, Baylor University, Waco, TX
- U P772 **Native and non-native vascular plants on the Weston Ranch, Guadalupe County, Texas**
Nicole K. Switzer*, Rogers Brown, Mark Gustafson, and Alan Lievens, Texas Lutheran University, Seguin, TX.
- U P727 **Seed germination requirements of Honey Locust (*Gleditsia triacanthos* L.)**
Tana Saul*, Jessica Poole, Ivy Sustaita, and Herb Grover, Wayland Baptist University, Plainview, TX
- U P729 **Variability in seed pod and seed production between Honey Locust (*Gleditsia triacanthos* L.) trees on the Wayland Baptist University campus, Plainview, Texas**
Joshua Lucas*, David Gary II, Rebekah Slentz, and Herb Grover, Wayland Baptist University

Cell and Molecular Biology

- U P713 **Antagonistic effects of coriander, garlic and ginger against *Escherichia coli* O157:H7 in ground beef**
Goldie da Costa*, Patricia Baynham Department of Biological Sciences, St. Edward's University, Austin, TX 78704 United States Department of Agriculture, New Orleans, LA 70124
- G P812 **Assessment of oxidative stress gene expression in the *Brassicaceae* plant family; Implications for the genetic engineering of plants for phytoremediation**
Florestella Ruiz*, Elyssa R. Garza* and Michael W. Persans, Department of Biology, University of Texas Pan American, Edinburg TX
- U P986 **Characterization and mapping of *Arabidopsis thaliana* mutants defective in peroxisome function**

- Violetta Vasquez*, Southwestern University, Georgetown, TX, Bonnie Bartel, Rice University, Houston, TX, Andrew W. Woodward, St. Edward's University, Austin, TX
- U P773 **Characterization of growth and genetic diversity of *Rhizobia* species colonizing *Acacia smallii* in Bell County, Texas**
Sarah Theresa Tello*, Dr. Kathleen Wood, University of Mary Hardin-Baylor, Belton, TX.
- NS P827 **Development of naïve models for studies of endosymbiosis**
Justin Norrell*, Hillary Corwin, Bridgette Kirkpatrick, Collin Thomas, Collin College, The Center for Advanced Studies in Mathematics and Natural Sciences, Plano, TX
- U P703 **Effect of dichlorvos on leg development in *Drosophila melanogaster***
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Catherine M Turner*, Lisa M Goering, St. Edward's University, Austin, TX.
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Lisa Rougraff* and Dr. Lisa Goering, St. Edward's University, Austin, TX
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Aaleen Cox* and Dr. Lisa M. Goering, Department of Biological Sciences, St. Edward's University, Austin, TX

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Jacare Cardoza* and Lisa Goering, St. Edward's University, Austin, TX
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Andrea Ochoa* and Charles Hauser, Bioinformatics Program, St. Edward's University, Austin TX 78704

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Julio E. Valladares* 1, Pat Nandakumar2, Erika Alvarado1 and William Krutz1 Department of Chemistry, Science and Math Division Midland College, Midland Texas, USA Department of Chemistry, University of Texas at Permian Basin, Odessa, Texas USA

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Zane Goodwin*, St. Edward's University, Austin, TX and Jamison McCorrisson, Konstantinos Krampis, Indresh Singh and Jason Miller, J. Craig Venter Institute, Rockville, MD
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- U P1029 **Population dynamics of *Gambusia nobilis* and *Cyprinodon elegans* in San Solomon Ciénega, Balmorhea State Park, Texas**

- Kelbi Delaune*, Gary Garrett, Raelynn Deaton and Chad Hargrave, Department of Biological Sciences, Sam Houston State University, Huntsville, Texas; Texas Parks and Wildlife, Inland Fisheries
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- U P894 **Effect of simulated microgravity on the nematode *Caenorhabditis elegans***
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- U P704 **Nutrient limitation of phytoplankton in the Brazos-Santiago Pass, South Padre Island, Texas**
Victoria Brown*, Justine Zoe Gapayao, Eliezer Antonio Gracia, Aaron S. Barreiro, Natasha Mitra, and Liana Garza, 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 P868 **Plankton primary productivity of the tidal segment of the Rio Grande, TX**
Irwin Mendoza* and Hudson DeYoe, Dept Biology, University of Texas - Pan American, Edinburg, TX
- U P705 **Primary productivity in the Lower Laguna Madre, Texas, from Port Mansfield to the Gulf of Mexico**
Eliezer Antonio Gracia*, Aaron S. Barreiro*, Victoria Brown, Justine Zoe Gapayao, Natasha Mitra, and Liana Garza, 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 P865 **Synoptic survey of water and sediment quality of the Lower Laguna Madre, TX**
Darlene Flores* and Hudson DeYoe, Biology Dept, Univ Texas Pan American
- U P874 **Transmission of potential zoonotic parasite to oysters (*Crassostrea virginica*) in the Lower Laguna Madre, South Texas**
Juan J Ramirez*, Brian L. Fredensborg, The University of Texas-Pan American, Edinburg, TX
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Natasha Mitra*, Liana Garza*, Aaron S. Barreiro, Eliezer Antonio Gracia, Victoria Brown, and Justine Zoe Gapayao, 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.

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Christy MacKinnon*, Jessica Hernandez, Frank Torralva, University of the Incarnate Word, San Antonio, TX.
- NS P822 **An overall assessment of “Biology of the Arachnids”; a two and a half week mini-course (June 2010) conducted at the Texas Tech Llano River Field Station in Junction, Texas**
Ned E. Strenth*, Biology Department, Angelo State University and H. Lynn McCutchen, Biology Department, Kilgore College.
- U P1060 **Draw-A-Scientist-Test [DAST]: Altering stereotypical misperceptions at an elementary level**
Angela Aukes*, Kirsten Barnett*, Kelsey Abbott, and Wendi Moran, Hardin-Simmons University
- U P1003 **Hydrophobicity measurements of modified and native silk proteins using the contact angle method: a biophysical chemistry experiment for undergraduate labs**
Hong Zhe* and David E. Coleman, University of the Incarnate Word
- G P1049 **NSF GK-12 project Flowing Waters: Secondary student attitudes towards science after the GK-12 experience**
Kristina Dame* and Julie Westerlund, Texas State University- San Marcos
- NS P1063 **Opportunities for scholarly activities in Germany via scholarships from the Germans**
Rick C. White*, Department of Chemistry, Sam Houston State University
- NS P993 **PlantingScience: Fostering student research through scientific inquiry and online mentorship**
Michael A. Grusak*, USDA-ARS Children’s Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX
- U P813 **Rapid escape reflexes of the Madagascar hissing cockroach, *Gromphadorhina portentosa*. A science laboratory activity developed for use in the middle school classroom**
Natorre S. Cole* and Veronica G. Martinez Acosta, Biology Dept., University of the Incarnate Word, San Antonio, TX 78209

Symposium on Engineering

- U P740 **Portable power for a construction site: A mobile photovoltaic cart**
Dr. Alison Whittemore, Saul Meza, Neal Jackson, Francisco Segura, Andrew Mocio; The University of the Incarnate Word, San Antonio, Texas

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- G P1059 **Timing in the absence of supraspinal input: A qRT-PCR analysis of the effects of temporally regular stimulation on the spinal cord**
Kuan H. Lee*, Sandra M. Garraway, Kyle M. Baumbauer, James W. Grau, Texas A&M University

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- G P988 **A molecular analysis of owl prey from Koanaka Hills, Botswana**
Joseph L. Reeve*, Madhusudan Choudhary, Patrick J. Lewis, Monte Thies, Department of Biological Sciences, Sam Houston State University
- U P700 **Assessing body sizes and wing loads of the monarch butterfly during the fall migration through central Texas: does size really matter?**
Joshua S. Huckabee*, Jakob Russell and Jason L. Locklin, Temple College, Temple, TX.
- U P866 **Assessment of introgressive hybridization between three species of *Juniperus*: Evidence from morphological and genetic data**
Humberto Hernandez* and Randall Terry, Lamar University
- U P760 **Genetic analysis of the 5'utr of bovine viral diarrhea virus**
Candace Frerich*, Loren K. Ammerman, Angelo State University, San Angelo, Tx and Dale Weise, Texas Vet Labs, Inc., San Angelo, Tx
- G P871 **Molecular phylogeny of *Aspergillus* species based on the internal transcribed spacer region**
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Paloma Reinoso* and Allan Hook, St. Edward's University
- NS P1022 **Phylogenetic and morphometric investigation of genital divergence: A meta-analysis**
Sibyl Bucheli*, Alan Archambeault, Natalie Lindgren, Brent Rahlwes, Stacy Stoops, Hojun Song, and Raelynn Deaton, Department of Biological Sciences, Sam Houston State University
- U P681 **Temperature effects on male mating and female nesting behavior in *Bembecinus neglectus* (Hymenoptera: Crabronidae: Bembecinae)**
Matthew Perez* and Richard Patrock, St. Edward's University
- G P927 **The Diagnosis of South African Microfauna Using Femoral Morphology**
Irisa Arney, New Mexico State University, Las Cruces, NM, Patrick J. Lewis*, Monte L. Thies, Sam Houston State University, Huntsville, TX

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Richard S. Tutalo*, Patrick J. Lewis, Monte L. Thies, Sam Houston State University
- U P905 **A survey of ectoparasites from small mammals from Honduras**
Lizbeth Cruz* and Christopher M. Ritzi, Sul Ross State University
- G P816 **Brood care and transport behaviors in *S. invicta***
Rachel Grotte*, Robert Renthal, University of Texas at San Antonio
- U P769 **Call latency in anuran breeding call surveys in Central Texas**
Alexander S. Hall* and Benjamin A. Pierce, Southwestern University, Georgetown, TX
- G P817 **Competition and Light Exposure as Possible Factors in the Distribution of *Verbesina virginica***
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- U P696 **Effect of land use on playa invertebrate richness and abundance**
Ivy Sustaita*, Tana Saul, Natividad Sandoval, and Andrew C. Kasner, Department of Biology, Wayland Baptist University, Plainview, TX.

- U P1045 **Effects of gopher mounds on a spotted knapweed (*Centaurea stoebe*) population**
Benjamin Itz*, Stefano Pineda, William Quinn, Osvaldo Hernandez, St. Edward's University, Austin, TX and David Knochel, Timothy Seastedt, University of Colorado, Boulder, CO
- G P1025 **Female mortality rate, age at maturity, and annual reproductive output predict species status in turtles**
James Cureton, Jeff Goessling*, and Raelynn Deaton, Department of Biological Sciences, Sam Houston State University
- NS P1026 **Hot moments and hot spots: Identifying spatial and temporal predictors of road mortality of turtles in Texas**
Raelynn Deaton and James C. Cureton II, Department of Biological Sciences, Sam Houston State University
- U P1030 **Landscape effects on seedbank and seedling density, cover, growth and seed production of *Centaurea stoebe* in Boulder County, Colorado**
Stefano Pineda*, Dr. Osvaldo Hernandez, Benjamin Itz, St. Edwards University Austin, Tx, Dr. David G. Knochel, University of Colorado at Boulder.
- U P684 **Longevity, philopatry and tests of oviposition preferences in *Exoprosopa albicollaris* (Diptera: bombyliidae), a parasite of *Bembecinus neglectus* (Hymenoptera: Crabronidae: Bembecinae)**
Rachael Amador* and Allan Hook, St. Edwards University
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Jessica Lyon* and David L. McCulloch, Collin College, Plano, TX

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Virtually reconstructing Mayan architecture: Discoveries of virtual artifacts

Leah McCurdy*, University of Texas at San Antonio

Architectural virtual reconstruction in archaeology is relatively new and interesting. The use of advanced technologies usually peaks interest amongst a crowd. Various media outlets provide general insights into the compelling nature of these technologies. With respect to virtual reconstruction, highlights from such media have only scratched the surface. Most archaeologists, as well as the general public, can readily appreciate the simple aesthetic usefulness of virtual reconstructions. With this presentation or poster, I aim to broaden the awareness of potentials of the virtual reconstruction process for archaeologists. The experience of creating a virtual reconstruction presents opportunities for learning. It is constructive learning, creative and critical in nature. I will describe my recent project reconstructing Plaza A-III of the Maya site of Xunantunich, Belize. My presentation will focus on the *virtual artifacts* which arose as I reconstructed the architecture of this ancient Maya complex. As will be shown, the reconstructive experience is a powerful research tool in itself and one which can culminate in the creation of a tool fit for further research applications.

697 Anthropology

Identification of economically significant plant species in the free state, South Africa: An archaeological-ethnobotanical approach

Senna Thornton-Barnett*, Texas State University

In 2009 I assisted Dr. C. Britt Bousman in his excavations at Erfkroon in the Free State, South Africa. While digging a series of units associated with the early part of the Later Stone Age (LSA), we unearthed several partial grinding stones. These grinding stones provide evidence for the technological transition that took place between the Middle Stone Age (MSA) and the Later Stone Age, a shift that is poorly documented in Southern Africa. Bousman hypothesizes that this transition is marked by a shift from more structured, less flexible subsistence, technology, and mobility strategies to a less structured, more flexible suite of strategies (foraging). The discovery of plant remains in situ would provide the most direct evidence for the MSA to LSA transition, though plant remains at Erfkroon have not been preserved. To mitigate this limitation, I carried out an ethnobotanical study of modern plant use among the Tswana and Sotho peoples that have historically inhabited the Free State, in order to extrapolate the species that may have been used during the period in question. I made contact with local informants, conducted interviews regarding their plant knowledge, and accompanied them out into the field where we collected and identified economically important species. The next phase of my research will involve historical, botanical, and archaeological investigations into the variety, distribution and use of grass veldt plants, with greater focus on edible species.

745 Anthropology

Paleoindian/Archaic transitions in Texas

Britt Bousman*, Anthropology, Texas State University

Historically the Paleoindian/Archaic transition was viewed as a simple linear progression from one lifestyle to another. Paleoindians were characterized as small groups of hunter-gatherers who hunted large, extinct, animals. Archaic hunter-gatherers were believed to have expanded their economic pursuits and focused on smaller game and plant foods. New light on this transition in Texas shows that societies in the Late Pleistocene and Early Holocene developed in complex ways. This paper presents a current summary of the evidence for this transition that looks at the settlement, human burial, subsistence, technological and stylistic shifts over the first 2600 years of the Holocene.

746 Anthropology

GIS in archaeology

Chris R.L. Davis*, Texas State University

Geographic Information Systems (GIS) is not merely a specific program or computer application, it is a system that "aids in the collection, maintenance, storage, analysis, output, and distribution of spatial data and information" (Bolstad 2008). For archaeology, this system is a useful tool that provides the opportunity to combine spatial and non-spatial data in a form that can be used for analysis. When combined with qualitative information on the archaeology of a region, GIS can be used to help identify patterns in the archaeological record that can provide further insight into past cultures. Using examples from field work at Javelina Heights (41VV2005), Eagle Cave (41VV167) and Alibates Flint Quarries National Monument (41PT1), this presentation will demonstrate how geographic information systems can be incorporated into archaeological field methods to create, manage, and analyze digital datasets

785 Anthropology

Documenting stable carbon isotopic composition of bone collagen in modern leporids as a guide to past environments

Stephen Smith*, Robert Hard, Raymond Mauldin, and Cynthia Munoz, Department of Anthropology and Center for Archaeological Research, University of Texas San Antonio

Isotope research focused on small herbivore collagen allows archaeologists to reconstruct past ecological conditions. The validity of those reconstructions, however, has not been tested against a baseline of isotopic studies derived from different environments. This research focuses on reconstructing changes in vegetation using stable carbon isotopic compositions preserved in modern bone collagen of jackrabbits and cottontails collected from several different ecological settings. We correlate recent precipitation and temperature data with specimen $\delta^{13}\text{C}$ collagen values. The comparison of those carbon signatures with the short-term temperature and rainfall records provide data to assess the suitability of these species as ecological proxies.

790 Anthropology

Pre-Hispanic resource use and household production strategies at San Estevan, Belize

Antonia L. Figueroa* and Sarah M. Wigley, University of Texas San Antonio

This paper discusses the results of the analysis of chipped stone from the Prehispanic site of San Estevan, located in northern Belize. Differences observed in residential architecture at San Estevan have been attributed to differences in household organizational strategies. By examining household economies, such as lithic production, at various spatial and temporal scales, researchers can begin to understand resource management and production strategies. The viability and discontinuity of particular residential loci also becomes salient in addressing issues of resource management and sustainability in this region of the Maya Lowlands.

794 **Anthropology**

The Burris Site: An initial attribute analysis of the lithic material from 41VT41

Jason B. Perez*, University of Texas San Antonio

The Burris Site is a Late Prehistoric (Toyah Period, 800 to 400 BP) assemblage with a possible underlying Late Archaic component. The site, designated 41TV41 and 41VT66, is located along Coletto Creek in Victoria County, Texas. First recorded in 1975 by Anne Fox of the Center for Archaeological Research (CAR) at UTSA, the Southern Texas Archaeological Association conducted a field school at the site in 2001 under the direction of Dr. Steve Tomka of CAR. To date, little work has been done on the lithic assemblage collected during that 2001 field school. This paper presents the results of an analysis of that assemblage. The analysis included examination of both debitage and stone tools. The initial goal of this work was to confirm the temporal placement of the site through a review of the projectile point assemblage. Debitage analysis included maximum flake dimensions, completeness, platform faceting, and reduction attributes. While the debitage analysis contributes information on site function, occupation duration, and reduction processes, the primary focus of this paper is on the impacts of raw material availability. The data collected from analysis at Burris, where access to abundant, high-quality cherts is limited, is compared to data from other sites in Central and North-Central Texas. This comparison allows a consideration of the impacts of low chert availability on lithic reduction strategies.

803 **Anthropology**

Exploring diagenetic alteration in stable isotopic signatures in bone collagen

Patricio Villanueva*, Cynthia Munoz, and Raymond Mauldin, University of Texas San Antonio, Geology and Anthropology)

As stable isotope analysis of mammalian bone for paleodiet reconstruction continues to increase, it is important to reevaluate the most widely used quality assessment measurement that identifies diagenetic alteration in the collagen extract, the C:N ratio. Those samples that do not fall within the 2.9 to 3.6 C:N atomic range are considered to be diagenetically altered or contaminated. A series of controlled experiments exposing modern and prehistoric bison bone samples to various conditions including exposure to heat (90 ° C) and moisture variation for over 1,000 hours was conducted to produce artificial diagenesis. Modern and prehistoric samples exposed to a dry, heat environment fell within the acceptable C:N ratio throughout the duration of the experiment. Samples exposed to heat and variations of moisture initially remained within the range but soon shifted out of range after about 300 hours of exposure. Several modern samples that were considered acceptable produced carbon isotopic signatures that were two standard deviations away from the mean of the control samples. Based on more than 100 replicate isotopic analyses, we suggest refinements in diagenetic identification tools, including the C:N ratio.

809 **Anthropology**

The linguistic etymology of a Mayan hieroglyph: Determining the origin of *ajaw*

Kevin McKinney*, Texas State University-San Marcos, San Marcos, TX

The Mayan glyph for 'Lord', *ajaw*, is an example of a morpheme and associated graphical symbolism loaned to the Maya culture by Mixe speakers at the end of the Middle Formative period, roughly 400 BCE. Based on the comparisons of Mayan and Mixe Zoquean, if it is indeed a borrowed item, then *ajaw* expresses a foreign influence. The etymology of *ajaw* provides new insight into the earliest function of non-royal elites among the Middle Formative Maya. These insights provide a more complete understanding of the introduction of kingship into Southeastern Mesoamerica. Based on my research and a review of the literature comparing the various Maya *ajaw* allographs to Mixe-Zoquean roots morphemes, there appears to be greater morphological complexity for some sign forms, and less for others. It is likely that each of these allographs have different linguistic roots. Furthermore, the iconographic analysis of representations of Olmec and Epi-Olmec rulers can provide supporting evidence regarding the original function of the more complex *ajaw* signs. As a result, I have identified three different themes represented by the various *ajaw* allographs: (1) the headband of rulership associated with the three different *ajaw* head variants, (2) the cave mouth related to the calendrical and non-calendrical *ajaw* variants, and (3) the responsibilities of office associated with the affix *ajaw* variant. Each of these themes represents different aspects of kingship that came to be symbolic of a single morpheme used by the Maya as early as the Late Formative period.

845 **Anthropology**

Changes in Karankawan subsistence patterns following Spanish contact

Kelley Denham*, The University of Texas at San Antonio, San Antonio, TX

A comparison of the archaeological and ethnographic literature suggests that the Spanish missions in Texas had a significant impact on Karankawan diet. In this presentation I discuss preliminary results of lipid residue analysis derived from ceramics obtained from Karankawan prehistoric and Spanish Colonial Mission assemblages. To define the typical prehistoric Karankawan dietary profile, the archaeological literature and record were explored to identify lipid residue signatures expected in ceramics absorbed residues. To define the Spanish Colonial Mission residue compound signatures, the ethnohistoric record was examined. These typical prehistoric and historic residue profiles were compared with the residue compound signature profiles derived from archaeological ceramic assemblages. The archaeological samples were obtained from a prehistoric Karankawan site of Southern Texas and are compared to samples from Mission Refugio, where the Karankawa were documented to have been the primary residents. The extraction of the residues and the biochemical analysis of the compounds were performed at Millsaps College Keck Lab using lc-ms (liquid chromatography – mass spectrometry).

P857 **Anthropology**

Controlled and bonfire firing experiments of ceramics made of local clays

Steve A. Tomka*, Lori Barkwill Love, Center for Archaeological Research, University of Texas San Antonio

During the past few years, the senior author has been collecting raw clays from throughout South Texas and the Coastal Plains to establish a comprehensive Instrumental Neutron Activation Analysis (INAA) comparative baseline and use the clays in experimental manufacture of ceramic vessels and as part of controlled firing experiments. Clay samples have been fired under controlled conditions and vessels tempered with crushed bone have been fired in bonfires while temperature readings were collected on a systematic basis. The results of these experiments are beginning to shed light on the working characteristics of clays from distinct formations and the firing characteristics of these clays. These results have implications for future INAA and thermo-luminescence analyses and the identification of clays used by prehistoric potters.

858 **Anthropology**

The implications of a modern snail assemblage for archaeological research

Steve A. Tomka*, Barbara A. Meissner, Center for Archaeological Research, University of Texas at San Antonio

Over the past decade, Texas archaeologists have been engaged in the systematic collection of snail assemblages from archaeological sites in an attempt to use their species composition and size ranges as proxy indicators of paleoclimatic conditions and as evidence of human consumption. A recently collected snail assemblage from an abandoned homestead in south-central Bexar County is examined to provide clues regarding the implications of collection and laboratory processing methods for the reconstruction of paleoclimate and evidence of human consumption of snails. It is revealed that collection methodology and the size of the screens employed in snail assemblage extraction have significant effects on the reconstruction of both paleoclimatic conditions and human predation.

899 **Anthropology**

Exploring chemical indicators of the use of the land snail *Rabdotus* as a food resource in prehistoric Texas

Raymond Mauldin*, Antonia Figueroa, Cynthia Munoz, University of Texas at San Antonio, San Antonio, TX

Accumulations of large numbers of unbroken snail shells of the genus *rabdotus* are sometimes present on prehistoric archaeological sites in Central and South Texas. Some researchers argue that these accumulations reflect refuse from the large-scale consumption of this snail, though unambiguous criteria for identifying these concentrations as cultural in origin are not well developed. Research to develop criteria has focused primarily on comparisons between on-site and natural *rabdotus* concentrations, but results are often ambiguous. Here we focus on possible chemical signatures in shell related to probable cooking methods for this snail. If snails were consumed in quantity, likely processing methods include some form of heating, with boiling being the most commonly suggested cooking method. Using modern and archaeological snails, we review our ongoing work that focuses on possible chemical shifts in shells as they are heated. These include reviews of racemization shifts in selected amino acids and shifts in carbon and oxygen isotopic signatures as an outgrowth of heating. Previous research, though underreported, seems to suggest that boiling has no impact on racemization values in amino acids in shell.

Focusing on a wider set of amino acids and using a more sensitive method, our research on *rabdotus* seems to confirm this earlier work. We do, however, find intriguing differences in carbon and oxygen isotopic variability in boiled and non-boiled samples. If confirmed by additional research, these isotopic differences suggest avenues for identification criteria in boiled snails.

904 **Anthropology**

Prehistoric use of the natural landscape in Pecos County, Texas: An examination of archaeological survey observations

Jon J. Dowling* and Bruce Darnell, Ecological Communications Corporation

A reconnaissance level archaeological survey of numerous mesa tops, talus slopes, valley flats, and canyon washes within Pecos County Texas offered additional insight into ancient adaptive strategies to a harsh environment, contributing to the reconstruction of prehistoric cultural systems in the Mountains and Basins Ecological Area of Texas. Specifically, the use of the natural landscape to overcome certain environmental conditions will be discussed based on the results of a survey conducted by Ecological Communications in the summer of 2010. Observations of the archaeological record and landscape just southwest of Iraan, Texas offer a glimpse into a myriad of human adaptive techniques and modifications employed to make the best use of a limited availability of water, resources within a desert biotic community, and the geologic distribution of rock shelters and natural landscape formations.

918 **Anthropology**

Lithic reduction features of South Texas: Identification, analysis and interpretation

Christopher W. Ringstaff*, Texas Department of Transportation

Recent archeological investigations by the Texas Department of Transportation focuses attention on one of the less common and subtle feature types identified within the South Texas archeological setting; the lithic reduction feature. These features consist of spatially discrete clusters of chipped stone flaking debris resultant from in-situ tool production or secondary disposal loci and are found in surface and subsurface contexts. The heterogeneous nature of raw material sources in the region allow for high resolution analysis in which individual tool reduction episodes can be identified and characterized technologically. The results of these analyses could be used to address research questions including technological organization, mobility, and raw material economy. This paper provides a review of this feature type, describes site specific examples and addresses integrity issues, analytical approaches, and interpretations.

954 **Anthropology**

Land of the Tejas: Identity and interaction in Texas A.D. 1300-1700s

John W. Arnn*, Archeological Studies Program, TxDOT

In terms of historical and archaeological data the very late prehistoric and the very early historic periods of Texas provide a rare opportunity for understanding native peoples, for together they span the last prehistoric and the first historic records of this region. However, where historians document significant cultural diversity between A.D. 1528 and 1700, archaeologists observe homogeneity in the Toyah material culture that began in A.D. 1300 and vanished shortly after direct European contact. These sharply divergent perspectives suggest a clearer understanding of identity and interaction is necessary. Therefore, the identity and interaction of late prehistoric and the early historic peoples was contextualized within social institutions and environmental settings common to both prehistoric and historic peoples in order to compare archaeological and historical data. The results of this synthesis demonstrates that many culturally diverse peoples participated to varying degrees and in different ways in a widespread social field that spanned prehistory and history, and large portions of the region. In addition to resolving the dichotomy between historical and archaeological interpretations, the results of this research also present indigenous socio-cultural identity and interaction in terms of continuum.

669 **Biomedical**

Culberson County, Texas: The unreported county in regards to cancer occurrence

Dianna D. Marin* and Christopher M. Ritzi, Department Of Biology, Sul Ross State University, Alpine, Texas

According to the American Cancer Society and the National Cancer Institute's cancer registries, cancer ranks as the second leading cause of death in the state of Texas. However, in many rural communities where cancer treatment facilities are not located, the cancer incidence statistics are suppressed to prevent duplication of counts from the reporting county where the patient is treated. We performed an overview of the cancer incidence and trends of the top ten cancers for the United States and all sites combined for the rural area of Culberson County, Texas wfor the years 2000 through 2009. Data for the study came from reports from the International Classification of Diseases (ICD-9) and medical records from Culberson County Hospital and the Van Horn Rural Health Clinic in Culberson County, Texas. A total of 429 actual new cancers were identified over the ten year period. This is an average of 42.9 official new cases each year for a rural population of only 2431. After adjusting these numbers to make comparable at "per 100,000" as reported by state and national registers, the cancer incidence rate for this target area was found to be three times higher than either average. With medical advancements in cancer treatment and an aging population, the cancer incidence will likely continue to rise for years or even decades to come. Accurate accounting for rural areas will provide information on the impact of cancer on the health care system, document the need for increased research, and further the progress in supporting cancer control knowledge across all regions of the country.

P685 **Biomedical**

An observational study of physical fitness and academic achievement in third through sixth grade students in Seguin, Texas

Jessica Giattino*, Texas Lutheran University, Seguin, TX

The objective of this study was to examine the relationship between physical fitness (FITNESSGRAM), as measured by aerobic fitness and body mass index (BMI), and academic achievement (Texas Assessment of Knowledge and Skills) in school-aged children. Subjects consisted of third through sixth grade students in the Seguin Independent School District of Seguin, Texas. FITNESSGRAM scores from the year 2009-2010 were analyzed against 2010 Texas Assessment of Knowledge and Skills (TAKS) scores in order to determine the nature of the correlation. A statistically significant correlation between academic achievement and physical fitness was seen when fitness was measured by aerobic capacity, but not when measured by BMI. Lack of socioeconomic status (SES) and other confounding variables make it difficult to determine the causality of this relationship.

689 **Biomedical**

Bioactive coatings with BMP-2: stage 1

Marziya Hasan*, Texas Lutheran University, Seguin, TX and Stefanie Crumlett Shiels, University of Texas at San Antonio, San Antonio, TX

Local delivery of drugs or proteins to a wound site may greatly improve drug efficiency and possibly healing time. Attaching bone healing drugs to a scaffold made of hydroxyapatite (HAp), a natural constituent of bone, may deliver the drug to the sight of a break while also providing a foundation for bone repair. Bone Morphogenetic Protein-2 (BMP-2) was attached to the scaffolds because it triggers bone growth at a site of injury. This study focused on the coating properties of the linkers between HAp and BMP-2. Polyethyleneimine (PEI), which has a natural affinity for HAp, and polyethylene glycol (PEG) were used as polymeric spacers coat HAp discs. Optimal PEI adsorption time was determined via contact angle measurements on PEI-soaked HAp discs over various time intervals. Coating efficiency of PEI was determined using the fluorescence plate reader and a fluorescence microscope. Lastly, the coating chemistry of PEI to PEG was altered to potentially increase the amount of PEG attachment to PEI. Free amines of PEI were thiolated to provide an alternate route for PEG attachment.

P715 **Biomedical**

Antimicrobial properties of cinnamon and chili seed essential oils against *Salmonella enterica* on whole minimally processed strawberries

Carlos F. Mendoza* and Patricia J. Baynham, St. Edward's University

Salmonella enterica represents a common human enteric pathogen responsible for numerous outbreaks of illness in the United States. Recent outbreaks have involved contaminated minimally processed fruits and vegetables. Contamination may occur during production, transfer, or preparation of produce by nature or human sources due to inadequate cleansing. Plant-derived essential oils (EOs) with antimicrobial properties have been used to address this public health concern. Thus, we investigated chili seed EO antimicrobial properties for possible inhibitory effects on *S. enterica* and their use in a tasteful decontaminating wash for ready-to-eat fresh fruits such as strawberries. We tested each EO (with an ethanol control) in-vitro against *S. enterica* using an agar dot diffusion assay with concentrations from 0.0825% to 5% for each EO. Ethanol did not inhibit *S. enterica*, cinnamon bark (steam) EO inhibited growth as low as 0.0825%, and the chili seed EO MIC measured 1.0%. Fresh strawberries reached contamination levels of 3.04×10^8 CFUs of *S. enterica* and we treated them with a water bath containing various concentrations of chili seed EO or no EO. We then washed strawberries with saline peptone water and determined the CFUs by dilution and plating. *S. enterica* did not occur on fresh strawberries. The inoculated and untreated

strawberries (control group) had an average of 3.04×10^8 CFUs. Compared to the control group, the DI water treatment increased *S. enterica* growth by 8.6×10^7 CFUs, and the chili seed EO treatment reduced growth from 91.84% (0.5% chili seed EO) to 94.51% (1% chili seed EO). The results indicate chili seed EOs potential use in reducing produce-associated outbreaks

718 Biomedical

Organic acids in barbeque marinade inhibit the growth of *Salmonella enterica* in chicken

John Taylor Gabriel*, Dr. Andrew Woodward, Dr. Patricia Baynham

Approximately four million people are infected with *Salmonella enterica* each year, and many of these cases are transmitted via chicken. These infections are characterized by diarrhea, cramps, nausea, and vomiting that frequently lasts a week but is rarely fatal. Because *S. enterica* is a common chicken contaminant that is virtually impossible to eradicate from the processing stage of chicken production, the consumer must ensure that their poultry is safe to eat. In this study, we tested organic acids to determine if they would inhibit the growth of *S. enterica* in chicken when placed in a common barbeque marinade. In the first experiment, we compared three barbeque marinades containing 5% (wt/vol) tartaric or citric acid, or 5% (vol/vol) lactic acid to a simple marinade that had no added organic acids. Chicken pieces were treated with these marinades and incubated at 37 °C for 24 hours. In the second experiment, each of the organic acid marinades were standardized to 300 mM and the chicken was incubated at 4 °C. The results indicate that all of the organic acids inhibited *S. enterica* growth while tartaric acid did so most effectively. This suggests that inclusion of tartaric acid in barbecue marinades may be an effective strategy to decrease the incidence of *S. enterica* infection. This strategy may also be applied to other meat marinades and may be applied to bacteria that cause other food-borne infections.

731 Biomedical

The effect of skin surface area on arm tactile perception

Madalyn Mendoza*, Roberto B Gonzales, Northwest Vista College, San Antonio, TX

This study investigated whether tactile perception differs as a function of varying skin surface area. Adult skin surface areas in various regions of the body may change over time due to a number of factors such as obesity, exercise, or other pathological or non-pathological conditions. The cortical regions, or corresponding mechanisms, required to process this tactile information may not adapt to the extent required to maintain the same level of tactile discrimination. This preliminary study used two-point threshold (TPT) examinations to determine if changes in tactile perception due to variation in skin surface area, or arm composition, exist in adult male and female participants. Two-point threshold information was collected using the lateral surface of the upper arm. Data was then compared across subjects with varying arm lengths, circumferences and arm composition to determine if a correlation exists between arm surface area and TPT levels. Not distinguishing between genders, a significant positive correlation between TPT and arm surface area, as well as TPT and circumference was found. In males, a significant correlation between TPT and arm surface area, as well as circumference, was revealed, whereas in females, a significant correlation between TPT and skin fold, as well as arm length, was found.

P765 Biomedical

Creation of a HER2/NEU expressing MDA 231 stable line

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The monoclonal antibody trastuzumab can be effective in targeting the kinase activity of Her2 and reducing tumor growth. Trastuzumab is a recombinant monoclonal antibody that has been humanized to reduce immune response complications in patients and to increase likelihood of recruiting immune effector cells; it is an IgG1 kappa antibody specific for the HER2 extracellular receptor. The HER2/neu proto-oncogene is a member of the ErbB receptor tyrosine kinase family. Receptor tyrosine kinases are transmembrane proteins which dimerize via ligand binding an extracellular N-terminal domain. HER2/neu, or human epidermal growth factor receptor 2, is an orphan receptor and belongs to a class of receptor tyrosine kinases that are responsible for many cellular activities including growth, survival, and differentiation. Her2/neu is overexpressed in 20-30% of breast cancer cases, and is also overexpressed in cancers of the ovaries, lungs bladder, pancreas, stomach, salivary glands, and colon. Furthermore, Her2/neu tumors are typically aggressive tumors, characterized by rapid progression and chemoresistance with a generally poor prognosis. In order to study the effectiveness of another monoclonal antibody therapy, creation of a cell line stably expressing Her2/Neu was desired. MDA 231 cells were acquired and transfected with a plasmid containing the HER2/neu gene. Transfected cells were selected for using G418; MDA 231 was then subcloned to select for cells with high expression or Her2/Neu. Varying concentrations of G418 were used to selection and expression HER2/neu levels were monitored using flow cytometry assays.

786 Biomedical

Silencing the call to arms: Loss of the drug efflux regulator MexI severely impairs production of *Pseudomonas aeruginosa* quorum signal PQS

James V. McCann*, Carolina Corkill, Stephen Wells, Marvin Whiteley, and Megan L. Boulette, St. Edward's University Department of Biological Sciences, Austin, Texas

Pseudomonas aeruginosa is an opportunistic human pathogen prevalent in the lungs of cystic fibrosis patients, where it leads to the decline of pulmonary function and often death. *P. aeruginosa* relies on the intercellular signal Pseudomonas quinolone signal (PQS) to help optimize density-dependent regulation of virulence genes. By binding to the PQS-dependent transcriptional regulator, PQS aids in biofilm formation and regulation of other virulence factors. PQS has been detected at 2µM in sputum samples of CF patients, offering physiological evidence of PQS importance for infection. Mutants unable to produce PQS exhibit avirulence in several virulence models. The mode of entry and exit of PQS from the cytoplasm is unknown. Members of the Resistance-Nodulation-Division (RND) family of small molecule efflux proteins have been implicated in efflux of other *P. aeruginosa* quorum signals. Thus, we hypothesized that members of the RND family were involved in PQS transport and undertook a screen to identify RND mutants from the publically-available PA14 library that were defective in PQS production. One mutant containing a transposon insertion in *mexL* produced scant PQS as measured by thin layer

chromatography, a defect that could be complemented by expression of *mexL* from a plasmid. MexL belongs to the TetR family of repressor proteins involved in transcriptional control of multidrug efflux pumps, pathogenicity, and has been demonstrated to transcriptionally repress a newly characterized RND pump. Further investigation is required to elucidate the direct targets of MexL. Our results suggest the involvement of the RND family of small molecule efflux proteins in production of PQS.

833 Biomedical

Diruthenum complexes as a potential anticancer agent

Destinee Stroud*, Texas Southern University, Houston, TX; Jamie Dooley- Renfro, Texas Southern University; Tuan Phan, Texas Southern University; Bobby L. Wilson, Texas Southern University

According to the Centers for Disease Control Prevention (CDC), cancer is one of the leading causes of death in the United States. Scientists have been involved in extensive research to develop a drug that targets cancer cells. Past anti-cancer drugs have been unsuccessful during chemotherapy treatments, because they destroy normal body cells and are insoluble in water. The purpose of this investigation is to test the hypothesis that the organo-metallic compound, water-soluble diruthenum complex of allopurinol, has potential as an anti-cancer drug. The importance of this study is to find a chemical complex that can target the cancer cells and cause necrosis (cell death). Overall, this study will benefit patients in the future with various types of cancer because the interaction of anti-cancer drugs and targeted malignant cells may involve the same mechanisms. Research efforts involved the administering of the drug to MCF-7 breast cancer cells to determine necrosis (cell death). The concentration of the drug uptake was determined using the Neutral Red Assay. The detection of the neutral red dye found in the lysosomes of the MCF-7 cells was determined at a specific wavelength using the Bio-TEK plate reader. Absorbance values obtained from the Bio-TEK plate reader revealed that this organo-metallic drug has the potential of being classified as an anti-cancer drug. Laboratory data results from the screening of the drug at lower concentrations was completed. Due to the fact that the diruthenum allopurinol complex is water soluble and the qualitative and quantitative data obtained from the first screening yielded promising results indicates that necrosis has possibly occurred. Preliminary indications are that this organo-metallic complex is an ideal candidate with great potential to be classified as a drug screening candidate as an anticancer drug.

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834 Biomedical

Transcription factor NF- κ B mediates high energy radiation induced activation of Cox-2, MMP-9, and I κ Ba

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Space, the "last frontier", is home to high-energy galactic cosmic rays (GCRs). These highly charged radioactive particles would eradicate life as we know it without the deflective nature of the Earth's magnetic field. Astronauts and future space travelers are at an increased risk of adverse health impacts from exposure to GCRs, protons and electrons trapped in the Van Allen Radiation Belts as well as radiation from Solar Proton Events. Based on the international push for commercial space travels and lack of sufficient knowledge about high-energy radiation, it is important to investigate pathways affected by high-energy radiation exposure. The transcription factor Nuclear Factor-kappaB (NF- κ B), regulates numerous genes including cytokines and chemokines, through its activation of genes responsible for innate immunity, inflammation, and cell survival. Conversely, dysregulation of NF- κ B has been linked to cancer development and inflammation. Numerous research efforts have conclusively established radiation as a carcinogen, which makes NF- κ B a good target to study the effects of high-energy radiation induced carcinogenesis. Balb/C mice were exposed to high-energy (1GeV) proton radiation to achieve an exposure of 0.1, 1, and 2 Grays. Tissue samples were obtained, homogenized and analyzed by Western blotting with specific antibodies against p65, COX-2, MMP-9 and I κ B. In this study, we demonstrate that high-energy (1GeV) radiation induced the activation of MMP-9 and COX-2 in mice, through activation of NF- κ B.

P838 Biomedical

Biosensors: Immobilization of Avidin on Nanoporous Alumina

Jessica Koehne*, Paolo Actis, Adam Seger, Boaz Vilozny, Olufisayo Jejelwo, Meyya Meyyappan, Nader Pourmand

Biosensors are capable of detecting, measuring, and differentiating between chemical components of the environment, commercial products, and complex systems including biological organisms; the detection of harmful chemical compounds (e.g. carcinogens, pathogens, biothreats, etc.) can lead to their identification and quantification. We are developing an electrical biosensor based on nanoporous alumina. Nanoporous alumina is a good platform to immobilize receptors because the aluminum oxide surface can be functionalized with known chemistry. On the nanoscale, aluminum oxide pores contain strong ionic interatomic bonding which give rise to its unique and desirable properties; at a larger size, the same unique properties do not exist in the pores. The unique properties of aluminum oxide's pores (electrically insulating, pellucidness, high resistivity, and malleable pore sizes) along with its affordable price and simple mode of synthesis are the benefits to using this material to compose a biosensor platform for the experiments. However, the best way to attach molecules (e.g. proteins) is not yet known. In the experiments planned, we will exploit nanoporous alumina's unique properties to optimize conditions for immobilizing avidin as a model protein on the alumina surface. By immobilizing proteins, microscopy of these macromolecules on a surface is made possible. The protein-functionalized alumina surface will be characterized by electron microscopy, surface contact angle, and fluorescence microscopy. We will determine what methods give the best results in terms of stability over time without degradation of the protein.

876 Biomedical

Unexpected modulation of *Yersinia pestis* virulence following exposure to low shear forces

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Previous studies that have characterized the responses of various Gram-negative bacterial pathogens to low shear forces have demonstrated transient hyper-virulence as observed in both cell culture and animal infection model systems. This phenomenon was observed for the *Salmonellae*, enterohemorrhagic *E. coli* and enterotoxigenic *E. coli*. To further these investigations evaluating the response of Gram-negative pathogens to low shear forces, we employed a closely related pathogen, *Yersinia pestis* (YP). Unlike its closely related Gram-negative cousins, YP behaved quite differently following growth under low shear force. YP suffered what appeared to be impaired type 3 secretion system (T3SS) function, which is important for delivery of toxins into targeted host cells, as well as reduced production of the T3SS toxins themselves. This compromised T3SS function could have accounted for the decreased virulence of potential of YP during eukaryotic cell infections. Low shear force-grown YP was less effective in inducing HeLa cell rounding and was less effective in proliferating vis-a vis cultured RAW 264.7 macrophages. We conclude that low-shear forces do not affect all pathogenic Gram-negative bacteria similarly.

887 Biomedical

Structure, mechanism and anticancer potential of the isothiocyanate diruthenium complex (3,1)Ru₂(F3ap)₄(NCS)₁

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Ruthenium (Ru 44), a hard white metal containing four crystal modifications, is a rare transition metal belonging to the platinum group. Drug resistance and toxicity experienced following the administration of cisplatin has propelled the development of novel platinum, and non-platinum based antitumor drugs. Consequently, novel ruthenium compounds have been engineered so as to improve clinical effectiveness, reduce general toxicity and broaden the spectrum of activity. The cytotoxic effects of (3,1) Ru₂(F3ap)₄(NCS)₁, an isothiocyanate diruthenium complex, was measured in HeLa-human epithelial carcinoma cells, A293-human embryonic kidney epithelial cells, and LNCaP-human prostate adenocarcinoma cells by the MTT uptake method. Our results demonstrate that the diruthenium compound (3,1) Ru₂(F3ap)₄(NCS) inhibited viability and growth of HeLa, A293, and LNCaP cell lines in a dose dependent manner indicating ruthenium's potency as a cytotoxic agent. We will elucidate the mechanism of action of (3,1) Ru₂(F3ap)₄(NCS) in future studies.

1048 Biomedical

Impact of TiO₂ metallized carbon nanotubes (TiO₂- CNT) on regenerative bone

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In the field of modern medicine the use of Carbon Nanotubes (CNT's) for drug delivery, virus detection, and molecular methods for disease diagnosis has begun to emerge and is expected to develop into large scale industrial production. However, the use of CNT's in various fields, especially in medical applications, raises serious concerns about health and safety issues. Currently there are several areas that are looking towards nanotechnology as a new form of enhancement, specifically regenerative medicine. Previous studies with osteoblast cells and the use of titanium oxide (TiO₂) nanotubes have demonstrated the promise of nano-biotechnology methods¹. Studies have proven that titanium oxide nanotubes can play a key role in accelerating the healing process of bone tissue. In our study we will investigate the TiO₂ coated carbon nanotubes (TiO₂-CNT) as an enhancing agent for bone healing. The objective of this study is to evaluate the impact of TiO₂-CNT's on the viability of human fetal osteoblast cells by examining TiO₂-CNT toxicity using 3-[4, 5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide] (MTT), Neutral Red Assay, Lactate-Dehydrogenase Assay, and Calcium Quantification kit. If TiO₂-CNT enhances the growth of osteoblasts, then TiO₂-CNT has a likelihood of accelerating the growth of fractured bones cells leading to a rapid recovery. It is theorized that the structural characteristics of TiO₂-CNT can potentially play a major role in regenerative bone treatment as they have greater wear resistance and fatigue. Other regenerative studies have focused on the role of titanium oxide nanoparticles for the acceleration of bone growth². This study is interested in the assessment of TiO₂-CNTs as tissue scaffold for building a transition between regenerative cells and injured bone tissues. The research will consist of culturing a cell line of human fetal osteoblast cells exposed to a TiO₂-CNT, single wall carbon nanotube, and titanium nanoparticles.

P1068 Biomedical

Bioinformatics of gene clusters

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Bacillus spores typically show resistance towards unfavorable conditions such as UV radiation, H₂O₂, desiccation and starvation, just to name a few. This raises a major concern for decontamination procedures. For example, certain microbial species have been found even after disinfecting the Jet Propulsion Spacecraft Assembly Facility. Amongst these contaminants included various species of endospore-forming *Bacillus*. Spores from one of these species, *B. pumilus* SAFR-032 (BPU), survive and persist in extreme environments and exhibit elevated resistance to UV and H₂O₂, as compared to the closely related *B. subtilis* and the *B. pumilus* type-strain ATCC7061 (BPA) (with spores not resistant to UV/peroxide). Preliminary whole genome comparison of BPU and BPA revealed several genes and gene clusters from BPU not shared by BPA. We report the results of our study that seeks to determine if these genes were shared by BPU with other *Bacilli* or if they are likely unique to BPU.

698 Botany

Abiotic and biotic factors affecting first year seedling growth and survival in *Acer grandidentatum*, Bigtooth Maple

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actors affecting growth and survival of first-year *Acer grandidentatum* seedlings were considered. The woody plant community within a thirty year-old deer enclosure at Lost Maples State Natural Area was evaluated using the quadrat method and compared to nearby xeric and mesic sites. First year seedlings were transplanted into the deer enclosure or to the xeric site and growth and survival rates were monitored. A greenhouse experiment compared the interaction of nutrient availability and competition with simulated herbivory. Other seedlings were grown at varying light levels. Comparisons were made of survival and growth rates as well as aboveground and belowground biomass. Photosynthetic rates of ten juvenile maples were measured at varying light levels. In terms of density and basal area, the community within the enclosure was dominated by *Quercus buckleyi*, *Acer grandidentatum*, and *Juniperus ashei*. The mesic site was dominated by adult *Platanus occidentalis*, *Diospyros texana*, and *Prunus serotina*, while the xeric site contained primarily *Juniperus ashei*. The enclosure had the highest number and density of seedlings, saplings, and adult trees. While all three sites had large numbers of *Acer grandidentatum* seedlings, the mesic site contained no saplings or adults and the xeric site contained some saplings but few adults. Seedlings planted inside the enclosure survived at a greater rate than those outside the enclosure. Seedlings exposed to 60% ambient sunlight survived the best and attained significantly higher biomass. Photosynthetic curves were generated. Herbivory has the potential to affect seedling growth both through direct damage and by altering abiotic conditions.

719 Botany

Analysis of plant diversity on the Weston Ranch, Guadalupe County, Texas, over a four year survey

Rogers Brown*, Nicole Switzer, Alan Lievens, Mark Gustafson, Texas Lutheran University, Seguin, TX

The Weston Ranch is an approximately 1250 hectare (12.5 square kilometers) property southwest of New Braunfels, Texas, located in an area of convergence of the Edwards Plateau and the Blackland Prairie. Beginning in 2007, a four year floristic study of the Weston Ranch was initiated to better document the plant species present on the ranch, and by extension Guadalupe County. At this time 329 species of vascular plants have been documented on the Weston Ranch. The focus of this paper is to determine how comprehensive this study has been by analyzing herbarium samples and forming a species accumulation curve using the cumulative number of species found versus collection period from the ranch. The species accumulation curve indicates that there are likely species not yet documented. The species richness was also plotted on a species-area curve for several floristic studies in Texas.

720 Botany

A newly discovered evergreen swamp forest in Central Cambodia

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Cambodia forms part of the Indo-Burma hotspot and conserves a considerable portion of its natural forests. Recent explorations of the country's last remnants of lowland rainforests reveal an undescribed type of evergreen swamp forest, whose natural distribution encompasses six disjunct, highly restricted refugia. Dominant species and vegetation structure of this endemic flora are listed and described. Hydrophytic trees include *Eugenia*, *Ficus*, *Litsea*, *Macaranga*, *Myristica*, and *Pternandra*. Unique but closely related congeners of these arborescent elements occur in adjacent upland habitats. *ALivistona* palm emerges from the canopy as an indicator species of this specialized vegetation, while dense stands of additional palms (*Calamus*, *Areca*, *Licuala*) and locally abundant tree ferns (*Cibotium*) dominate the understory. As hydrophytes, many plants exhibit pneumatophores, stilt roots, and aerial roots. Floristic data of swamp forests in Indochina indicate that these hydrophytic communities are rare, endemic, and worthy of protection. These discoveries also indicate that the description of the Earth's plant communities on a global scale is far from complete, despite the general abandonment of these traditional forms of botanical investigation in developed countries.

P727 Botany

Seed germination requirements of Honey Locust (*Gleditsia triacanthos* L.)

Tana Saul*, Jessica Poole, Ivy Sustaita, and Herb Grover, Wayland Baptist University, Plainview, TX

Honey Locust (*Gleditsia triacanthos* L.) is native to the eastern deciduous forests of North America and is commonly grown as a shade tree in communities throughout the region. It is known for its rapid growth, dense wood, and drought hardiness. Although there are many honey locust trees growing on the campus of Wayland Baptist University in Plainview, Texas, we noticed that seedlings were seldom observed, even though seed production was abundant from many trees. For this study, seeds of honey locust were collected from trees located on or near the Wayland campus. The seed coats of this species are known to be resistant to imbibition and it has been suggested that seed germination in nature is favored by ingestion and exposure of the seeds to stomach acid. We examined the effects of boiling water, hydrogen peroxide, and mechanical and acid scarification treatments prior to imbibition to confirm that seed coat impermeability was effective in delaying seed germination. Seed germination was less than 10% for all treatments except acid scarification (soaking the seeds in concentrated sulfuric acid for one hour), which yielded germination percentages in the range of 48%. Additional studies examining the effect of temperature and hormone treatments on seed germination were conducted and will be included in our presentation as well.

P729 Botany

Variability in seed pod and seed production between Honey Locust (*Gleditsia triacanthos* L.) trees on the Wayland Baptist University campus, Plainview, Texas

Joshua Lucas*, David Gary II, Rebekah Slentz, and Herb Grover, Wayland Baptist University

This study quantified variability in seed pod and seed production between Honey Locust (*Gleditsia triacanthos* L.) trees on the campus of Wayland Baptist University in Plainview, Texas. The study was conducted as part of the laboratory requirements for a course in general ecology in the fall 2010 semester. Eight trees were selected for the study based on their location and evidence of seed pod production. Ten 0.5 m² quadrats were located in a radial pattern extending from the trunk to the canopy edge under each tree selected for study. Pods were collected weekly from each tree for nine weeks beginning in mid-September. Data collected included number of seed pods, number of seeds per pod, and number of seed compartments per pod. The results of this study indicate that trees could be separated into two groups of four trees each: (1) a high-yield group producing per-tree, per-collection averages of 5.68 pods, 48.97 seeds, and 87.25 seed compartments; and (2) a low-yield group producing per-tree, per-collection averages of 2.40 pods, 24.72 seeds, and 37.43 seed

compartments. Field observations confirmed a third group of Honey Locust trees – those that produced no pods. These findings may corroborate the reported polygamo-dioecious character of this species; a finding that will be discussed in greater detail in our presentation.

P747 **Botany**

Impact of non-native privet (*Ligustrum* spp.) on regeneration of native oaks (*Quercus* spp.) in William Cameron Park, Waco, TX

Marcus Keck*, Andra Nava, and Susan Bratton, Baylor University, Waco, TX

Invasive, non-native, evergreen privet (*Ligustrum lucidum* and spp.) is potentially suppressing native oak regeneration in Cameron Park, Waco, Texas. We established 180 5 × 5 meter plots, centered on living oaks greater than 10 cm in diameter at breast height (dbh), dead deciduous trees, and at random points on a gradient from ridge tops to the bottom of ravines. Field teams measured the dbh of all woody species over 2 m height, and categorized seedlings and sprouts into five height classes: < 10 cm; 10 to < 25 cm; 25 to < 50 cm; 50 to < 100 cm, and 100 to < 200 cm. Both the dbh of the largest privet within a plot and the total basal area of privet displayed significant negative correlations to the total number of oak seedlings, sprouts and saplings under 2 m height (p=.0002). Considering individual oak species, however, the presence of Shumard oak (*Quercus shumardii*) reproduction was significantly negatively correlated to privet dbh (p=.004), while bluff or Durand oak (*Q. sinuata*) provided a trend toward significance (p=.082). Privet dbh was not significantly correlated to the presence of escarpment live oak (*Q. fusiformis*) (p=.142), or bur oak (*Q. macrocarpa*) (p=.318) reproduction. DECORANA found privet and Shumard oak occupy similar topographic ranges relative to the moisture gradient, which potentially increases the impact of privet on Shumard oak, while escarpment live oak, which prefers more xeric ridges, and bur oak, which prefers moister stream and river bottoms, were less affected by the non-native tree.

P772 **Botany**

Native and non-native vascular plants on the Weston Ranch, Guadalupe County, Texas

Nicole K. Switzer*, Rogers Brown, Mark Gustafson, and Alan Lievens, Texas Lutheran University, Seguin, TX.

The study of non-native vascular plant species is critical for understanding the impact of human influence on the land and its ecosystems. In an ongoing study of the vascular plants of the Weston Ranch, Guadalupe County, Texas, we analyzed the percentage of non-native taxa that comprise the ranch. The Weston Ranch is an active cattle ranch of approximately 1250 hectares, located southwest of New Braunfels, Texas. Floristically, the ranch is located at the intersection of several ecoregions, such as the Edwards Plateau, the Blackland Prairie, and the South Texas Plains. The floral inventory was started in the summer of 2007. To date, 329 taxa have been collected. These taxa were classified as native or non-native, based on if they occur naturally or were introduced to Texas. We then calculated the percent of non-native vascular plants on the ranch. This was compared with the results of floristic studies done in other parts of Texas.

P782 **Botany**

Effects of grazing and soil nutrients on the competition between *Prosopis glandulosa* (Fabaceae) and *Buchloe dactyloides* (Poaceae)

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Prosopis glandulosa Torr. var. *glandulosa* (honey mesquite) is a woody plant found in the American southwest which has increased in density over the last 150 years. *Buchloe dactyloides* (Nutt.) Engelm. (buffalo grass) is a key element of upland short-grass prairies and can be found growing in the same areas as *P. glandulosa*. Both species have been shown to increase in density on heavily grazed areas. Previous studies have shown that *B. dactyloides* competes more successfully than *P. glandulosa* for soil resources. A greenhouse experiment was conducted to study the effects of simulated grazing of *B. dactyloides* and soil nutrients on the competition between *P. glandulosa* and *B. dactyloides*. Two levels of simulated grazing were tested - no clipping and clipping at 10 cm above the soil surface. Two levels of soil nutrients were tested – a native soil low in soil nutrients and native soil amended with Hoagland nutrient mixture. Each species was grown alone or in mixture with each other. We hypothesize that when *B. dactyloides* is not clipped, increased soil nutrients will increase the competitive ability of *B. dactyloides* which will cause an inhibition of *P. glandulosa*. We also hypothesize that clipping of *B. dactyloides* will decrease its competitive ability, regardless of soil nutrient level. Evaluating the competitive abilities of *B. dactyloides* and *P. glandulosa* during simulated grazing and altered soil nutrients will allow a better understanding of factors which may contribute to changes in grassland communities in the southwestern United States

840 **Botany**

Gametophyte development in *Anemia mexicana* from spores of different ages

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Nongreen homosporous fern spores usually have longer viability than green fern spores. Nongreen spores of the homosporous fern, *Anemia mexicana*, have been shown to have 75-95 % spore germination after storage for up to 32 years at 4°C. This study investigated gametophyte development from spores collected in seven years between 1978 and 2003. Spores had been stored in glass vials at 4°C except during transport. Spores were dusted onto the surface of agar-solidified mineral medium and placed under fluorescent lights at room temperature. Semi-permanent microscopic slides were made of gametophytes every 3-4 days for 35 days. Photographs were also taken of gametophytes with a digital camera and dissecting microscope. All ages of spores began germinating at 4-5 days with protrusion of the rhizoid. At nine days, most gametophytes were two-dimensional with an elongate rhizoid. A lateral meristem was initiated by day 14 and this meristem shifted to the terminal position. Unicellular marginal hairs were produced after development of the meristem. Antheridia began forming at day 22 and were abundant by day 32 on male gametophytes. Archegonia formed later on separate gametophytes. Gametophyte growth and development varied within each age of spores, but there was essentially no difference when spores were 7 to 32 years old and had been stored at 4°C.

P880 **Botany**

A comparative study of buoyancy duration in *Carya aquatica*, *Carya illinoensis*, and *Carya × lecontei* seeds

Gretchen E. Kroh*, Jessica R. Svoboda*, St. Edward's University, Austin, TX; Larry J. Grauke, USDA ARS Pecan Breeding & Genetics, Somerville, TX; and Michael A. Grusak, USDA-ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX

A characteristic of *Carya* species is that their seeds are buoyant. The different physical properties of *Carya* seeds, such as oil composition and air-filled cavities, may contribute to this buoyancy. *Carya aquatica* (water hickory) and *Carya illinoensis* (pecan) trees are found along streams and rivers, suggesting that seed buoyancy may facilitate hydrochory (i.e., dispersal by water). This study focused on seeds of *C. aquatica*, *C. illinoensis*, and *C. × lecontei*, the latter being an interspecific hybrid of pecan and water hickory. We measured the initial densities of seeds from several genotypes of each of the species and hybrid, the rate of change of these densities over time (while placed in water), and the duration that seeds remained buoyant. For the buoyancy duration tests, seeds were placed in a water-filled tub, in which a submersible pump was used to mimic the movement of water in a stream. Seeds were monitored daily until a density of greater than 1.0 g/mL was reached and buoyancy was lost. Average initial seed densities (based on several genotypes) ranged from 0.85–1.05 g/mL for pecan, 0.77–0.85 g/mL for *C. aquatica*, and 0.60–0.89 g/mL for *C. × lecontei*. The change in density over time (seeds in water) was comparable across the pecan relatives, while buoyancy duration varied, being associated with initial seed density. These data will be used to assess seed dispersal capabilities of *Carya* relatives and to discuss the potential of this phenomenon in promoting *Carya* gene flow and genetic diversity across riverine landscapes.

P881 **Botany**

A comparison of root iron reduction capabilities in *Carya aquatica*, *Carya illinoensis*, and *Carya × lecontei*

Jessica R. Svoboda*, Gretchen E. Kroh*, St. Edward's University, Austin, TX; Larry J. Grauke, USDA ARS Pecan Breeding & Genetics, Somerville, TX; and Michael A. Grusak, USDA-ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX

Carya aquatica (water hickory) is a species that thrives in areas near water and has been shown to suffer from iron deficiency when grown outside of water-saturated soils. *Carya illinoensis* (pecan) is generally iron-adequate when grown in non-flooded (i.e., non-water-saturated) areas. In water-saturated, low oxygen, reducing environments, iron is found predominantly in the ferrous form, whereas in oxygenated, non-flooded soils, iron is found predominantly in the ferric form. *Carya* species absorb iron in the ferrous form, and in most soils they use a root iron reductase to reduce ferric to ferrous iron prior to absorption. We hypothesized that the iron reductase capabilities of *Carya aquatica* might be lower, relative to pecan, because ferrous iron is more readily available in this species' habitat. Experiments were designed to measure and compare iron reductase capabilities in water hickory, pecan, and an interspecific hybrid, *Carya × lecontei*. Plants were grown in a hydroponic nutrient solution with 10 uM iron, and then were grown with 0.5 uM iron prior to root measurements. Two assays, both utilizing a colorimetric ferrous iron chelate, were performed in order to determine either the activity, or the root-system localization, of the root iron reductase. Results of these assays showed that there is variation within and amongst the species and hybrid. However, measured rates of iron reduction were not significantly different between the species or hybrid. These results suggest that other iron acquisition related factors are responsible for the apparent iron inefficiency of water hickory, when grown outside its natural environment.

883 **Botany**

Spring baseline floral inventory of Hancock Hill, Brewster County, Texas

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Research was conducted from March-May of 2010 in Brewster County, Texas, to catalogue plant specimens in bloom, fruit, or easily identifiable along a 1 mile (1.6 km) belt transect near Sul Ross State University. The study yielded a collection of 18 families and 32 taxa. Asteraceae, Acanthaceae, Cactaceae, and Pteridaceae were the most prevalent families with three or more taxa collected from each of these families. All of the plants collected were identified and prepared for the Herbarium at Sul Ross State University. The study closely resembles previous findings, showing minor differences in families most likely due to length of the study and time of year.

928 **Botany**

Foliar scent production in *Matelea reticulata* and *Matelea edwardsensis* (Apocynaceae)

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Matelea reticulata (green milkweed vine) and *M. edwardsensis* (plateau milkvine), two of the fifteen *Matelea* species found in Texas, are widely distributed in oak-juniper woodlands across the Edwards Plateau region of the state, occasionally occurring sympatrically. *Matelea reticulata* is the more common of the two species and is easily recognizable by the reflective silvery stigmatic head in the center of the flower. Although *M. edwardsensis* is not categorized as a threatened or endangered species, it is notably much less common than *M. reticulata* across its range. Vegetatively, the species are very similar (twining vines with opposite cordate leaves and milky sap) but can be readily distinguished on the basis of foliar pubescence: *M. reticulata* bears a mixture of simple and glandular trichomes on the abaxial leaf surface and *M. edwardsensis* produces only simple hairs. The species also differ in their scent, with the leaves of *M. reticulata* giving off a disagreeable aroma when touched, while the leaves of *M. edwardsensis* produce no discernible odor. Empirical evidence from a site in Comal County, Texas, at which *M. reticulata* and *M. edwardsensis* occur together, suggests that white-tailed deer (*Odocoileus virginianus*) browse preferentially on the stems and leaves of *M. edwardsensis*, contributing to its rarity at this location. We have used headspace analysis and gas chromatography-mass spectroscopy (GC-MS) to examine the scent differences between these two species and conclude that organic molecules contained in the glandular trichomes covering the lower leaf surface of *M. reticulata* are responsible for the unpleasant aroma characteristic of this species that may limit herbivory by white-tailed deer.

945 **Botany**

Morphology and anatomy of emergent and submersed stems and leaves of three aquatic Acanthaceae: *Justicia americana*, *Hygrophila polysperma* and *Nomaphila stricta*

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Justicia americana (American water-willow; Acanthaceae) is a native species common along stream margins across the Edwards Plateau region of Texas that typically grows as an emergent aquatic herb, but that can occasionally be found growing completely submerged in areas of strong current velocity. *Hygrophila polysperma* (East Indian hygrophila) and *Nomaphila stricta* (stiff beargrass, giant hygro) are non-native members of the family that have been introduced into several Texas streams. *Hygrophila*, which has become abundant in the San Marcos, Comal, and Guadalupe rivers and in San Felipe Creek at Del Rio, Texas, typically grows as a completely submerged plant but occasionally produces emergent shoots in shallow water or low current velocities, while *Nomaphila*, which has also been introduced into San Felipe Creek, usually grows as an emergent, but may produce submerged shoots in areas of fast-moving water. Emergent and submerged stems and leaves of the three species were examined and the submerged organs were determined to exhibit most of the characteristic morphological and anatomical features associated with submergence in aquatic plants: elongation of the leaf blade, thinning of the cuticle, increase in abundance of air-filled tissues, and loss of functional stomata. The presence of cystoliths, a characteristic anatomical feature of the leaves of members of the Acanthaceae, was one feature that remained unchanged in submerged versus emergent leaves.

950 **Botany**

Evidence of hybrid speciation in *Iris nelsonii*

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Hybridization often results in the production of hybrids with lower fitness than the hybridizing taxa. However, in some systems, hybrid lineages may be fit in a novel habitat such that the hybrid lineage can diverge from the progenitor species. Homoploid hybrid speciation involves the evolution of reproductive isolation between such a hybrid lineage and the originally hybridizing taxa. *Iris nelsonii* is a purported homoploid hybrid species derived from hybridization between three widespread species of Louisiana Iris: *Iris brevicaulis*, *I. fulva*, and *I. hexagona*. We conducted a survey of the genetic variation in populations of the three widespread species and *I. nelsonii* in order to investigate the origin of *I. nelsonii*. Iris retrotransposon display fragment variation indicates that *I. nelsonii* is a stabilized species that shares much of its fragment variation with *I. fulva*. These data are consistent with previous analyses of allozyme and random amplified fragment polymorphisms within this system.

953 **Botany**

Distribution patterns of rare South Texas flora

Samantha Garcia*, Andrew McDonald, and Teresa Patricia Feria

Documented historical and contemporary observations of selected rare flora found in the South Texas counties of Zapata, Starr, Hidalgo, Cameron, Willacy, and Kenedy were compiled and analyzed to determine if they collectively demonstrated non-random patterns of distribution. Additionally, distribution patterns were assessed in relation to the distribution of currently conserved areas in South Texas. The database was compiled from 134 historical records of 19 species among 15 families. Locality records were obtained from the University of Texas at Austin Plant Resource Center and Texas Natural Diversity Database. All plant records were consolidated to plot spatial patterns by overlapping distributional data and vector grids with "Create Vector Grid (line/polygon)" of the Hawth's Tools toolbar in ArcGIS 9.3. The resolutions used were 10,000 m² and 20,000 m². The number of species on each grid cell were numerically counted. Results from generated maps and statistical analysis using SPSS 17.0 determined that the distribution is not random. Areas of concentration where more than two species were observed were considered centers of rarity. A map of natural conserved areas was overlapped with the distributional data. Results were visualized with GIS software ArcView 3.2 and Arc GIS 9.1 and illustrated that the conserved areas were not consistent with the centers of rarity. Environmental factors to determine possible causes for centers of rarity will be correlated and overlapped with generated maps.

958 **Botany**

Subspecific classification of *Phoradendron serotinum* (Viscaceae): Development of microsatellite markers for assessment of population genetic structure

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Phoradendron serotinum (leafy mistletoe) is a hemi-parasitic plant of the family Viscaceae found in the United States and Mexico. *P. serotinum* has been divided into four subspecies. Three of these are subsp. *tomentosum*, subsp. *macrophyllum*, and subsp. *serotinum* which occur in the eastern United States from southern New Jersey to southern Florida, through the Midwest south of Oklahoma and into Mexico, and on the west coast from Oregon to Baja California. Subspecies *angustifolium* grows in isolated regions of central Mexico. Subspecies may be difficult to identify based on morphology alone. Identification of *P. serotinum* subspecies in eastern Texas is especially difficult as characters that are otherwise diagnostic of subspecies do not adequately separate three of the subspecies (*macrophyllum*, *tomentosum*, and *serotinum*) that overlap in this region. Molecular and morphometric analyses were utilized in conjunction for a total evidence approach to resolve taxonomic confusion within *P. serotinum*. A subset of 96 samples of total genomic DNA, divided among 10 populations from the entire growth range, was analyzed over 6 microsatellite loci using GENEPOP. Morphometric measurements were recorded from 150 vouchers and analyzed by principal components analyses

1005 **Botany**

Plants for human health: Stable isotope approaches to assess the Vitamin A value of biofortified Golden Rice and high beta-carotene maize

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Vitamin A deficiency is a major public health problem, especially in populations of the developing world where staple foods, such as rice, wheat and maize, make up a significant portion of daily caloric intake. Seeds of these crops contain little to no provitamin A carotenoids (e.g., beta-carotene, a precursor of vitamin A); thus, the consumption of diets focused on these foods, in combination with limited intake of colored fruit, vegetables, or animal products, leads to sub-optimal vitamin A status in humans. To combat this problem, plant scientists have used various strategies to develop biofortified food crops. These are new crop cultivars with the ability to accumulate or synthesize higher concentrations of nutrients or nutrient precursors (relative to existing cultivars). The transgenic Golden Rice and conventionally bred high beta-carotene maize are two such product lines. In order to assess their nutritional value, and to determine their potential for alleviating vitamin A deficiency, we have used stable isotope approaches to label beta-carotene in seeds, using deuterium, a heavy isotope of hydrogen. Labeled food products have been fed to human subjects and blood samples have been collected, which allowed us to monitor the absorption of beta-carotene and determine its conversion efficiency to vitamin A. Our methods development will be discussed to describe the possibilities and problems encountered when attempting to label plants with heavy water (deuterium oxide). Results of the clinical trials will be presented to demonstrate that both Golden Rice and high beta-carotene maize can serve as effective sources of vitamin A.

1012 **Botany****Lichens of the Weston Ranch, Guadalupe County, Texas**

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The Weston Ranch covers an area of approximately 1250 hectares. It is located southwest of New Braunfels in northern Guadalupe County. New Braunfels and surrounding areas are experiencing rapid development and urbanization. A floristic study of the vegetation of the ranch has been underway for the past four summers (2007, 2008, 2009, and 2010). Although vascular plants have been the main focus of the study, a collection of lichen specimens has also been made by two of us (AWL and MPG). These specimens have been sent for identification by the third of us (SCT). Identified specimens are now housed in the herbarium at Texas Lutheran University, while some have been sent to other institutions by SCT. In general, Texas is undercollected with regard to lichen taxa. Many counties, in fact, have no known collections of lichen specimens. Although ours from Guadalupe County are not the first from this county, they do add a significant number of collections. This is all the more important because lichens are sensitive to environmental pollutants and it is important to have a foundation for understanding which lichen taxa occur here. The specimens collected in the summer of 2010 have not been fully processed yet and the same holds true for some of the earlier collections. Examination and identification of specimens from 2007, 2008, and 2009 have resulted in a list of 44 lichen taxa from the ranch. We have published *Lichens of the Weston Ranch*, as a result of collections from those years; the publication lists those 44 taxa and provides photographs of 26 of them. The taxa have been collected from a variety of substrates. Collections like this provide information about the occurrence, distribution, and abundance of various lichen taxa in this county, and these serve as a basis for studies in the future.

1020 **Botany****Possible causes for the distribution of *Heliotropium tenellum* (Boraginaceae) in central Texas cedar glades**

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Cedar glades in central Texas consist of intercanopy bare patches in *Juniperus* woodlands. These bare patches have shallow soils where limestone bedrock is at or near the surface, plant cover is low, and herbaceous vegetation is dominant. An herbaceous species found in these bare patches is a summer annual called *Heliotropium tenellum* which grows from May to October. Abiotic and biotic factors that potentially influence the distribution of *H. tenellum* were examined in the field. Photosynthetic rates, stomatal conductance, and transpiration rates of five *H. tenellum* plants were measured at midday. Water potential of ten *H. tenellum* plants was measured at pre-dawn. There were significant differences in photosynthetic rates at different light levels (One way ANOVA; Tukey-Kramer HSD; $p < 0.0001$). The maximum net photosynthetic rate (A_{max}) was $27.17 \pm 2.75 \mu\text{molCO}_2/\text{m}^2/\text{s}$. There was no significant difference between stomatal conductance and the light levels tested (One-way ANOVA; $p = 0.1796$). There were significant differences in transpiration rates at different light levels (One-way ANOVA; Tukey-Kramer HSD; $p = 0.0011$). Mean water potential of *H. tenellum* was -0.84 ± 0.07 MPa. Sun plants typically have higher photosynthetic rates allowing them to grow at high levels of radiation. The A_{max} and associated light curve variables suggest that *H. tenellum* is a true sun plant. Furthermore, *H. tenellum* does not appear to be under water stress because of its high water potential. This may help explain the ability of *H. tenellum* to grow in the hottest, driest part of the season in these intercanopy bare patches.

P683 **Cell and Molecular Biology****The role of Argos in the formation of dorsal appendages contributes to the diversity of eggshells in *Drosophila* species**

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Studying the model organism, *Drosophila*, is a way to trace evolutionary changes caused by genetic variation in developmental pathways that lead to phenotypic diversity. An example of this variation exists between the *Sophophora* and *Drosophila* subgenera; in the *Drosophila* subgenus, most species have four dorsal respiratory appendages (DAs) on the eggshell. One exception is *Drosophila melanica* which has two, similar to all species in the *Sophophora* subgenus. The formation of dorsal appendages in *Drosophila melanogaster* (a *Sophophoran*) is well understood, but why a species like *D. melanica* develops a characteristic of more distant relatives is not understood in full. In *D. melanogaster*, a single peak of EGFR signaling is split into two through the actions of *argos*. In species like *Drosophila virilis*, *argos* is hypothesized to undergo a second wave of expression that ultimately creates a second lateral domain which gives rise to the four DAs. The question is whether *argos* expression in *D. melanica* is more similar to *D. virilis* or *D. melanogaster*. Degenerate PCR primers were designed in order to clone and amplify *argos* from *D. melanica* and *D. virilis* and ultimately determine the possible function in these different species. *D. virilis argos* was successfully cloned, while *D. melanica* was not. The degenerate primers must be modified to carry on with the comparative study.

P703 **Cell and Molecular Biology****Effect of dichlorvos on leg development in *Drosophila melanogaster***

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How environmental factors affect the phenotype of an organism is an outstanding question in the field of developmental biology. Organophosphates (OPs), commonly found in pesticides, are hazardous to both insects and humans. Here I use leg development in *Drosophila melanogaster* as a model system to investigate the effects of OPs. My hypothesis is that when *Drosophila melanogaster* are exposed to an organophosphorous insecticide at an early stage in development, organophosphorous insecticides will negatively affect leg development. *Drosophila* were fed organophosphorous insecticides throughout development. During this experiment, five different lines of flies were used. Four replicates at different concentrations of OP were made for each line of flies at the following concentrations: 0 ppb (DMSO only), 0.015 ppb, 0.15 ppb, and 1.5 ppb. Leg abnormalities were assayed in two ways. First, general morphology was assayed by analyzing leg number and size at each concentration. Second, expression of the leg patterning gene *Distal-less (Dll)* was examined using a *Dll-lacZ* reporter gene. Data suggests that OPs do affect *Drosophila* leg development as both femur length and *Dll-lacZ* expression area is increased in animals raised on food containing OP. Future research could increase the dose of OP administered to the flies. Another possibility would be to examine the effect of OPs on other morphological features, such as eyes or wings.

707 Cell and Molecular Biology

Effects of hyperosmolarity on the growth of two environmental isolates of *Vibrio vulnificus*

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Vibrio vulnificus is an estuarine bacterium that can cause severe problems for people when they either eat shellfish containing the bacterium, or persons with open wounds are exposed to estuarine waters, leading to bacterial infection. Although all persons may be susceptible, persons with diabetes, liver or kidney disease, hemochromatosis, or who are immunocompromised are at an increased risk. Ingestion may lead to septicemia or gastroenteritis, and wound exposure may lead to necrotizing fasciitis. Previous reports described alteration in population of *Vibrio vulnificus* when exposed to environmental perturbations, including hyperosmolar conditions. The purpose of this project was to test the hypothesis that bacterial isolates from estuaries with different salt concentrations would have varied phenotypic growth curves in response to hyperosmolar conditions. *Vibrio vulnificus* isolate RB0307-7 and isolate NUE 0400407-7 are from Redfish Bay and Nueces Bay. Each isolate was exposed to 2.7 molar NaCl, and cell growth was measured by spectrophotometer for six hours. At the end of this period, the Nueces Bay isolate did show a difference in growth curves compared to the Redfish Bay isolate, but this difference is not significant. Future studies are needed to determine the effect of environmental changes on *Vibrio vulnificus*. Such information may be of benefit to susceptible populations residing in coastal cities, as these persons may be exposed to estuarine waters from recreation or flooding from hurricanes.

P713 Cell and Molecular Biology

Antagonistic effects of coriander, garlic and ginger against *Escherichia coli* O157:H7 in ground beef

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Escherichia coli O157:H7 is associated with ground beef products and infection with this bacterium can lead to dysentery and kidney failure, especially prevalent in children and the elderly population. Plant extracts and spices have traditionally been regarded for their preservative and medicinal purposes. For this reason, the use of spices as an antimicrobial agent was examined through three prominent Indian spices and their corresponding essential oils (EOs). Samples of lean ground beef (93/7) were inoculated with 10^6 CFU *E. coli* O157:H7, treated with Lazia's Chapali Kabab masala or no spice at all, and enumerated for bacterial contamination. To determine the effectiveness of individual spices, the EOs of coriander (*Coriandrum sativum*), garlic (*Allium sativum*), and ginger (*Zingiber officinale*) were tested in ground beef patties and for susceptibility. While previous studies indicated the potency of garlic against *E. coli*, the use of plate count methods and disk diffusion assay effectively determined that *E. coli* O157:H7 was most susceptible to coriander, decreasing *E. coli* O157:H7 populations by 5%, whereas garlic and ginger increased populations by 1% and 2%. Data collected from this experiment indicate that while the use of spices alone may not be sufficient in completely eliminating food-borne pathogens, there is potential in the coupled effects of spices with other food preservation methods

P714 Cell and Molecular Biology

Investigating regulatory polymorphisms for anterior-posterior patterning in *Drosophila melanogaster*

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Phenotypic variation, both within and between species, is partly determined by genetic variation in developmental pathways. The link between genetic changes and how they affect phenotypic variation can be studied by researching Anterior-Posterior (AP) patterning in the fruit fly, *Drosophila melanogaster*. AP patterning in *Drosophila* is regulated by a hierarchy of genes that result in a segmented embryo with clear anterior and posterior ends. One of the genes in the hierarchy is *even-skipped (eve)*, a pair-rule gene expressed in seven transverse stripes across the embryo. Previous research indicates that there is phenotypic variation for AP patterning, as measured by the positioning of the cephalic furrow (CF), and that CF position along the AP axis is correlated to the AP positioning of *eve* stripes. Specifically, stripe 3 and 4 are shifted anteriorly in lines that also have a more anterior CF. These shifts in stripe pattern are possibly directed by genetic variation in the stripe 3 and 4 enhancer sequences. To investigate this possibility, the *eve* stripe 3 + 7 and 4 + 6 enhancers from six fly lines—three lines with an anteriorly placed CF and three lines with a posteriorly placed CF—were sequenced. Results indicate that there are no enhancer polymorphisms associated with the two phenotypic groups. Thus, the shift in *eve* stripes is not likely due to genetic variation in *cis* regulatory modules. Alternatively, there may be variation in the sequence of regulatory proteins that bind to these enhancers, or in their localization along the AP axis

716 Cell and Molecular Biology

Brassinolides promote the gravitropic response of maize roots by disrupting actin filament organization

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When positioned horizontally, inflorescence stems and hypocotyls in dicots and pulvini in monocots respond by bending upward whereas roots bend downward toward the direction of gravity. This phenomenon called gravitropism is regulated in large part by the plant hormone auxin. In addition to auxin, other plant hormones have been implicated in some way to the control of gravitropism. For example, brassinolide, a steroidal type of hormone was shown to promote the gravitropic response of maize roots. However, the mechanisms by which brassinolides (BL) promote root gravitropism remain unclear. From our previous work, we showed that roots treated with the actin disrupting drug, Latrunculin B (LatB), enhanced the gravitropic response of maize roots. To determine whether BLs promote root gravitropism via mechanisms that involved actin, we treated maize roots with BL and compared the gravitropic response with roots treated with LatB. We found that curvature of BL and LatB-treated roots followed very similar kinetics. Furthermore, like LatB-treated roots, BL-treated roots displayed the persistent curvature response when grown on a slowly rotating clinostat. Confocal microscopy of Alexa-fluor-phalloidin labeled actin in BL-treated roots revealed a general disruption of actin organization that mirrored Lat-B-treatment. Collectively, our data indicate that the BL-induced promotion of gravitropism in roots is mediated in part via the actin cytoskeleton (Supported by NASA grant NNX10AF43G and the Samuel Roberts Noble Foundation).

722 Cell and Molecular Biology

Bacterial community dynamics in poultry litter treated with *Bacillus subtilis* spp. studied by dgge and 454 pyrosequencing

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Bacterial communities present in used poultry litter, a combination of sawdust and manure, largely affects the performance of the birds in poultry houses. The effect of *Bacillus subtilis* spp. on the bacterial communities in the used poultry litter was studied with DGGE (Denaturing Gradient Gel Electrophoresis) and 454 pyrosequencing of 16S rDNA. DNA was extracted from 8 sets of litter samples collected from 4 different broiler houses. The total DNA samples processed with DGGE were 116 from the first two sets and 96 from the last 6 sets. The total DNA samples pyrosequenced were 20 from each 1st and 8th sets. Python scripts and multivariate analysis were used to analyze DGGE gel images and pyrosequencing data. The analysis of DGGE gel images showed no significant difference in the richness of the bacterial communities among houses for all 8 sets of samples. The average richness of bacterial communities observed was 234 (approx.) in all the samples. The taxonomical assignment of the sequences from pyrosequencing was done using RDP Classifier. A total of 188 and 199 unique taxa were assigned to the 1st and 8th sets of samples, respectively. In the samples from both the sets, relative abundance of *Corynebacterium* spp., *Staphylococcus* spp., *Lactobacillus* spp., *Salinicoccus* spp. were found to be more than 10%. The results of the experiment showed that there was no significant change in the richness and the composition of bacterial communities in the poultry litter when treated with *Bacillus subtilis* spp.

P732 Cell and Molecular Biology

Peroxisome-defective mutants in *Arabidopsis thaliana*

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Arabidopsis thaliana is a useful model system for studying peroxisomes because peroxisome function in this plant is similar to humans, and *Arabidopsis* mutants can be representative of human peroxisomal disorders. Plant peroxisomes are responsible for fatty acid β -oxidation, branched chain amino acid catabolism, and metabolism of the plant hormone auxin. In this study, ethyl methanesulfonate-mutagenized *Arabidopsis* seedlings were screened for the defective fat metabolism and auxin responses characteristic of decreased peroxisome function. In order to map peroxisome-defective mutants, mutant *Arabidopsis* was crossed with another *Arabidopsis* accession. Progeny exhibiting a peroxisome-defective phenotype in the F2 generation were selected as a mapping population. Molecular markers were developed to test the parental type of DNA present at different locations on the chromosomes and search for a region with linkage. Once linkage was localized to a small region of a chromosome, DNA sequencing of candidate genes was used to find the exact base pair mutation within the mutant. To date, we have found mutations in the genes *PXA1*, *CHY1*, *LON2*, and *PEX13*. Studying the molecular and physiological effects of these mutations aids in understanding the contributions of each gene to peroxisome function

P738 Cell and Molecular Biology

Lipopolysaccharide-induced amyloid-beta formation as a model of Alzheimer's disease pathology

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Alzheimer's disease (AD) is characterized by neuronal cell death and atrophy in regions of the adult brain, including the hippocampus and cortex, due to formation of amyloid-beta ($A\beta$) plaques and neurofibrillary tangles. Presence of these pathologies can limit normal signaling properties and ultimately lead to learning and memory deficits. Chronic inflammation has been implicated in the onset and progression of these AD pathologies. Our study was designed to create an animal model of peripheral inflammation-induced AD-like pathologies in a common strain of laboratory mouse using the bacterial endotoxin lipopolysaccharide (LPS). C57BL/6J mice were given intraperitoneal injections of LPS or saline for 7 consecutive days. Hippocampal tissue from animals receiving LPS contained significantly higher levels of $A\beta$ 1-42, a peptide component of AD plaques, than did saline control animals. To determine if the elevation in $A\beta$ 1-42 might inhibit learning, we first had to determine if the consecutive days of LPS lead to sickness behavior. Here we demonstrate that one injection of LPS leads to sickness behavior, but 7 consecutive days does not, implicating a tolerance to the endotoxin. These findings suggest that using cognitive behavior tasks to assess learning following repeated LPS administration might not be limited by sickness behaviors. Further biological and cognitive testing will be conducted in the future to determine if other hallmarks of AD can be produced by this method.

750 Cell and Molecular Biology

The effect of acute dose charge particle radiation on expression of DNA repair genes in mice

Christina Randall*, Muhammad Akram Tariq, Honglu Wu, Nader Pourmand, Olufisayo Jejelowo

Components of the space radiation environment are as follows: trapped particle radiation, solar particle radiation, and galactic cosmic radiation. Protons are the bulk of particles in the space environment. A health concern for astronauts is the constant exposure to GCR and occasional solar particle events. For their safety, posed health risks must be determined. To fully determine health risks during space missions, understanding of cellular responses to proton exposure is vital. Gamma rays and X-rays are types of ionizing radiation. The expression of DNA repair genes in response to ionizing radiation has been studied. DNA repair in response to protons is deficient. By employing qPCR analysis, we investigated changes in gene expression resulting from positively charged particles in four categories (0, 0.1, 1.0, and 2.0 Gy) in five different DNA repair genes. These 5 genes were isolated from the testes of irradiated mice. The DNA repair genes selected are: ERCC1 (5' incision subunit, DNA strand break repair), PARP1 (base excision repair), XPA (binds damaged DNA in pre-incision complex), ATM (activates checkpoint signaling upon double strand breaks), and XRCC3 (DNA breaks and cross link repair). Our results evince that ERCC1, PARP1, and XPA genes, show no change at 0.1 Gy radiation, display up regulation at 1.0 Gy radiation (1.09 fold, 7.32 fold, 0.75 fold respectively), and a prevalent increase in gene expression at 2.0 Gy radiation (4.83 fold, 57.58 fold and 87.58 fold, respectively). These DNA repair proteins operate in cellular pathways. Here we present data on possible mechanisms of action

P759 Cell and Molecular Biology

Investigating phenotypic variation for anterior-posterior patterning in *Drosophila melanogaster*

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Phenotypic evolution is driven by genetic variation in developmental pathways. One can use *Drosophila melanogaster* Anterior-Posterior (AP) body patterning as a model for studying this genotypic and phenotypic relationship. The position of the cephalic furrow, a morphological marker of AP patterning, varies among inbred lines of *D. melanogaster*. To determine possible genetic causes of the cephalic furrow (CF) shift, the pair-rule gene *hairy*, which participates in segmentation along the AP body axis, will be analyzed to determine if a corresponding shift in expression occurs. *hairy* mRNA expression, will be examined by an *in-situ* hybridization in three lines with an anteriorly placed CF and three lines with a posteriorly placed CF. Results will be compared to the changes in expression of other genes in the segmentation hierarchy, to determine the genetic level at which phenotypic changes are occurring.

P773 Cell and Molecular Biology

Characterization of growth and genetic diversity of *Rhizobia* species colonizing *Acacia smallii* in Bell County, Texas

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Huisache, a common plant inhabitant of Texas, has become of economic concern due to its ability to successfully invade rangelands. Huisache, known as *Acacia smallii* Isley, is a species of woody shrub in the legume family, Fabaceae, which occurs in great numbers throughout South Texas. One reason for its success as an invader is its symbiotic relationship with nitrogen-fixing bacteria, the rhizobia. These bacteria colonize the plant's roots and convert atmospheric nitrogen to ammonia, which in turn provides nitrogenous compounds to the plant as well as a competitive advantage on nitrogen-deficient soils. In this project we are characterizing bacteria isolated from root nodules of lab-grown huisache. Huisache seeds initially collected from Bell County were planted in soil obtained from locally growing huisache. After several weeks, the root nodules were collected in preparation for bacterial isolation. These nodules were washed, crushed, and streaked onto yeast extract mannitol (YEM) plates to note the growth characteristics. Twelve pure strains were successfully isolated to begin testing. Phenotypic and biochemical characterization tests performed included gram staining, an intrinsic antibiotic sensitivity assay, and temperature tolerance. Preliminary PCRs of the 16S and 23S rDNA intergenic region with subsequent RFLP analysis using *HaeIII* and *MspI* suggest that genetic diversity between the 12 isolated strains exists.

787 Cell and Molecular Biology

Dorsal appendage spacing as a result of mRNA abundance in *Drosophila melanogaster*

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In order to further understand the differences in phenotypes that result from genotypic changes involving the role of regulatory polymorphisms, spacing of respiratory appendages on the dorsal anterior eggshell of *Drosophila melanogaster* was studied. I hypothesized that spacing of the dorsal appendages (DA) on the eggshell would correlate to expression levels of specific candidate genes involved in DA development and those changes in expression level will be associated with DA phenotype. Thus, phenotypic spacing as a result of mRNA abundance will be explored. Expression was analyzed using quantitative RT-PCR for candidate genes from inbred lines of *Drosophila melanogaster* harboring wide and narrow spaced dorsal appendages. Preliminary data suggest that there are quantitative differences in mRNA abundance between phenotypic (wide vs. narrow spacing) groups. These genes are then candidates to harbor regulatory variants that affect patterning. The results of this screen for quantitative differences in mRNA may provide insight into diversity generating mechanisms in eggshell patterning among other species.

P795 Cell and Molecular Biology

The effect of simultaneous exposure of both microgravity and radiation to the *Candida albicans* fungi

Anu Matthew*, Olufisayo Jejelowo

During space flight, astronauts often receive exposure to ionizing or Gamma radiation (IR), which might eventually lead to cancer. Ionizing Radiation damages DNA in cells (i.e. altering metabolism and function, causing transformation, and minimizing cell repair) and causes cell deaths (i.e. causing cell scarring). To understand the effect of IR on cells and determine cell damages that might occur in astronauts during space flight, we propose to use cell culture model (i.e. *Candida albicans*, which occurs in the spacecraft). Very few studies on the effect of Gamma radiation on *Candida albicans*. The Sun gives off ionizing radiation. The astronauts and the *Candida albicans* found on the space station receive exposure to these types of radiation. To understand how Gamma radiation (IR), could affect our fungi, *C. albicans* will be cultured and single spores will be collected and radiated. Samples will be taken and tested at four different time periods in growth and conditions for a four-day time frame. We propose to look at the morphological changes caused by the stress of radiation and its recovery affords. We will perform Optical Density tests to understand the change in mass of the fungi. Our working hypothesis is that Gamma radiation (IR) causes change in *Candida albicans* morphology. It may alter the size and structure of our fungi and cause death and mutation in the fungi. We also hypothesize, that after radiation, *Candida albicans* are able to repair themselves and

continue their growth.

P801 Cell and Molecular Biology

Exploration of the phenotypic effects of orthodenticle haplotypes in *Drosophila melanogaster*

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Analyzing *cis*-regulatory regions and the role they play in variation for embryonic patterning contributes significantly to understanding the evolution of phenotypic development across species. This study aims to detect the genetic variation that influences phenotypic variation by focusing on distinct polymorphisms within genes of the AP patterning cascade of *Drosophila melanogaster*. Previous research has detected two distinct haplotypes within the *orthodenticle* (*otd*) early head enhancer. The two haplotypes are characterized by 12 SNPs and a 16bp insertion/deletion, for which each are named. The I-haplotype shows increased expression through the ventral region of the *otd* expression domain when compared to the D-haplotype. However, this variation pattern has only been examined within homozygous embryos. This study aims to discover the phenotype produced from embryos heterozygous for the two enhancer haplotypes. The expression pattern of *lacZ* expression will be investigated in embryos heterozygous for the D- and I-haplotype transgenes. Results will determine the dominance pattern of the alleles as well as develop a greater understanding for the evolutionary significance of regulatory polymorphisms.

806 Cell and Molecular Biology

Early developmental signaling molecule, beta catenin, is expressed during regeneration in the california blackworm, *Lumbriculus variegatus*

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Lumbriculus variegatus is an excellent regenerative model system, regenerating an entirely new worm from a three segment fragment. Determination of axial position and segmental polarity following injury 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 mobilization of stem cell populations and subsequent differentiation via specific cell-type gene expression. While our lab has characterized some aspects of regeneration within the lumbriculid central nervous system, the mechanism of induction and the genes which may be involved are not well understood. Based on our previous studies, we hypothesize that the newly regenerating head might be a source of signaling that is necessary to maintain regeneration. In this study, we have characterized cellular populations recruited to the regenerating head using confocal microscopy and western blot analysis. β -catenin, an early developmental signal, is expressed in regenerating worm tissue. Interestingly, beta-catenin expression precedes expression of a morphallaxis associate protein (MP66) in regenerating heads. These data suggest that regenerating head buds may be an important signaling center which controls reorganization of the axial body pattern in *Lumbriculus* during regeneration

P807 Cell and Molecular Biology

Immunoaffinity purification of 66KDA glycoprotein which is upregulated during neural morphallaxis in the California blackworm, *Lumbriculus variegatus*

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Body fragments of the annelid worm, *Lumbriculus variegatus*, regenerate lost body parts during asexual reproduction and recovery from injury. Regeneration of new head or tail segments is accompanied by a transformation of the original fragments through a process called Morphallaxis. Morphallaxis involves the reorganization of many body processes and structures, including the central nervous system, to match changes in segmental position as fragments regenerate. The cellular and molecular events that underpin neuro-behavioral plasticity associated with neural morphallaxis in this worm are largely unknown. Our lab has utilized 2D-SDS PAGE to generate proteomic profiles of control and regenerating worm fragments to reveal an extensive percentage of proteins whose expression was altered during morphallaxis. However, only a small set of protein modifications was specifically correlated with neural morphallaxis (Zoran and Martinez, 2009; Martinez et al., 2005). A morphallactic protein with a molecular weight of approximately 66 kDa (MP66) was previously shown to be upregulated in fragments of both regeneration and asexual reproduction groups (Zoran and Martinez, 2009; Martinez et al., 2005), however MP66 remains unidentified. A major focus of the laboratory has been characterization of proteins that play a role in the unique regenerative capability of *Lumbriculus*. Using various immuno-purification techniques we hope to ultimately determine the protein sequence of MP66. The protein purification work presented here will allow for further biochemical characterization of the mechanisms involved during Lumbriculid regeneration

P812 Cell and Molecular Biology

Assessment of oxidative stress gene expression in the *Brassicaceae* plant family; Implications for the genetic engineering of plants for phytoremediation

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Phytoremediation is a technique that employs plants to clean-up a variety of environmental pollutants, such as heavy metals. One problem that is frequently encountered with the use of hyperaccumulator plants for phytoremediation is that they are slow growing and often have relatively low biomass. This is a limitation affecting how much total metal can be accumulated. The flowering-plant family, *Brassicaceae*, contains several hyper-accumulating plant species, and other non-accumulator species such as *Brassica juncea*, which show great promise for use in phytoremediation because they are fast growing, have high biomass, and are closely related to the heavy-metal tolerant plant species. Therefore, engineering gene expression in these non-accumulating *Brassicaceae* species has become of great interest. Oxidative stress response (OSR) genes and heavy metal transporter genes (MTP) are largely responsible for a plant's ability to tolerate heavy metal stress and accumulate heavy metals. These enzymes allow an organism to neutralize reactive oxygen species or sequester metals in the plant vacuole. The six genes of interest in this study are Catalase (CAT), Glutathione Reductase (GR), and Superoxide Dismutase (SOD) (Fe, Cu/Zn, and Mn varieties) and the Cation Diffusion Facilitator (CDF) vacuolar metal transport protein MTP1. The purpose of this research is to compare the RNA expression levels of these OSR and MTP genes between non-accumulators and hyperaccumulator plants

under control conditions and treatment with 100 μ M Ni. These data may indicate which genes when transferred via genetic engineering to non-accumulators may increase their metal uptake and tolerance therefore making them more useful in phytoremediation

825 Cell and Molecular Biology

Quantitative analysis of phenotypic variation of anterior-posterior patterning in *Drosophila melanogaster*

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The foundation of evolutionary and developmental biology is the relationship between genotype and phenotype. Genotypic changes are known to cause a number of phenotypic changes in *Drosophila melanogaster*. These morphological changes can occur by a number of mechanisms, for example, a change in the functionality of a protein, or a change in gene expression due to cis-regulatory elements (CREs). *Orthodenticle (otd)* is a gene known to contain several polymorphisms, resulting in different haplotypes and varying expression of *otd*. However, little research has been done to study the quantitative effects of these genetic polymorphisms. Using Q-PCR it is possible to determine the quantitative effects of the *otd* enhancer polymorphisms and the role they play in phenotypic variation. It was found that the expression levels from the two haplotypes were different in transgenic lines; further research is necessary to determine whether the same is true of the endogenous enhancers

826 Cell and Molecular Biology

A role for autophagy in endosymbiont maintenance

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Endosymbiosis involves a complex set of interactions between the host and the resident endosymbiont. The establishment of a cellular symbiosis necessitates a change in components of the host's innate immune response. We present data from a cellular slime mold and freshwater ciliate in which modification of host autophagy may play a role in the establishment of infection and endosymbiosis. In an organism which lacks established endosymbionts such as *D. discoideum*, the deletion of autophagy genes *atg1*, *atg6*, and *atg7* uncouples phagocytosed bacteria from the lytic pathway and creates a lethal bacterial-pathogenesis. Conversely, in organisms such as *Paramecium bursaria* which harbor endosymbiotic algae, pharmacological stimulation of autophagy results in a diminution in the steady-state endosymbiont population. Our elucidation of a role for autophagy in endosymbiont maintenance has also provided us with an insight into the adaptive value of a photosynthetic endosymbiont. Zoochlorella are known to benefit their hosts through the secretion of sugars into the host cytoplasm and thus are thought to be bioenergetically adaptive a source of reduced carbon for the cell. During a drug-induced nitrogen starvation, *P. bursaria* accelerate endosymbiont traffic through the lytic compartment resulting in an increase in host cell mass. We hypothesize that host cells may use endosymbionts as a form of banked nitrogen and phosphorus mobilized by autophagy during starvation.

P827 Cell and Molecular Biology

Development of naïve models for studies of endosymbiosis

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Eukaryotes have developed sophisticated intracellular surveillance for foreign incursions in the cell, chiefly viruses and bacteria. Since the biological world is replete with instances of nucleated algae inhabiting the cells of animals and protozoans, the distinction between the two types of 'infections' may be more than semantic, but it is also unclear how (or if) a eukaryotic host distinguishes between bacterial and eukaryotic infections. To this end, we have developed a working endosymbiosis hypothesis which suggests that there are two types of eukaryotic cells, differentiated by how they gain access to food. The first group are eukaryotes that are constitutively phagocytotic and prey on other organisms for food. The second group are eukaryotes that do very little phagocytosis and get their nutrition through molecular transport from the environment or from other nurse cells or tissues. We suggest that all eukaryotic endosymbionts are found exclusively in the first group by necessity of the way in which they gain entry into the cell. If endosymbionts are found in the second group, they arise from cell lineages that are derived from a phagocytotic cell. Since infections are rarely seen in the second class, we hypothesize that exclusion is the primary means keeping this class free of endosymbionts. We are interested in knowing whether this second group of cells lack innate immune mechanisms for warding off eukaryotic infection. We term cells with this lack of immunity "naïve." We present data for the development of naïve models for the study of endosymbiosis.

831 Cell and Molecular Biology

Effect of simulated microgravity on the reproduction on *Caenorhabditis elegans*

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Caenorhabditis elegans provide an optimal organism to understand the effects of environmental factors on the living systems. Because of its small and completely sequenced genome, availability of mutants and well-defined pattern of development, it serves as a good model organism to study the effects of simulated microgravity on its reproduction. Liquid cultures of *C. elegans* wild type (N2) seeded with *Escherichia coli* OP50 as food source were used. HARV (High Aspect Ratio Vessel) bioreactor used to simulate microgravity, 4 vessels filled with liquid culture of *C. elegans*, 4 flasks with identical liquid culture kept on a shaker; used as the control. Samples were taken every 3 days (3, 6, 9, and 12 days), from treatments and control, and all life stages were counted. Eggs from each treatment were extracted via lyses of hermaphrodites and were compared. RESULTS: The final population of all life stages of the HARV exposed *C. elegans* was lower than the control in all four treatments. Extracted eggs from cultures exposed to simulated microgravity took longer time to develop to the first larval stage and to hatch the longer the treatment. Microscopic examination of adult stages exposed to simulated microgravity exhibited a congested digestive system with unprocessed *E. coli*. CONCLUSION: Longer exposure to microgravity demonstrated lower reproduction and increased mortality. Some physiological changes were also observed. Thus far, our observation of *C. elegans* has provided useful data in the areas of microgravity and reproduction. Research supported by NASA Grant #NNX0BA47A at Texas Southern University.

847 Cell and Molecular Biology

Analysis of β -Lactam resistance mediated by the AmpC/AmpR region in a set of *Pseudomonas aeruginosa* clinical isolates

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Pseudomonas aeruginosa employs several measures to evade antibiotics including efflux pumps, porins, and β -lactamases (AmpC) which hydrolyze β -lactam antibiotics. AmpC is typically produced at basal levels, but higher levels can be induced when using β -lactams such as ceftiofloxacin and imipenem. AmpC regulation is under the control of three proteins, AmpR, AmpD and AmpG. The overall goal of this ongoing study is to understand the genetic basis for high and low level resistance to cephalosporins in a set of clinical *P. aeruginosa* isolates obtained from a tertiary care center in Cleveland, Ohio. We hypothesized that: 1) there would be more than one clone type; 2) levels of resistance to cephalosporins would be correlated with different clone types; 3) the same types will be identified by the three separate methods; and that the sequence of *ampR* genes impacts the level of resistance. Through the use of three DNA-based typing methods, the number of clone types was determined. Thirty-eight isolates from the Cleveland Clinic 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. Previously raised polyclonal rabbit antibodies generated against AmpC were used to measure levels of PDC-3 (*Pseudomonas*-derived cephalosporinase) expression at steady state using SDS-PAGE gel electrophoresis. Screening for additional β -lactamases was conducted to better understand the isolates' genetic composition. This knowledge will result in a better understanding of *P. aeruginosa* resistance which is imperative to successfully treating patients.

P877 Cell and Molecular Biology

Phenotypic effects on anterior-posterior patterning due to altered *bcd* doses in *Drosophila melanogaster*

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Variations in morphological phenotypes of *Drosophila melanogaster* are associated with changes in genetic pathways. Research regarding development along the Anterior-Posterior (AP) axis helps define the linkages between genotype and phenotype. A hierarchy of regulatory genes prompts distinguishable anterior and posterior regions, which maintain AP patterning and segmentation. Bicoid is a morphogen localized in the anterior pole of the embryo and diffuses in a concentration-dependent manner towards the posterior. Previous studies show that *bicoid* is dosage sensitive, and with variation in the number of copies introduced into the maternal genome, there is phenotypic variation along the AP axis. In this study, the phenotypic effects of altered *bcd* dosage on larval morphology were investigated to determine whether naturally occurring genotypic variation for AP patterning leads to the same phenotypic effects.

P920 Cell and Molecular Biology

Identification of DNA topoisomerases induced by interleukin-2 in HuT 78 cells

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The activities of both type I and type II DNA topoisomerases are induced in three transient peaks in HuT 78 cells, a human T cell lymphoma cell line, within 12 hours after treatment with 1,000 units of interleukin-2 (IL-2)/ml. The identities of the type I and type II DNA topoisomerases induced by IL-2 were determined by immunoprecipitations of the enzymes from nuclear extracts of IL-2-treated HuT 78 cells using polyclonal antibodies specific for DNA topoisomerase I and DNA topoisomerase III α (type I enzymes) and for DNA topoisomerase II α and DNA topoisomerase II β (type II enzymes). The immunoprecipitates were assayed for catalytic activities of DNA topoisomerase I and DNA topoisomerase III α by relaxation of supercoiled pBR322 DNA. The results indicate that DNA topoisomerase I, but not DNA topoisomerase III α , is activated in IL-2-treated HuT 78 cells. The immunoprecipitates were assayed for catalytic activities of DNA topoisomerase II α and DNA topoisomerase II β by decatenation of kinetoplast DNA. The results demonstrate that both DNA topoisomerase II α and DNA topoisomerase II β are activated upon treatment of HuT 78 cells with IL-2. Therefore, the activities of DNA topoisomerase I, DNA topoisomerase II α , and DNA topoisomerase II β (but not DNA topoisomerase III α) are transiently activated in IL-2-treated HuT 78 cells.

P931 Cell and Molecular Biology

Identification of Lombricine Kinase in the Oligochaete *Enchytraeus* through PCR and cDNA analysis

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Phosphagen Kinases (PKs) are a family of enzymes that catalyze important metabolic equilibrium reactions in animals, and are important in stabilizing the cellular ATP/ADP ratios during increased energy demands. Whereas vertebrates are characterized by creatine kinase, the invertebrates contain a variety of PKs with the greatest variety seen in the Annelid Phylum. Information on Oligochaetes comes from enzymatic analysis and molecular confirmation is scant. This study present evidence for the existence of Lombricine Kinase in *Enchytraeus*, a small terrestrial Oligochaete. Data will be presented related to the cDNA sequence, the deduced amino acid sequence and the comparisons with other PKs. Additional data will be presented with respect to the location/size of the introns in the genomic DNA. The data provides further confirmation that Lombricine Kinase is the typical PK in the Oligochaetes.

P932 Cell and Molecular Biology

Mitochondrial SuperOxide Dismutase in the leech, *Placobdella parasitica*, and the planarian, *Bipalium kuwensi*: Identification and comparison of cDNA sequences

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Superoxide dismutases (SODs) are essential enzymes in combating the effects of oxidative stress due to the presence of reactive free radicals. The purpose of the project was to search for the presence of the message for SODs in two invertebrate species, *Placobdella parasitica* (leech) and *Bipalium kuwensi* (flatworm). Initial PCR experiments using degenerative primers for SOD1 were unsuccessful. The use of degenerative primers for SOD2 resulted in positive, clear amplicons. The bands were gel extracted, ligated into pGEM-T Easy vectors and transformed into TOP10 cells. Plasmids were purified from minicultures and the inserts sequenced. The translated consensus sequence (~300 bp) of each was examined via BLAST and each indicated a high homology with mitochondrial MnSOD (SOD2). The next step in this project is to obtain the complete sequence via RACE methodologies such that a better phylogenetic relationship can be obtained

P937 Cell and Molecular Biology

Whole genome transcriptional profiling of a *Chlamydomonas* mutant defective in chloroplast protein synthesis

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Regulation of chloroplast mRNA translation represents an important determinant of plastid gene expression. Abundant genetic and biochemical evidence exists in the green alga *Chlamydomonas reinhardtii* that nuclear-encoded factors are required for the stability, processing, and translation of chloroplast-encoded mRNAs. In addition to the well-characterized light-mediated translational regulation of photosynthetic protein mRNAs, translation of plant and algal chloroplast mRNAs may respond to other environmental and physiological regulatory signals. The *C. reinhardtii* nuclear double mutant *ac-20 cr-1* accumulates approximately 30% of the wild-type level of chloroplast ribosomes due in part to a defect in the 16S rRNA processing. Translation of chloroplast-encoded ribosomal proteins is unaffected by the overall reduction in chloroplast protein synthesis in this mutant, however translation of mRNAs encoding photosynthetic proteins is severely diminished (10% wild type). Based on the hypothesis that *ac-20 cr-1* is defective for a class-specific translation factor required for the preferential translation of chloroplast-encoded ribosomal protein mRNAs, DNA microarray analyses were carried out on the single mutants (*ac-20*, *cr-1*) and double mutant (*ac-20 cr-1*) strains to identify factor(s) responsible. The results of these analyses will be reported.

957 Cell and Molecular Biology

Characterizing the expression pattern and transcriptional control of a neuropeptide receptor in *Drosophila* embryos

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Mammalian neuropeptide Y (NPY) is involved in feeding behavior and stress tolerance. The *Drosophila* NPY ortholog, NPF, mediates similar aspects of *Drosophila* behavior. The NPF receptor *NPFRI* is found primarily in the adult midbrain, but its expression pattern and regulation within the embryo is unknown. Alkaline-phosphatase *in situ* hybridization was performed to determine the expression pattern of *NPFRI* in embryos. Expression begins at stage 15 and is restricted to a dopaminergic CNS cell called the H-cell. The H-cell is part of a distinct population of CNS cells that lie along the midline of the *Drosophila* embryo. Although an H-cell is found in each of the thoracic and abdominal segments of the embryo, *NPFRI* is most frequently expressed in all of the thoracic segments and first abdominal segment. The transcription factor *tailup* (*tup*), which is also evolutionarily conserved, is an important H-cell regulator controlling the expression of genes that are required for dopamine biosynthesis in the H-cell. Therefore, expression of *NPFRI* in *tup* mutant embryos was analyzed to determine whether *tup* is necessary for *NPFRI* expression in the embryo. Preliminary results indicate that the expression of *NPFRI* shifts to more posterior segments in the *tup* mutants. We hypothesize that interactions between *tup* and members of the Homeotic gene family may control *NPFRI* expression since *tup* is expressed in all of the abdominal and thoracic segments. Since NPF/NPY has a conserved role, understating how *NPFRI* is regulated may provide insight into NPY function in vertebrates.

P970 Cell and Molecular Biology

Investigation of *E. coli* morphology when cultured in sub-inhibitory concentrations of the beta lactam antibiotic cefsulodin

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Inhibitory doses of beta-lactam antibiotics are often prescribed to treat infections caused by gram-negative bacteria. These antibiotics interfere with formation of the bacteria cell wall preventing cell division. However, little is known about bacteria cell morphology when exposed to sub-inhibitory concentrations of these antibiotics. Transient sub-inhibitory concentrations may occur over time within different areas of the patient's body as the drug concentration changes relative to dosage and timing. These experiments demonstrate that under low antibiotic conditions, there are significant morphological differences in *E. coli* compared with normal prokaryote growth. Multinucleated filaments form, indicating that the antibiotic is inhibitory to septum formation, but not cell division. The cell wall continues to grow, forming a filament, and appears to stop growing in a dose-dependant manner. This results in multiple protoplasts contained within a cell wall filament. These growing cells eventually break out from the peptidoglycan shell becoming independent "cell wall deficient" cells also known as "L form" bacteria, which are capable of autonomous division. We are investigating the ability of these "L form" membrane cells to revert back to the parent cell wall morphology. These "L-forms" may play a role in persistent chronic infection in humans. We have demonstrated that the "L-form" of *E. coli* can be induced by low dose cefsulodin. Future studies will investigate the nature of this dimorphism.

P986 Cell and Molecular Biology

Characterization and mapping of *Arabidopsis thaliana* mutants defective in peroxisome function

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An array of processes occur in plant peroxisomes, including fatty acid β -oxidation, peroxide metabolism, and the glyoxylate cycle. The peroxisomal conversion of indole butyric acid (IBA) to the active auxin IAA involves β -oxidation similar to peroxisomal fatty acid β -oxidation. The end product, IAA, is released from the peroxisome and causes inhibition of root elongation. The inability to convert auxin precursors to IAA makes plants immune to the effects of IBA when supplied exogenously. A mutant called MB154 was determined to be resistant to IBA, but sensitive to IAA. These characteristics suggested that the mutant may be peroxisome defective. Recombination mapping was employed to identify the mutation. The mapping population was selected based on the phenotype of growth dependence on exogenous sucrose resulting from the inability to metabolize seed storage lipids as a carbon source prior to germination. DNA was

extracted from 13 MB 154 F2 seedlings, and PCR with molecular markers was used to identify the mutation. Linkage disequilibrium was found at the south end of chromosome 5. After sequencing a candidate gene within this region, a G-to-A splice acceptor site mutation was found within the *CHY1* gene previously implicated in peroxisomal branched-chain amino acid catabolism. We have conducted a *chy1* suppressor screen to identify second-site mutations that suppress the *chy1* phenotype, and are currently mapping these suppressor mutations to elucidate the role of *CHY1* in general peroxisome function.

P688 Chemistry and Biochemistry

Chemical compositions of different colored violin varnishes and effects on drying time

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Varnish is applied to string instruments because the properties inherent in the varnish prevent the wood from succumbing to the environment and degrading in quality. Once dry, the varnish decreases the amount of water in the wood and the resonance of the instrument is no longer hindered by excess moisture. Different hues of violin varnishes have correspondingly different ingredients and vary in drying time (1). The chemical transformation in the varnish process is characterized by investigation of drying time, coloration, and other parameters. Investigated in this research are light brown varnishes. The amount of time needed for drying may affect the overall quality of the wood, however, that was not investigated at the time. 1. Violin Varnish, J. Michelman, 1946

P691 Chemistry and Biochemistry

Computational studies of novel phosphonium orthoborate ionic liquids

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In this study, the equilibrium geometries and vibrational frequencies for three tetraalkyl phosphonium orthoborate ionic liquids were computed: isobutyl(trihexyl)phosphonium bis(oxalato)borate (i-BH₃P BOB), isobutyl(trihexyl)phosphonium bis(malonate)borate (i-BH₃P BMB), and isobutyl(trihexyl)phosphonium bis(salicylato)borate (i-BH₃P BSB). These novel compounds were recently synthesized and have potential applications as green chemistry solvents and electrolyte additives. The relationship between ionic bond distances, HOMO-LUMO energy gaps, and electric dipole moments for each ionic liquid were examined and correlated to experimentally determined properties, such as ionic conductivity and viscosity. Molecular models were constructed using the graphical computer interface *GaussView* and the calculations were run using *Gaussian 09*. The equilibrium geometries and vibrational frequencies were determined using density functional theory (DFT) with the B3LYP hybrid functional applied in conjunction with two different basis sets, the Stuttgart-Dresden (SDD) set and the 6-311G set. The results from the 6-311G basis set calculation revealed that the compound i-BH₃P BOB exhibited a 4.98 Å bond distance, a 5.19 eV HOMO-LUMO energy gap, and a dipole moment of 17.95 Debye; the compound, i-BH₃P BMB had a 4.90 Å bond distance with a 7.74 eV HOMO-LUMO energy gap and a dipole moment of 15.33 Debye; and finally, i-BH₃P BSB showed a 4.96 Å bond distance, a 4.56 eV HOMO-LUMO energy gap, and a dipole moment of 10.62 Debye. Our computed vibrational frequencies were found in excellent agreement with the experimental frequencies, suggesting our proposed models are good representations of the actual molecular structures.

P699 Chemistry and Biochemistry

Caffeine content in various dietary supplements

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Supplements have always played a pivotal role in a dieter's nutritional choices. Many different products from Omega-3 Fish Oil supplements to green tea extracts are used in order for the dieter to gain that slight advantage when trying to reach their weight loss goals. Sometimes these products prove to be beneficial; in other instances, these supplements can prove harmful. The main reason for such a drastic disparity among results when using supplements is that the Food and Drug Administration does not regulate them. Some of the more dangerous supplements come in the form of fat-loss pills. Many people take these pills in order to get that quick-fix fat loss, but in reality, these pills contain a very high amount of caffeine. When reading the nutrition facts of certain pills, caffeine content is listed. However, since there is no regulation in the supplement industry, are these caffeine levels correct? How much caffeine is actually in certain fat-burning dietary supplements? In order to determine the concentration of caffeine in certain pills, absorbance of the diluted supplements are recorded using Ultraviolet spectroscopy.

726 Chemistry and Biochemistry

Synthesis, electrochemistry and spectroscopic characterization of 2,3- and 3,4- manganese(II) tetrapyrroldiporphyrzine complexes

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Two Mn(II) tetrapyrroldiporphyrzine complexes, 2,3- and 3,4-Mn-PyD, were synthesized via a one-step reaction. The crude products were purified through a series of processes including washing by methanol to remove the solvent; reaction with HCl and NaOH to remove any other organic side products and finally washing by deionized water to discharge inorganic impurities. The purified products were further characterized by cyclic voltammetry and UV-Visible spectroscopy in non-aqueous media. Each compound undergoes three reversible one-electron reductions and the half-wave potential of each reduction in the case of 3,4-isomer exhibits a positive shift as compared with that of 2,3-isomer, similar to what was seen in other tetrapyrroldiporphyrzine complexes having different central metal ions. Three electroreductions of both 2,3- and 3,4-Mn-PyD were confirmed to be diffusion-controlled processes in cyclic voltammetry.

728 Chemistry and Biochemistry

DDT degradation catalyzed by iron macrocyclic complexes

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Iron phthalocyanine and two other macrocyclic iron compounds were examined based on their electrochemical, UV-visible spectroscopy properties, and DDT [1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane] reductive reactions in four different organic solvents. Each macrocyclic complex undergoes two to three reversible one-electron reductions and the half wave potentials depend upon the nature of each compound and the basicity of the solvent. With the addition of DDT, the current of the second reduction of each iron complex exhibits a remarkable enhancement, indicating that the doubly reduced species are able to catalyze the DDT reductive decomposition. The performance of the catalyst showed that iron phthalocyanine has a higher turnover number for DDT reductive reaction as compared to the other two derivatives under the same solvent conditions. This trend is well-consistent with the order of the half wave potential of the second reduction among three iron macrocyclic complexes. Additionally, the property of the solvents can also affect the activity and selectivity of DDT conversion, probably due to the various extent of aggregation of the iron complex in different solvents

P733 Chemistry and Biochemistry

Development of an NADH-dependent coupled enzyme assay to assess microbial urease activity of cell free extracts

Robin Prosha*, Texas Lutheran University

An assay was developed for rapid analysis of urease activity in unidentified microbial cell-free extracts (CFE). Urease catalyses the hydrolysis of urea into carbon dioxide and NH_4^+ . When the reaction is coupled with glutamic acid synthesis via glutamate dehydrogenase in excess of NADH, the rate of ammonia production is stoichiometrically equal to the rate of NADH oxidation; therefore, the rate of ureolysis can be indirectly monitored on a spectrophotometer. The assay was successful, and linear regression produced positive linear correlations with significant R-squared values of 0.9672 and 0.9983, respectively, for jack bean urease and the unidentified microbial urease activity when enzymatic activity ($\mu\text{mol}/\text{min}/\text{mL}$) was compared with urease concentration (U). As microbial ureases play a vital role in pathogenesis, ruminant metabolism, and environmental nitrogen fixation, this assay can be used to assess the enzymatic activities and significance of the roles specific microbes play in these processes.

P748 Chemistry and Biochemistry

Direct route to potent anti-HIV chalcones

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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. The goal of this continued research is the creation of a direct route to these compounds by mixed aldol condensation reactions between aldehydes and lithium enolates formed from the methyl ether protected 2,4,6-trihydroxyacetophenone. Through our previous research efforts we found that THAP (2,4,6-Trihydroxyacetophenone) was a very effective starting compound for the synthesis of an anti-HIV chalcone. Consequently, we protected the three hydroxyl groups of THAP using four equivalents of methyl iodide (CH_3I) and four equivalents of potassium carbonate (K_2CO_3) in anhydrous acetone. This afforded the trimethylether in quantitative yield. The product ($\text{C}_{11}\text{H}_{14}\text{O}_4$) was identified by TLC and FTIR. This crucial intermediate will be converted to the lithium enolate and serve as the nucleophile in condensation reactions with various aldehydes to form interesting analogs of β -hydroxychalcones.

756 Chemistry and Biochemistry

Purification and characterization of a 4T1 murine breast cancer cell cytotoxin from *Withania somnifera*

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Withania somnifera (Ashwagandha), an herb used in ayurvedic medicine, contains bioactive plant steroids. Previous work in our laboratory identified and partially characterized a compound from *W. somnifera* with cytotoxic effects on 4T1 murine breast cancer cells. The objectives of this study were to improve methods for purification and further characterize this compound. Powdered root was rinsed with hexane to remove lipids, dried, and subjected to methanol Soxhlet extraction for 6 h. The resulting extract was concentrated and slurry absorbed onto silica gel. After washing the gel slurry, adsorbed material was eluted with chloroform-methanol and resolved into multiple bands via silica gel TLC. Bands on TLC plates were scraped, eluted in DMSO and analyzed via UV-visible spectroscopy, HPLC and mass spectrometry. Cytotoxicity of eluted TLC bands was determined using MTS assays on cell cultures of 4T1 cells. Commercially available Withaferin A and a single TLC band were observed to cause 4T1 cell death. HPLC and MALD-MS analysis revealed the band to contain a steroidal species (molar mass of 493.231). Additional characterization of the active component is ongoing.

P776 Chemistry and Biochemistry

Isolation of NADase from *Agkistrodon piscivorus leucostoma* venom

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Nicotinamide adenine dinucleotide glycohydrolase (NADase) enzymes often show activities of NAD-glycohydrolases, ADP ribose (ADPR) cyclases or cyclic ADP ribose (cADPR) hydrolases. The NADase of *Agkistrodon acutus* venom demonstrated multiple activities including the hydrolysis of ATP, ADP, and AMP-PNP as well as the cleavage of NAD^+ to ADPR and nicotinamide. NADase from *Agkistrodon piscivorus leucostoma* venom was isolated in a three step purification procedure by cation exchange, gel permeation and anion exchange chromatography after the method of Wu, et al. Homogeneity of the isolated enzyme was verified by SDS polyacrylamide gel electrophoresis.

P804 Chemistry and Biochemistry

Qualification and quantification of Vitamin E in Chap Sticks

Molly K. Hutcherson* and Kiley P-H Miller, Schreiner University

Cosmetics have been around for centuries. Cosmetics are mentioned in the bible, shown in depictions in ancient Egypt and paintings from ancient Greece and Rome, and in the last two centuries have become more readily available. In the past, people wore cosmetics, specifically “make-up”, to illustrate class or one’s position in society. Today, all women in general wear cosmetics, regardless of class. In this research, we intended to determine first, what brand and/or type of cosmetic was most readily used by the female population at Schreiner University, and second, if that product does what manufacturers claim. A cosmetic use survey showed that a particular brand of chapstick was used by over 50% of those responding. This provided a basis for further investigation. The research was then designed to determine if Chap Stick, which people use to moisturize lips, contains the moisturizing agent Vitamin E, followed by quantifying Vitamin E in different formulations using GC-MS.

P828 Chemistry and Biochemistry

Microscopy characterization of nanoporous alumina

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Nanoporous alumina has been characterized with a scanning electron microscope (SEM) to study environmental effects on the thin-film material. The experiment evaluated the size and distribution of pores on nanoporous alumina. A unique characteristic of nanoporous alumina was its nanochannels (of 50nm to 300 nm in diameter) that can transmit particles and conduct ionic current. The ion current can be used as a signal in biosensing, but the signal depends on pore size and distribution. Currently, the effects of time, solvent, and heat on alumina nanoporous properties are unknown. Environmental effects on the nanoporous alumina pores size were evaluated in this experiment. A scanning electron microscope was used to characterize the nanoporous alumina surface and determine the pore size. The nanoporous alumina was placed in various environments, such as air, water, and ethanol for various periods of time to evaluate pore stability. The experiment results determined whether pores are stable under a variety of conditions, and what factors contribute to their degradation or blockage. These results will enable future studies of nanoporous alumina as a platform for nanoporous biosensors

835 Chemistry and Biochemistry

A kinetics study of Cytochrome C and Cytochrome C Oxidase

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The basis of my experiment is to study the reaction of cytochrome c and cytochrome oxidase using site-directed mutagenesis and steady-state kinetics. The goal was to characterize the electrostatic interaction between cytochrome c and cytochrome oxidase. The mutants that were expressed in this project were E89T/E90Q and E89T/E90K. These mutants replaced the native negative charge on glutamic acid 90 [E90] with a neutral charge, glutamine [Q], or a positive charge, lysine [K]. By gathering data from the kinetic experiments, we will be able to determine if the mutations had an effect on the reaction between cytochrome c and cytochrome oxidase. Steady-state kinetics generally displays saturation kinetics at sufficiently high cytochrome c concentrations and often obeys Michaelis-Menten kinetics with a Michaelis constant, K_m , and a maximum velocity, V_{max} [2].

849 Chemistry and Biochemistry

The Moore-Penrose pseudo-inverse matrix for quantitation of mixtures

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Application of the Linear-Least-Squares (LLS) analysis to the UV/Vis analysis is generally limited to the analysis of one or two species at two to three wavelengths. Absorbance by the mixture is correlated to the absorptivity of each species using the superpositional properties of Beer’s Law and assuming the absence of interactions between species. In this work we make two significant modifications to this process: 1) a spectral range (spectrum) is utilized and 2) the LLS analysis of the spectrum of the mixture is reduced to a single matrix operation. A special matrix which we have rediscovered known as the Moore-Penrose Pseudo-Inverse (MPPI) matrix has the property that it reduces the absorbance vector (sequence of values) to a column of the concentrations of the mixture’s component species. The derivation of the MPPI matrix demonstrating its equivalence to the LLS method will be shown and the weaknesses and strengths of this method will be discussed.

P850 Chemistry and Biochemistry

The synthesis of 2-pyrone derivatives

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The goal of this research was a one pot synthesis of 2-pyrone derivatives. In nature, many 2-pyrone derivatives exhibit antimicrobial, antifungal, and cytotoxic properties. They are often studied for their ability to affect specific parts of proteins. The initial goal of this research was to create a one-pot synthesis of undec-2,9-ene-4,8-dione. However, we were unable to complete this project due to time constraints. This research, however, did afford an important precursor which was prepared successfully in two steps. Beginning with 4-methyl-6-hydroxy-2-pyrone, we were able to form 4-acetoxy-6-methyl-2-pyrone via overnight reaction with acetic chloride in catalytic triethylamine. Next we formed methylenebis(4-methyl-6-hydroxy-2-pyrone) by reacting 4-methyl-6-hydroxy-2-pyrone with formaldehyde at 70 °C. Our yield for this reaction following optimization was 60%. The product was characterized by traditional methods using 300 MHz NMR, and IR. Attempts to create a one-pot synthesis of undec-2,9-ene-4,8-dione with this bispyrone were unsuccessful, as yields for the first step (the hydrogenation of the 4 and 5 carbons of the 2-pyrones) were too low.

P861 Chemistry and Biochemistry

Structural dynamics of biomimetic Ni(II) & Zn(II) metal-ligand complexes: A computational study

Nick Kubelka*, William Davis, Santiago Toledo, Texas Luthern University

Proper *in vivo* metalloenzymatic catalysis is directly dependent upon the complex quantum interactions between the ligand and the electronic properties of the metal center. To decipher how interactions among the *in vivo* amino acids and the metal center promote proper Ni(II)-Acireductone Dioxygenase (Ni-ARD) functioning, geometry optimizations and vibrational frequency analyses of several Ni(II) and Zn(II) inorganic mimics of Ni-ARD were computed. Effects based on the identity of the metal center (Ni(II) versus Zn(II)), the identity of the oxygen-containing group (alkoxide versus phenoxide), the length of the hydrocarbon backbone (ethylene versus propylene), and the coordination of N-heterocyclic groups (pyridine versus quinoline) were analyzed. These calculations were initially run using a Hartree Fock (HF)/3-21G basis set to obtain crude data to compare with literature results. Bond lengths were within 0.1 Angstroms and bond angles were within 5-10 degrees of published data. Frequency data was obtained after changing to a HF/6-31G(d) basis set and then compared to laboratory data. Values for frequency predictions were found to be within 160 cm^{-1} of observed laboratory values.

879 Chemistry and Biochemistry

New pH sensor based on ionomer/carbon nanoparticle composite film: Extension of detection into the very strong acidic environment

Nameera Baig*, Tuan Tran, Dr. Mian Jiang, Dr. Byron Christmas- University of Houston Downtown

Conventional pH measurement is only valid in pH~ 3-9 because of the limitation by "acid error" and "sodium error." We report a new hydrogen ion detector that can be used in very strong acidic environment (pH<3). The detector is based on ionomer/carbon nanocomposite films capable of entrapping organic dyes. We utilize the voltammetric response of the redox-active dyes, which comprises a stable, reversible and sensitive current signal upon changing pH, towards the hydrogen ion. The ionomer Nafion has received growing interest and remains a focus in primarily chemistry based research because of its high ionic conductivity. Its unique properties makes it useful in applications like high temperature coatings, super acid catalyst, proton transporting, water purification and fuel cells. In our current work we have studied Nafion composite membranes and their electrochemical utilization, especially pH sensing. We have incorporated various carbon powders into the Nafion polymer network by means of simple mixing. It is evident that these composites not only exhibit high capacitive features (in comparison to either the bare electrode surface or the free standing Nafion membrane by itself) but also strong inclusion capacity to entrap redox active species (thus functioning as electro catalysts). The former has potential for application in super capacitor (ideal battery), while the latter sheds promise for sensing, including the hydrogen ion detection. We have systematically compared the dyes and finalized the optimal entrapment and follow up pH sensing. Our preliminary results hold great potential for future sensor and battery development.

P892 Chemistry and Biochemistry

Structural influences on intramolecular hydrogen bond formation in diols

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The nature of intramolecular hydrogen bonding in diols is determined by a variety of factors. A given hydroxyl group may be attached to a primary, secondary, or tertiary carbon. The number of carbons between the two hydroxyl groups, and the bulkiness of any substituted alkyl groups, also affect intramolecular hydrogen bonding. In this study we have examined the infrared spectra of a variety of diols in very dilute (<0.01M) cyclohexane solution to determine (1) if intramolecular hydrogen bonding occurs and (2) if infrared OH stretching data can be used to show experimentally which hydroxyl group is the preferred electron donor for pairs of nonequivalent OH's. Evaluation of the spectral data we have obtained to date indicates one can readily reach conclusions about which nonequivalent hydroxyl group is the preferred electron donor in some diols. For other diols, the result is not readily apparent.

P893 Chemistry and Biochemistry

Structural characteristics of diols which form reverse micelles in cyclohexane and carbon tetrachloride

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We have studied the infrared OH stretching bands of a numerous diols in very dilute (<0.01 M) solutions in cyclohexane and carbon tetrachloride. In addition to bands associated with free OH conformations and the presence of intramolecular hydrogen bonding, in some diol solutions we also see spectral evidence for intermolecular hydrogen bonding despite the very low concentrations of these solutions. The position of these observed OH stretching bands associated with intermolecular bonding are at a frequency typically associated with alcohols or diols at high concentrations. This result indicates the formation of reverse micelles in these solutions. The diols we have examined include 2,3-butanediol, 2,4-pentanediol, 1,5-pentanediol, 1,8-octanediol, 1,2-octanediol, 3-methyl-1,3-butanediol, 1,2-hexanediol, 1,3-butanediol, 1,2-propanediol, 1,7-heptanediol, 1,6-hexanediol, 2,5-hexanediol, 1,4-butanediol, 2-methyl-2-propyl-1,3-propanediol, 2,2,4-trimethyl-1,3-pentanediol and others. We have examined the data to see if reverse micelle formation can be correlated to length on the "alkyl tail" or other physical characteristics of the diol molecules

P895 Chemistry and Biochemistry

Variation in infrared stretching bands of various diols

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We have examined the infrared OH stretching bands of a variety of diols in very dilute (<0.01M) cyclohexane solution. Two hydroxyl groups in the same diol molecule introduce complications in analysis of the infrared spectrum not found in alcohols. The purpose of this study is to examine the factors which influence the position of the OH stretching bands in diols. In addition to the possible presence of symmetric/antisymmetric OH stretching modes for equivalent pairs of OH bonds, the interaction between two nonequivalent hydroxyl groups in close proximity can alter the frequency of the OH stretching bands. In alcohols, OH stretching band position also differs predictably for hydroxyl groups attached to primary, secondary, and tertiary carbons. This study seeks to determine if it is possible to correlate the position of the OH stretching band in diols with the OH rotamer types associated with the primary, secondary, and tertiary carbons occurring in a given diol. Similar infrared studies of dilute solutions of a large number of alcohols in cyclohexane show a consistent relationship between OH stretching band position and free OH rotamer types for primary, secondary and tertiary alcohols. Our

results indicate band position in diols can also be correlated to OH rotamer type.

896 Chemistry and Biochemistry

Intramolecular and intermolecular hydrogen bonding in very dilute solutions of diols

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We have examined the infrared OH stretching bands of a variety of diols to study the various free and hydrogen bonded conformations present in very dilute (<0.01 M) cyclohexane solution. The diols we have examined include 2,3-butanediol, 2,4-pentanediol, 1,5-pentanediol, 1,8-octanediol, 1,2-octanediol, 3-methyl-1,3-butanediol, 1,2-hexanediol, 1,3-butanediol, 1,2-propanediol, 1,7-heptanediol, 1,6-hexanediol, 2,5-hexanediol, 1,4-butanediol, 2-methyl-2-propyl-1,3-propanediol, 2,2,4-trimethyl-1,3-pentanediol and others. Similar infrared studies of dilute alcohol solutions in cyclohexane can detect not only the presence of hydrogen bonding but also the presence of structurally different stable conformations having free OH rotamer types gauche to varying numbers of CH and CC bonds on the adjacent carbon. Besides looking for spectroscopic evidence for intramolecular and intermolecular hydrogen bonding in various diols, another goal in this study was to see if specific free OH rotamer types in diols could be identified from the position of the infrared OH stretching bands. In addition to observing various free conformations and intramolecular hydrogen bonding in some cases, we also see in some cases IR bands from intermolecular hydrogen bonding despite the very low diol concentrations - an indication of reverse micelles formation

908 Chemistry and Biochemistry

Vibrational and UV/Vis spectra of 9,10-dihydrobenzo(a)pyren-7(8H)-one and 7,8,9,10-tetrahydrobenzo(a)pyrene: An experimental and computational study

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The present study is focused on understanding the vibrational spectra and excited state features of 7,8,9,10-tetrahydrobenzo(a)pyrene (7,8,9,10-H4BaP) and 9,10-dihydrobenzo(a)pyrene-7(8H)-one (9,10-H2BaP) which are present in the atmosphere. In this study, a combined spectroscopic and quantum mechanical investigation of 9,10-dihydrobenzo(a)pyrene-7(8H)-one and 7,8,9,10-tetrahydrobenzo(a)pyrene is provided. The molecular geometries, vibrational and UV-vis spectra of 9, 10-dihydrobenzo(a)pyrene-7(8H)-one (9,10-H2BaP) and 7,8,9,10-tetrahydrobenzo(a)pyrene (7,8,9,10-H4BaP) were investigated using density functional theory (DFT-B3LYP), with the triple-z 6-311+G(d,p) and Dunning's cc-pVTZ basis sets. From the comparison between infrared experimental and calculated data and Raman activities, vibrational band assignments are comprehensively made. The calculated infrared frequencies below 1800 cm^{-1} are in good agreement to experiment data, with an average deviation of $< 4\text{ cm}^{-1}$. Via a B3LYP/6-311+G(d,p)/TD-B3LYP/6-311G(d,p) calculation of transition energies, optical oscillators of 30 lowest electronic absorption bands are assigned to the p-p* transitions, and good qualitative agreement between experimental and simulated absorption determined. In addition, the HOMO-LUMO gaps and their chemical hardness were analyzed.

923 Chemistry and Biochemistry

Novel sensor for tartrate based on nickel oxide moieties with carbon transducer

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Tartrates, found naturally in many plants, are widely used in pharmaceuticals and industrial food preparation. The current detection of tartrates includes indirect UV and solid infrared techniques that suffer from tedious operation and poor reducibility. In this work we report a novel method for tartrate based on voltammetric measurement by using nickel oxide particles/films in sodium hydroxide solution. Chemical dipping, electrochemical deposition, and simple mixing preparation were all tested for a feasible and practical approach to anchor active nickel oxide moieties on carbon transducers and were all proven effective. The transducer platforms employed in this study were graphite powders and glassy carbon. In NaOH solution nickel moieties exhibited a pair of well-defined, reversible voltammetric peaks that are associated with Ni(II/III) redox transaction. In the presence of tartrate or tartaric acid, the Ni(II) \rightarrow Ni(III) process was significantly enhanced whereas no such signal was detected by using the bare carbon electrode. Hence, the response of tartrate on NiO/C was attributed to the electrocatalytic oxidation. Our further tests demonstrated a linear dependence of the voltammetric signal on the tartrate concentration. To our knowledge no such reports in the literature we searched. We therefore systematically studied and optimized the new analytical protocol for tartrate. A remarkable feature, after we thoroughly examined, is the high selectivity of this procedure toward tartrate when many other compounds that have similar structures co-existed. Our presented protocol thus holds great promise for the new assay of tartrate-containing species.

926 Chemistry and Biochemistry

New Sensor for Potassium Ion

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Potassium is an essential component in human body. Its monitoring is an important index for blood analysis and cardiovascular diagnosis. There have been a lack of electrochemical, especially voltammetric, assays for potassium ions, mainly because of the very high reduction potential of K^+ (more negative than water hydrolysis potential). We recently developed a new and simple voltammetric method for potassium ion. In our proposed protocol we systematically studied Prussian blue and its analogues and their surface fabrication, and found the voltammetric response toward potassium by these thin films. Nickel hexacyanoferrate (NiHCF) especially showed excellent sensing toward potassium ion in neutral pH conditions with concentration dependence. This sensory effect is very selective in a relatively wide pH range that covers the conventional physiological pH, which makes our approach especially attractive in perspective clinic applications. Our method is a bioreagent-free, one-step, and easy to recycle approach. The responsive mechanism study is currently underway. This work was supported by SACP-UARP, UHD-ORC, Brown Foundation, and Welch Grant (BJ-0027)

942 Chemistry and Biochemistry

Photochemistry of cyclic sulfite esters

Rick C. White and Jacob Broadway*, Sam Houston State University

The photochemistry of cyclic sulfite esters made from the 1,2-diol and thionyl chloride was investigated. We undertook this work to correlate photoextrusion reactions from cyclic sulfites with those of cyclic carbonate esters. In some systems, such as benzene dimethanol sulfite, the system cleanly loses sulfur dioxide to generate a benzofuran, while in other cases such as meso-hydrobenzoin sulfite, both sulfur dioxide is lost to give diphenylmethane and sulfur trioxide is lost which gives a stilbene. These seem to be dependent on the stabilization of the radicals involved. Styrene glycol sulfite does not give the same products as those from the styrene glycol carbonate which suggests that the photoextrusion of sulfur dioxide from styrene glycol sulfite is slower than that of carbon dioxide from styrene glycol carbonate. These reactions were monitored by GC/MS, and by NMR spectrometry.

P943 **Chemistry and Biochemistry**

Detection of recombinant bovine somatotropin (rbST) in commercially available milk samples

Charli Baker*, Phong Ngo, and Dr. Paul Loeffler, Sam Houston State University

Bovine somatotropin, or bST, is a hormone produced in the somatotropes of the pituitary gland of all cows. Interest in bST stems from its ability to prolong the milk production of dairy cows after peak lactation. However, obtaining bST directly from the pituitary gland of a cow is both a time consuming and expensive process. These difficulties lead to the production of a recombinant form of bovine somatotropin. Recombinant bovine somatotropin (rbST) was approved for use in the US dairy industry in 1994, but rejected by the majority of the western world. Despite FDA approval, concerns over the health detriments of rbST are still being debated in the United States. In an attempt to detect bST and rbST in several types of local milk samples, an SDS PAGE was performed. Based on these results, an attempt to differentiate between bST and its recombinant form was made via a two dimensional SDS page.

P951 **Chemistry and Biochemistry**

Electrochemical sensing of sulfur-containing organic compounds by electrodes of non-noble metals

Israel I Sierra*, Mian Jiang, Larry Spears, University of Houston-Downtown, Houston, TX, Yongjie Zhan and Jun Lou, Rice University, Houston, TX.

Sulfur-containing organic compounds are involved in many biological and biochemical processes because sulfur is one of the essential elements in life evolution. Sulfur has a strong affinity and bonding towards noble/precious metals which further forms the foundation of the assay of sulfur-containing compounds by gold, silver, platinum substrates. To explore cost-effective assay alternatives, we have used non-precious metal conducting substrates. Glassy carbon electrodes were first introduced in our approach by coupling with voltammetry. Typical sulfur-containing organic molecules, L cystine, L-cysteine, DL-homocysteine, methionine, and thiourea were examined in broad pH range media. While these compounds generally display sluggish response on the bare carbon electrode, we found that the presence of transition metal ions can significantly enhance the response. Our systematic examination revealed the optimal pH as neutral to acidic with nickel or cobalt ions promoting most sensing. Coupling with different electrode treatments, our proposed protocol can selectively determine these sulfur-containing molecules. Some other non-noble metal based electrodes, including anodized aluminum oxide (AAO) electrode, were also tested in our follow-up study. Our work has thus offered a cheaper and fast alternative in the study and assay of sulfur-containing molecules. This work was supported by SACP-UARP, UHD-ORC, Brown Foundation, and Welch Grant (BJ-0027)

967 **Chemistry and Biochemistry**

Dinoflagellate bioluminescence: Cloning of luciferase genes and purification of luciferase-containing organelles of *Pyrocystis fusiformis*

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

Pyrocystis fusiformis is a protozoan species, approximately forty micrometers in length, that is closely related to plants and algae. These dinoflagellates are photosynthetic and also utilize a luciferase bioluminescence system. Luciferases are a class of enzymes that are responsible for luminescence by catalyzing the oxidation of a substrate molecule, luciferin, in a reaction that produces light at 475 nm. In an effort to discover the structural biology of the luciferase contained within *Pyrocystis fusiformis*, long-term research is focused on cloning the genes that code luciferase and purifying luciferin for bacterial transformation and expression in *Escherichia coli*. This portion of research involves the extraction and purification of chromosomal DNA from *Pyrocystis fusiformis* for the purposes of PCR cloning. Dinoflagellates are thecate, meaning their cellular membranes are interlaced with polysaccharide deposits that form rigid plates making it incredibly difficult to lyse, short of homogenization. With that being said, several DNA extraction methods and combinations thereof are being employed in order to determine the most effective protocol that does not shear the DNA

P973 **Chemistry and Biochemistry**

Extraction of ivermectin from aqueous solution with fluorescence detection

Adam Graham* and David A. Carter, Angelo State University

Ivermectin is a commonly administered animal antiparasitic. Studies have shown that Ivermectin has a negative effect on organism populations in the environment and is reported to have a high potential of becoming an environmental hazard. A method of measuring Ivermectin in aqueous environments is required to completely characterize its presence and transport through the environment. Although methods for the determination of Ivermectin in animal feces and soil samples have been developed, analytic studies on various concentrations of Ivermectin in aqueous solutions are sparse. The ultimate goal of this research is to refine a method that will allow the determination of Ivermectin below 0.1 µg/L level in surface and ground water samples. Fluorescence detection of Ivermectin down to 0.1 µg in 2.5 mL of derivatized solution was accomplished by derivatization with trifluoroacetic anhydride. Extraction of that amount of Ivermectin from volumes of water ranging from 200-1000 mL using a C-18 solid phase microextractor, followed by elution with and evaporation of methanol, and subsequent derivatization and fluorescence detection, suggests that detection of Ivermectin at this concentration should be possible. The reproducibility of fluorescence detection and extraction of Ivermectin under these conditions is reported along with the % recovery of the Ivermectin extraction procedure.

984 **Chemistry and Biochemistry**

Computational quantum chemistry: Applying numerical methods to the hydrogen atom as a system sufficiently simple for an undergraduate spreadsheet experiment

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In today's computerized world, computational quantum chemistry has become an important part of research, both in its own right and as a virtual requirement to augment much of experimental research. Students need to have a rudimentary understanding of computational chemistry in order to appreciate and possess the skills necessary to understand its application and results. This talk presents the use of an unoptimized linear combination of gaussian functions (LCGF) as an approximation of the hydrogen 1s wavefunction. The best fit coefficients and energy of the LCGF are determined using standard computational quantum chemistry methods. Use of this approximate wavefunction for determining expectation values and the significance of various common computational matrices will be presented. The existence of exact wavefunctions of the hydrogen atom allows for the calculation of "exact" results for comparison. All of the work presented is performed using Excel.

P1019 Chemistry and Biochemistry

Visible light photocatalytic activity and XRD characterization of TiO₂ doped with molybdenum and fluorine using a photocatalytic deposition method

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Different methods of doping TiO₂ for modifying the electronic properties of titanium dioxide has been used. The doped materials usually are tested to evaluate the photocatalytic activity and potential uses. In the present work a simple and inexpensive photocatalytic deposition (PCD) method of co-doping TiO₂ combining a metal, molybdenum, and a non metal, fluorine, is presented. The activities of the prepared samples were determined by using the photocatalyzed degradation reaction of the dye methylene blue (MeB) in aqueous solution under visible light. The results showed a substantial improvement compared with non doping samples: the calculation of the apparent first order kinetic constant increased in two orders of magnitude, from 10⁻³ to a 10⁻¹. The band-gap of the samples was determined by using the UV-Vis apparent absorption of the water suspension of the samples. They were also characterized by X-ray diffraction, measuring the diffraction patterns, showing that both molybdenum and fluoride were present in the crystal lattice of TiO₂ (Anatase). The samples prepared showed a potential for use in different photocatalytic applications such as more efficient methods of decontamination of water, water splitting and a new generation of solar cells

P1031 Chemistry and Biochemistry

Study of acetaminophen and transition metals and their analytical applications

Cassandra Flores*, Mian Jiang, and Larry Spears, University of Houston Downtown, SACP-UARP, UHD-ORC, Brown Foundation, and Welch Grant

Acetaminophen or paracetamol is an important drug that has utilizations as an active painkiller ingredient and beyond. Its pharmacokinetic and physiological interactions with other molecules hold importance in the full understanding of this classic medicine compound. Transition metal ions, regardless of being used as macro-, micro-, or non-nutrients, are natural ligands or complexing species for most organic molecules. In this work we employed voltammetry to study the interaction between acetaminophen and various transition metal ions. Our medium test reveals the coordination number of transition metal ions toward acetaminophen varies, with 1:1 molar ratio prevailing when the concentrations of present transition metal ion are relatively high. KCl (pH neutral) was proved to be the most suitable medium. Nickel ions have exhibited the excellent electrochemistry features (both oxidation and reaction) when used as a model transition metal to interact with acetaminophen. Further, the oxidation peak of nickel redox transition on the glassy carbon electrode and platinum electrode displays a linear dependence on the added concentrations of nickel ions in the presence of acetaminophen. Our mechanism study suggested that it was the redox activity of nickel, not acetaminophen, that contributes to the quantitative feature of the transition metal – acetaminophen system. Our sensory findings of this system have thus shed promised in future assay of nickel ion, a new alternative to study related pharmacokinetic and toxicity of acetaminophen

680 Computer Science

An ontological approach to manufacturing supplier discovery

Christian McArthur*, Farhad Ameri, Texas State University-San Marcos, San Marcos, TX

In modern manufacturing, supply chains are increasingly becoming global, virtual and short-lived requiring rapid and dynamic changes to keep up with the current marketplace. A major challenge is determining suitable suppliers in a timely and accurate fashion. Current methods of finding potential suppliers have difficulties fully addressing both attributes: time and accuracy. Keyword-based search methods performed by computers can be very fast. However, without performing complicated natural language processing, it is difficult to determine the context of words in a block of text causing inaccurate results. Human domain experts are able to interpret context within a textual description as well as perform reasoning processes; this allows for highly accurate results with a small set of suppliers. As the number of suppliers increases, the time for the human expert to examine all possible suppliers increases and the potential exists for an increased number of human errors on the part of the domain expert. The Manufacturing Service Description Language (MSDL), an ontology for formal representation of suppliers' capabilities and manufacturing services, will be presented. MSDL uses the Web Ontology Language (OWL) which allows definitions and meanings to be constructed for manufacturing concepts that are understandable by computers. A search engine has been developed that interprets the MSDL ontology. The search engine returns a ranked list of potential suppliers based upon a query and the information contained in the ontology. A comparison will be shown of the results of this search engine with the results from a pair of independent domain experts.

783 Computer Science

The design of digital recursive filters for the analysis of heart rate variability

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Digital recursive filters are computer algorithms that use previous values of both the input and output signals to calculate the filter function. We developed an Excel template for designing trapezoidal digital recursive filters. Our test signal was a time varying sine wave sampled at 20 Hz intervals. The user enters the low and high stop and roll-off frequencies, initializes the coordinates of the six-pole filter equation, runs the Excel Solver add-in to minimize RMS error between the observed and expected output and repeats the procedure to tune the filter. We tested low (LF, 0.04 to 0.15 Hz) and high frequency (HF, 0.15 to 0.40 Hz) filters with the sum of two sine waves with peak-to-peak amplitudes of -0.5 to 0.5 and mid-band frequencies of 0.095 and 0.275 Hz, respectively. The LF filter passed 100% of the 0.095 Hz signal, with a 2% ripple from the 0.275 Hz signal. The HF filter passed 66.6% of the 0.275 Hz signal, with 48.0% of the 0.095 Hz signal. In future work, we will adjust the low stop and roll-off frequencies of the HF filter to provide better separation.

798 Computer Science

The deployment of Wayland Baptist University's first computational cluster

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Recently, Wayland Baptist University was able to deploy a functional supercomputer at a cost of less than \$750 out of pocket. This presentation will demonstrate how this same process can be repeated in a similar environment, providing superior computational power with minimal financial burden. By recycling retired PCs, we constructed a computational cluster which only required the PC towers themselves, a networking switch with adequate cables, as well as physical shelving for storage. Finally, freely available software enabled us, with minimal effort and expertise, to build, deploy, and manage our own computational cluster. This presentation will demonstrate the capabilities of our cluster using code to perform intensive mathematical computations such as matrix operations, which can be easily scaled by increasing the dimensions of the matrices. Additionally, we tested the cluster's ability to perform real-world analysis on large-scale biological data, receiving encouraging results. Overall, the task of making a supercomputer from a modest budget may seem formidable, but ultimately, installing a cluster does not have to be a burdensome or expensive process

830 Computer Science

Computer vision detection of immobilized cells

Kenyon L. Coleman*, Adam Seger, Jessica Koehne, Olufisayo Jejelowo, Meyya Meyyappan, Nader Pourmand

Computer vision, a new scientific discipline, is the science and technology of machines that see. Using computer vision, a program is created to detect the presence and location of cells on a substrate. The ultimate goal of the program is to create a fully automated system of high throughput cell manipulation. A fully automated system is necessary to increase the efficiency of current cell manipulation methods. A digital image of immobilized cells on a substrate is loaded as input into a program that analyzes the image parameters for cell discrimination. Cell discrimination is accomplished through a series of calculations involving edge detection using derivative images. The cells are identified and the data stored for further use in a fully automated system. This program represents the initial stage of a fully automated cell detection system

878 Computer Science

Computational thinking and its value in computer science studies

Kassandra Perch*

Harnessing the power of critical thinking is necessary for full success not only in the field of computer science, but in all fields of industry. However, most computer science students approach assignments and projects with a reliance on pre-defined tools and with a language-dependent approach. Little time and energy is spent on code-independent methods of problem solving, such as flow charting, modeling, prototyping, and pseudocode. The skills used in computational thinking are meant to tie together the problems given in projects and assignments and ways to use paradigms and ideas to help model and begin to solve these problems before writing code. The presentation covers the Dreyfus model of skills acquisition, the idea of using paradigms, abstraction, and group brainstorming as tools, L-mode(Procedural, list-based) and R-mode(Relational, spatial) thinking, and how to use these concepts to solve complex problems in a faster and more efficient manner than language-specific design. The presentation is aimed at beginning computer science and introductory computer courses- but the skills involved with computational thinking itself are also applicable to studies in all fields of science.

P907 Computer Science

Performance, precision and accuracy of short-read genome assembly software

Zane Goodwin*, St. Edward's University, Austin, TX and Jamison McCorrisson, Konstantinos Krampis, Indresh Singh and Jason Miller, J. Craig Venter Institute, Rockville, MD

Automatic, next-generation genome assembly programs produce genome assemblies of varying accuracy and quality from short sequenced fragments of DNA. In order to compare assemblies, a number of statistics can be calculated to determine which assemblers produce the least fragmentary assemblies in the shortest amount of time with the least amount of computer resources. A software package was written in Perl to compare genome assemblies by calculating statistics that describe the distributions of contigs, scaffolds, and the reads used to assemble them. Assemblies of *E. coli* and *Y. pestis* reads from Illumina and Roche 454 sequencing platforms were compared by the package, while the time taken to run assemblies was determined using UNIX commands. Analysis with this package reveals that the genome assemblers CLC, Velvet, Celera Assembler and Mira consistently perform well on contig and scaffold-based statistics, with Velvet and Mira using the largest amounts of memory. EULER and SOAP-deNovo assemblers use less CPU power and less memory yet consistently produce poor assemblies of *E. coli* and *Y. pestis* reads from both Illumina and 454 platforms. The success-to-failure ratio of genome assemblers depends on the quality of the reads used, the structure of the genome being assembled and computer hardware constraints, yet it is clear that the choice of genome assembly software should be made based on these factors first and should then be further scrutinized by assembly statistics.

723 Conservation Ecology

Molecular genetic analysis of African lion (*Panthera leo*)

Martha McKeon Lyke*, University of Texas at San Antonio, San Antonio, TX

Over the past century, African lion populations have become isolated with a patchy continental distribution, and little is known about the adaptive differences that may exist between populations in different regions. I analyzed variation in 14 microsatellite loci in a population of 164 African lions inhabiting Etosha National Park in Namibia. Genetic analysis was coupled with demographic data to examine pride structure, genetic diversity, relatedness, and extra-group paternity (EGP). In general, pride demographics were similar to those reported for other African lion populations, with at least one difference in within-pride relatedness. Pride female coalitions have previously been reported to consist of only related females, which was the case in 90% of coalitions sampled, though at least one pride contained unrelated females. Genetic diversity ($H_o = 0.54$) was also similar to values observed in other lion populations and did not indicate inbreeding depression. My primary goal was to investigate the occurrence of EGP in the Etosha lion population. Extra-group paternity has not been previously reported in African lions, though paternity has been assessed in other regional populations. The rate of EGP in this study population was 53%, which challenges the current models of African lion mating systems, and supports the idea that regional populations need to be studied and managed independently.

743 **Conservation Ecology**

Monthly surface abundance, population size and movement of the Georgetown salamander, *Eurycea naufragia*, in two springs of central Texas

Benjamin A. Pierce*, Ashley E. Wall, Alexander S. Hall, and Kira D. McEntire, Southwestern University, Georgetown, TX

The Georgetown salamander, *Eurycea naufragia*, is an endemic neotenic salamander that occurs at less than 15 sites in Williamson County, TX. Rapid urbanization throughout its range places all known populations at risk. We conducted monthly surface counts of salamanders at two sites from 2007 to 2010 and conducted mark-recapture studies at these sites in the summer of 2010. The numbers of salamanders observed in surface counts varied from month to month, with somewhat higher numbers seen in spring and summer surveys. Numbers of salamanders observed at both sites dropped dramatically following a major flash flood that occurred in the fall of 2010 and slowly increased afterwards. Estimates from the mark-recapture studies suggest that in the summer of 2010 both populations consisted of only about 100-200 adult salamanders. Recaptures over a six-month period demonstrated that marked salamanders exhibited high site fidelity, most being recaptured within 5 m of the point of initial capture. These studies provide basic ecological information that can be used to develop a long-range conservation plan for the species.

752 **Conservation Ecology**

Reproductive patterns of Texas River Cooter (*Pseudemys texana*) and Red-Eared Slider (*Trachemys scripta elegans*) at Spring Lake, Hays County, Texas

Ivana Mali*, Thomas R. Simpson, Francis L. Rose, Texas State University-San Marcos, TX

Because chelonians are considered the most prolific amniote group, turtles have been used to test and developed optimality models predicting the strategy of maternal investment that will maximize maternal fitness within a population. Turtles are also ideal organisms for assessing the relationship of body size and reproductive fitness. We studied reproductive patterns of two species of emydine freshwater turtles, Texas river cooters (*Pseudemys texana*) and red-eared sliders (*Trachemys scripta elegans*) at Spring Lake, Hays County, Texas during the 2009 nesting season. After a female nested, we measured her plastron length, carapace length, carapace width, and determined her mass. Eggs were taken to the laboratory, where we measured egg length, egg width, and determined egg mass. We used simple linear regression to assess correlations between female body size and reproductive parameters (mean egg mass, mean egg length and width, mean clutch size and mass, and nest distance from water). Phenotype-habitat matching theory, (predicting increasing reproductive parameters with increasing body size) was followed for most of the reproductive parameters. The parameters did not show strong fit of data to the model ($r^2 < 0.3$). We found 30 Texas river cooters and 9 red-eared sliders nesting twice in a single nesting season. I used paired t-tests to determine if clutch parameters decrease with subsequent clutches laid during the same nesting season. Paired t-tests showed that mean egg mass, mean egg length and width decreased in subsequent clutches in Texas river cooters, but the sample size for red-eared slider was too small to make conclusions.

788 **Conservation Ecology**

A general habitat suitability model for the endangered Houston Toad (*Bufo houstonensis*) from remote sensing data

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The federally endangered Houston toad *Bufo houstonensis* is endemic to Texas. The species is threatened by extinction due to habitat loss as a result of growing urbanization and other anthropogenic factors that have reduced population size and extent. Its distribution is limited to a few counties with a largest and most extensive population in Bastrop County. The Houston toad population has declined dramatically in recent years. Population surveys are being conducted in potential habitat areas with a main focus in Bastrop County and adjacent counties. Previously we have derived habitat models based on species occurrence and a few most critical environmental parameters. Here, we attempt to use the recorded occurrence data and various bioclimatic and environmental variables derived from remote sensing, and GIS using a fundamental niche modeling approach to identify and quantify the potential habitat in Texas suitable for Houston toad. The potential habitat map produced will be incorporated with our previous model and other resources to assist in identifying putative historical and potentially undocumented Houston toad occurrence. It is a tool for prioritizing areas for future surveys and habitat protection and management.

802 **Conservation Ecology**

The importance of light levels and herbivory on the growth of a rare Texas endemic: The Bracted Twistflower (*Streptanthus bracteatus*)

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The bracted twistflower (*Streptanthus bracteatus*) is a member of the Brassicaceae (mustard) family and is a rare endemic of the Edward's Plateau ecoregion of central Texas. There appear to be many factors affecting its growth and distribution. This study examined two potential factors, light levels and herbivory and their effect on plant response variables including shoot height (cm), basal diameter (mm), aboveground and belowground dry mass, and total dry mass (g). A separate light experiment demonstrated that plants responded positively to higher light levels. Plants in the high light treatment had a significantly greater shoot height, basal diameter, aboveground, belowground, and total dry mass than plants in the most shaded treatments. Plants in the 2 x 2 factorial field enclosure (+ or -) and canopy (+ or -) experiment were negatively affected by herbivory and the presence of the canopy. There was a significant interaction between enclosures and canopy treatments. Plants in the full sun enclosures had higher aboveground, belowground, and total dry mass than plants in the full sun without enclosures. In addition, full sun plants in the enclosure had higher aboveground, belowground, and total dry mass than plants in enclosures below the canopy. From these studies, it appears that *S. bracteatus* prefers high light levels and was negatively affected by herbivory, likely white tailed deer (*Odocoileus virginianus*) that seem to have a high density in the area.

P805 Conservation Ecology

Bat activity distribution in a medium-sized city, Waco, Texas: Preliminary findings

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Mobility gives bats access to a range of habitats and can reduce their dependence on a particular setting. The presence of bats in cities has been reported around the world, spanning a wide variety of bat species, geographic locations and patterns of urbanization. The urban environment has been modified to fulfill human's demands, with cities showing a high degree of socioeconomic complexity and heterogeneity. Can this heterogeneity be recognized by bats who are sharing the city with us? Few published research papers specifically focus on bat activity distribution in urban habitats. But these papers suggest that bat foraging activity is not randomly distributed in urban habitats. The objective of this research is to investigate the possible association between abundance of bat calls and urban land use/land cover. A driving survey (about 450 miles) has been made from August to November 2010, covering about two-thirds of the Waco city limit. Downtown Waco and adjacent neighborhoods have been thoroughly surveyed. About 40 locations, clustering at 6 different areas, have been found with the clear echolocation records. More than half of these locations cluster in downtown Waco. The distribution pattern is compared with previous investigations in the Czech Republic and Mexico

856 Conservation Ecology

Is bigger always better? Mate selection in the Houston toad (*Bufo houstonensis*)

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Sexually dimorphic traits are used for mate selection either by female choice (intersexual selection) or male - male competitions (intrasexual selection). In anurans, past evidence has shown that either type of selection mechanism, although more commonly intersexual selection, will generally favor large males. In bufonids, however, male size does not seem to be a factor in mate selection. Very little is known about the mating preferences of the endangered Houston Toad (*Bufo houstonensis*). Studies examining the breeding dynamics of *B. houstonensis* were conducted during the early 1980's, however, results were conflicting. To further examine mate selection, 329 Houston toads were collected from Bastrop State Park, Texas and the snout-urostyle length (SUL) measured. There was no significant difference in size for males found in amplexus and those not in amplexus, therefore females are not selecting larger males. Results were compared to two studies examining *B. houstonensis* breeding behavior. Studies have found that age, pond densities, and/or call variables, instead of size, can influence female choice. Future research should involve breeding experiments focusing on pond densities and call variables in order to further understand the nature of mate choice among Houston toads.

863 Conservation Ecology

Building a predictive energy model for ocelots in Texas

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Ocelots (*Leopardus pardalis*) are an endangered felid that occur from southern Texas to Argentina. Rodents are a large part of ocelot diets across the species' range and small mammals (<10 kg, but typically <1 kg) comprise as much as 84% of ocelot diets, in addition to birds and herpetofauna. Studies also estimate that ocelots need to eat 558-837 g of animal tissue per day. In Texas, two important prey items are hispid cotton rats (*Sigmodon hispidus*) and Mexican spiny pocket mouse (*Liomys irroratus*). Their biomass averages 115 and 48 g, respectively. According to published estimates, Texas ocelots would need to consume 4-7 cotton rats or 11-17 pocket mice daily. No previous research has sought to determine the amount of energy available to an ocelot population. Our objective was to create a model to predict energy available to ocelots during drought and high rainfall. Rodent abundances were estimated using mark-recapture on a private ranch in Willacy County. These estimates were then compared over time to precipitation patterns. We will determine average caloric density using bomb calorimetry and ether extract for male and female, juvenile and adult, and reproductive and non-reproductive rodents. These energy values and abundance estimates will be used to create a predictive available energy model that will assist the planning of future ocelot translocations.

867 Conservation Ecology

Short-term effects of fire on juvenile amphibians in a southern USA pine forest

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Prescribed fire is a common tool used to conserve and manage the integrity of forest ecosystems. We investigated the short-term effects of fire (i.e., one prescribed burn and two wildfires) on juvenile amphibians in a southern USA pine forest. We surveyed amphibians and invertebrate predators before and after the fires during the summer of 2010. We tested for treatment (i.e., control, wildfire, or prescribed burn) and status (i.e., pre-burn or post-burn) differences in: (1) genus-level captures, (2) invertebrate predator abundance, and (3) amphibian health (inferred through a body condition index). *Bufo* and *Scaphiopus* survivorship (inferred through capture differences) increased in the prescribed burn treatment. Invertebrate predators showed a decreasing trend in the prescribed burn treatment, relative to the control and wildfire treatments. No differences in amphibian health were observed. The results indicate that prescribed fire could benefit amphibians not only through long-term habitat recovery, but also through short-term habitat changes.

P884 Conservation Ecology

The parthenogenetic marbled crayfish, *Marmorkrebs*, in Texas

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The southern United States is home to more crayfish species than anywhere else in the world, but almost half of them are at risk of decline or extinction. The introduction of non-indigenous crayfish often harms these endemic crayfish populations, as well as many other freshwater species. The marbled crayfish, *Marmorkrebs* (*Procambarus fallax* f. *virginialis*) poses a high risk of becoming an invasive species because it reproduces asexually: only one individual is needed to establish a population. *Marmorkrebs* are readily available through the pet trade (including an active online business in Flower Mound, Texas) and they are often promoted as live bait for fishing. We assessed whether *Marmorkrebs* could establish population in the natural ecosystems of Texas, modeling their potential distribution with maximum entropy approaches. We correlated *Marmorkrebs*' known geographic information with climatic data, extrapolating from the native distribution of the sexual form of the species (*P. fallax*), and the distribution of introduced *Marmorkrebs* populations in Europe and Madagascar. In all models, the coastal regions of Texas are predicted to be a suitable habitat for *Marmorkrebs*, with some models also predicting that large regions of southern Texas would be suitable habitats. That many exotic species have been released into the wild by pet owners and anglers suggests the need for measures to help keep *Marmorkrebs* contained to aquaria in Texas and other states.

948 Conservation Ecology

Seasonal and reproductive den site fidelity in the American hog-nosed skunk, *Conepatus leuconotus*, in Texas

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The American hog-nosed skunk, *Conepatus leuconotus*, is a medium-sized carnivore of the family Mephitidae. Though dens are essential components to the life history of most carnivores, the denning ecology of this species is relatively unknown. From March 2010 to November 2010, 14 radiocollared skunks (9 females, 5 males) were tracked a minimum of every three days to assess den site fidelity as part of an ongoing study of maternal den site use and behavior. Females with young might be expected to select and occupy dens differently than males or females without young. Of the nine females tracked, four had confirmed offspring at some point in the study; den sites from these skunks were considered maternal until August 15. Skunks were located 517 times to a total of 278 unique dens. Preliminary results suggest no significant difference in den site fidelity between males and females during the summer (1.68 and 1.65 days/unique den, respectively) or fall months (1.42 and 1.73 days/unique den, respectively), though females with young displayed nearly twice as much fidelity (3.32 days/unique) during summer. Additionally, maternal females showed an average of 3.00 days/unique den during the spring months. Further data collection is needed to develop a more substantial sample size and compare den site fidelity with males and nonreproductive females during spring.

P968 Conservation Ecology

Nest defense behavior by Carolina Wrens (*Thryothorus ludovicianus*) in an urban environment

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We tested the hypothesis that Carolina Wrens can discern between different nest predators that they may encounter in an urban environment. The study was conducted in residential yards in the city of Huntsville, Walker County, TX where domestic and feral cats are common. We compared responses of parent birds to mounts of a feral cat (*Felis catus*), a Texas rat snake (*Elaphe obsoleta lindheimeri*), and a cardboard box (control) placed near the nest during the nestling stage. Wrens emitted a variety of alarm calls towards mounts and spent more time close to nest predators than the control. Rasp alarm calls were given in response to both the cat and snake whereas cheer calls were given only toward the cat. The control received very little response. Preliminary findings indicate that Carolina Wrens in urban environments can distinguish between potential nest predators and may use different alarm calls accordingly.

P987 Conservation Ecology

Use of potential development and habitat suitability index maps to observe impacts on the red-cocked woodpecker (*Picoides borealis*) habitat areas near Big Thicket National Preserve, Texas

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We combined land-use (LU) change models and habitat suitability index (HSI) models to quantify the amount of potentially suitable habitats of red-cockaded woodpecker for various scenarios of hypothetical development. LU models are increasingly used to forecast conversion of vegetated land parcels to urban land cover. These models require varied information that range from physical structures, population density, to information on current land cover. In this paper, we describe the processes involved in creating variables that drive a LU model such as proximity to roads, population density and several land cover types. Geographic Information Systems (GIS) and remote sensing are useful tools in the construction of these variables. We combined these variables to find potential development probabilities for residential, commercial, industrial, as well as total probability of LU change. Then, we used HSI models to calculate the amount of suitable habitats available before and after the hypothetical developments have occurred. Our results indicate this method is useful to evaluate the effects of urbanization on wildlife habitat. This method could be even more effective when more data are available through the use of high resolution images and field work and when functions are validated empirically.

P1000 Conservation Ecology

Phylogenetic generalization of predators by the San Marcos salamander, *Eurycea nana*

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The introduction of novel predators into an environment has the potential to have detrimental consequences on prey species, especially if these species lack the ability to detect, recognize, and respond to these predators. One such species which may be negatively affected by introduced predators is the federally threatened San Marcos salamander, *Eurycea nana*. Previous research found that predator-naïve (captive hatched) salamanders showed decreased activity in response to the chemical cues of both a native fish predator (*Micropterus salmoides*) and an introduced fish predator (*Lepomis auritus*). Since there are native congeneric predators (*Lepomis* sp.) in the San Marcos River, it is possible that there are shared chemical cues among all *Lepomis* which elicit the antipredator response of naïve salamanders. We examined the antipredator response of predator-naïve salamanders to chemical cues from (1) a sympatric native *Lepomis* (*L. cyanellus*), (2) a sympatric non-native *Lepomis* (*L. auritus*), (3) an allopatric non-native *Lepomis* (*L. gibbosus*), (4) a sympatric non-native, non-Centrarchid cichlid (*Cichlasoma cyanoguttatum*), and (5) a blank water control to further understand predator recognition by *E. nana*. Analyses reveal that exposure to chemical cues from all fish predator treatments caused a reduction in salamander activity levels suggesting that *E. nana* may have innate recognition of certain predators and can potentially make generalizations about novel predators based on similarities to native predators.

1016 Conservation Ecology**Analyzing urine as a tool to understand interbreeding between wild red wolf (*Canis rufus*) females and wild coyote (*Canis latrans*) males**

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Red wolf (*Canis rufus*) once an indigenous species to Texas was classified as extinct in the wild in 1980. The remaining seventeen animals were captured in East Texas and Louisiana from which fourteen were initiated into a captive breeding program. The program has successfully reintroduced a small contingent of 100 animals into the Alligator River National Wildlife Refuge in North Carolina changing the status of wild red wolves from extinct to critically endangered. One of the most significant problems facing wildlife managers in the restoration of this critically endangered species is the interbreeding of wild red wolf females with wild coyote (*Canis latrans*) males. We propose that in isolating and comparing chemical constituents from urine samples of both red wolves and coyotes that we may provide insight into possible similarities that trigger the reproductive inbreeding behavior. In addition, further behavioral studies involving the chemical constituents could provide useful information for the development of additional management tools to ensure the integrity of the breeding program

P1023 Conservation Ecology**Preliminary population estimates, habitat selection and gut content analysis of the endangered Clear Creek Gambusia (*Gambusia heterochir*)**

Raelynn Deaton*, Pete Diaz, Richard Lewis, Catherine Mason and Mike Montagne, Department of Biological Sciences, Sam Houston State University

The Clear Creek gambusia, *Gambusia heterochir*, is a small livebearing fish (family Poeciliidae) endemic to the headwaters of the San Saba River, Texas and known only to one spring (Clear Creek) near Menard, Texas. Hubbs (1957) postulated that *G. heterochir* may have inhabited other areas but was outcompeted by its native congener *Gambusia affinis*. As a result, *G. heterochir* was listed as endangered in 1966. Known threats (e.g. habitat destruction and potential hybridization with *G. affinis*) coupled with stochastic (or random) events make this organism highly susceptible to extinction. In 1982, US Fish and Wildlife Service formulated a recovery plan for "securing the survival" of *G. heterochir*, which called for regular monitoring of the spring. Since that time, Hubbs (2001), monitored population densities of *G. heterochir* and measured spring habitat parameters and water quality. However, these data were based on relative abundance and were not true population estimates. Until this study, no population estimates have been made for *G. heterochir* and moreover, much of the data on relative abundance of *G. heterochir* and habitat parameters remain unpublished. Here we present data from preliminary population estimates from spring 2010. On 14 May, we conducted a population estimate of the upper pool using depletion sampling with minnow traps. We collected and released 2,385 individuals in this process. Additionally, we identified primarily *G. heterochir* and a few *G. affinis* in the head pool with no apparent hybrids. Finally, we quantified microhabitats and gut contents of *G. heterochir*. Further analyses are currently being performed and will be presented here. With these data, a true population viability analysis can be conducted to provide minimum population numbers necessary for long-term survival of *G. heterochir*.

P1024 Conservation Ecology**Potential behavioral reproductive isolation between two sympatric livebearing fishes in Texas: The endangered Pecos *Gambusia (Gambusia nobilis)* and the invasive Largespring *Gambusia (Gambusia geiseri)***

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Hybridization is of major concern for conservation of endangered species because, despite decreases in fitness (e.g. hybrid sterility), many vertebrates (especially fishes) do hybridize with closely related species. There are several documented cases of hybridization in livebearing fishes (family Poeciliidae) as some species are sympatric. Further, several livebearers are either invasive or endangered, providing an ideal system to test for reproductive isolation. The largespring gambusia (invasive) and Pecos gambusia (endangered) coexist in the San Solomon Cienega in west Texas. Research suggests that the invasive may gradually be replacing the endangered species in the cienega, a cause for concern because this is one of the few remaining habitats for the Pecos gambusia. While no solid evidence of hybridization is reported, recent field observations suggest a possible cross, as Pecos gambusia males were observed mating with largespring gambusia females. In addition, some individuals in the cienega share morphological features of both species, suggesting hybridization might be occurring. Therefore, testing for potential behavioral reproductive isolation in this system is important at this time. Here we present data from four behavioral experiments testing association preferences of each *Gambusia* species (both males and females) using a dichotomous choice experimental design. This design gives indirect insight into both mating and shoaling preferences. Preliminary analyses suggest no differences in association preferences for female or males of either species, suggesting a lack of discrimination. If

further analyses are consistent with this pattern, our results will support the potential for hybridization of these two species, which may result in additional conservation management of the endangered Pecos gambusia

P1027 Conservation Ecology

An update on the current status of the endangered Pecos gambusia (*Gambusia nobilis*) and Comanche Springs pupfish (*Cyprinodon elegans*) in Phantom Spring, Texas

Richard H. Lewis*, Nathan Allen, Stacy B. Stoops, Gary P. Garret, Christopher W. Kroll, Janalyn West, and Raelynn Deaton, Sam Houston State University

Springs of the desert southwest are home to many endemics, including the Pecos gambusia (*Gambusia nobilis*) and the Comanche Springs pupfish (*Cyprinodon elegans*). Both fishes inhabit the Phantom Springs complex in west Texas and are federally listed as endangered. Historically, several of the springs within this complex were dried due to irrigation. However, efforts were made to restore some of springs and preserve the organisms inhabiting them. Both *G. nobilis* and *C. elegans* inhabit the headwaters of this complex, Phantom Cave. Until recently, this spring and the two endangered fishes inhabiting it have not been monitored regularly. Therefore, it was our goal to census both species over two seasons in 2010 (spring and summer) to update their current status within Phantom Cave. We also sought to determine whether the introduced *Gambusia geisleri* was present in the spring. Finally, we provide habitat parameters for the spring and its adjacent canal. Here, we present data from our first full census with the intent to provide immediate information on these two species and the spring that will compliment a long term monitoring program

P1028 Conservation Ecology

Food web structure and potential community-level interactions in a reconstructed desert wetland, San Solomon Ciénega, Balmorhea State Park, Texas

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In an attempt to conserve two endangered fishes (*Cyprinodon elegans* and *Gambusia nobilis*), the Texas Parks and Wildlife Department (TPWD) restored a critical desert wetland habitat by creating the San Solomon Ciénega at Balmorhea State Park in 1996. This re-creation of a desert wetland habitat within the boundaries of the original, natural ciénega provided critical habitat necessary for survival of desert wetland biota. As a result, the native fish fauna, including *Cyprinodon elegans* and *Gambusia nobilis*, have flourished, and this location now provides a natural habitat with the largest known concentration of these taxa. It is believed that the primary benefit of the San Solomon Ciénega to the survival of these endangered fishes is the creation of a "natural" habitat with viable ecosystem-level processes that promote population stability. However, there have been no concerted efforts to document the community and ecosystem dynamics of this system. Herein, we describe seasonal gut content and stable isotope data for the fish community in San Solomon Ciénega. In general, food resources for the fishes in these ciénega are relatively consistent across season. Algae, is an important food resource for *C. elegans*. Both *G. nobilis* and *G. geisleri* (an invasive) are linked to terrestrial and aquatic invertebrates. These two species have high diet overlap and are likely to compete for limiting food in these systems. *Astyanax mexicanus* (also invasive) is largely predatory feeding on aquatic and terrestrial invertebrates. These species also play an important role in limiting abundance of native fishes through predation or competition

P1029 Conservation Ecology

Population dynamics of *Gambusia nobilis* and *Cyprinodon elegans* in San Solomon Ciénega, Balmorhea State Park, Texas

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Historically, Comanche Springs pupfish (*Cyprinodon elegans*) and Pecos gambusia (*Gambusia nobilis*) inhabited two large desert wetland (ciénega) systems in West Texas. However, human alteration of these systems for agricultural irrigation destroyed the associated wetland habitats, and endangered the persistence of Comanche Springs pupfish and Pecos gambusia. In an attempt to conserve these endangered fish species, the Texas Parks and Wildlife Department (TPWD) restored a critical desert wetland habitat by creating the San Solomon Ciénega at Balmorhea State Park in 1996 through a cooperative effort among private, state, and federal entities. As a result of this action the Comanche Springs pupfish and Pecos gambusia, have flourished in this location. In Fall 2009, TPWD created a second ciénega at Balmorhea State Park by replacing the small, refuge canal with a new 'natural' wetland habitat. Here we will report on seasonal monitoring efforts to document the establishment and development of *C. elegans* and *G. nobilis* populations in this new ciénega. We compare the population dynamics of these fishes in the new ciénega to the dynamics of these populations in the established ciénega. In general, seasonal populations in the established ciénega have been relatively stable since Spring 2008. Populations in the new ciénega were extremely low during Winter '09 and Spring '10 following immediate creation of the wetland. However, by Summer '10, populations of both species increased by an order of magnitude and reflect densities in the established ciénega habitat.

672 Environmental Science

The effects of carbon dioxide and air pollution on milkweed species (*Asclepiadaceae*) and monarch butterfly larvae and adults (*Danaus plexippus*)

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In the greenhouse and in the field, the effects of carbon dioxide and air pollutants on the growth of three species of milkweed (*Asclepiadaceae*) and monarch butterfly larvae and adults (*Danaus plexippus*) will be examined. Plants will be grown under ambient or elevated carbon dioxide levels for eight weeks and various growth parameters measured. Larvae will be given a choice of plants grown at both carbon dioxide levels and feeding preference determined. The larvae will be raised to adulthood on leaf material from plants in each treatment level, and changes in weight, length of instar stages and mortality noted. Leaf tissue will be analyzed for chemical changes across carbon dioxide levels. In the field, milkweed plants at two sites will be examined, one site with consistently high levels of air pollutants, and the other site with consistently normal or lower levels of air pollutants and various growth parameters measured. Natural monarch butterfly larvae populations will be monitored for mortality and a sample will be taken for determining feeding preference between field site plants. The hypothesis is plants exposed to higher levels of carbon dioxide will show poor performance as related to growth, and have lower overall

mass. Chemical changes will make these plants a less suitable host plant for monarch butterfly larva; larva will perform poorly on them, and show less health and higher mortality. For field experiments, it is proposed to see the same trends in plants grown in areas of consistently higher air pollution.

P711 **Environmental Science**

Isolation and characterization of arsenic-tolerant and arsenic-oxidizing bacteria from the Laguna Madre

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The Laguna Madre is a rare, hypersaline estuary which serves as the habitat of many species. Several anthropogenic chemicals may be present in the Laguna Madre due to agricultural runoff, illegal disposal and other inputs. Arsenic, which was historically used as a pesticide, is of concern along the US-Mexico border. Our goal was to examine interactions between Laguna Madre microorganisms and arsenic. Arsenic-oxidizing bacteria can transform arsenite (As III) to arsenate (As V), a less mobile form of arsenic. We sought to isolate potential arsenic-oxidizing bacteria from sediments in the Laguna Madre by first determining whether bacteria had a high tolerance for arsenite and then characterizing the organisms. Sediment samples from eight sites in the Laguna Madre were cultured on synthetic media with 100 μM arsenite. Densities of arsenite-tolerant bacteria at each site were determined and bacterial isolates were gram-stained, tested for the enzyme catalase and profiled using API 20E[®] test strips. Bacterial isolates were also tested for arsenite tolerance at different concentrations. Results showed that densities of arsenite-tolerant organisms ranged from 8,250 to 2,455,000 cfu g^{-1} of wet sediment. Random isolates (n=49) were found to be gram negative, catalase-positive rods but displayed several color morphologies when grown on agar plates. Results of the API 20E[®] assays showed that the isolates were >95% similar; most had identical phenotypes. Cultures have been grown in the presence of up to 600 μM As(III). We are currently testing a permanganate screening technique to qualitatively determine whether the bacteria are oxidizing As(III) to As(V).

712 **Environmental Science**

Comparison of the soil chemistry and the microbial communities in the rhizospheres of native and non-native grasses of the lower Rio Grande valley

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Native grasses of the Rio Grande Valley have been deleteriously affected by the rapid spread of introduced grass species. Non-native grasses can alter the chemical and microbial compositions of invaded soils; however, the effects of such changes on native plants have not been studied in depth. This study investigates microbial community variation among native and non-native grasses. It is hypothesized that rhizospheres of non-native grasses support a higher density of microbial growth and that microbial communities of invasive plants are better able to exploit a variety of carbon sources compared to microbial communities of native plants. Consequently, invasion-induced changes in soil chemistry and biota contribute to increased competitiveness of non-native species. To test this, samples of three native grasses, four non-native grasses, and soil from their respective rhizospheres were obtained from Las Palomas Wildlife Management Area in Arroyo City, TX. Colony counts revealed that non-native grasses had a significantly higher bacterial colony density in their soil than native grasses (ANOVA $F_{1,5}=19.055$, $p<.001$). EcoPlate[™] nutrient utilization assays showed that microbial communities from non-native plant soils had significantly higher total activity (ANOVA $F_{1,5}=11.021$, $p<.021$) and number of substrates utilized (ANOVA $F_{1,5}=7.601$, $p<.040$) compared to native plants soils. Soils were tested for fourteen chemical constituents; only pH was significantly different (ANOVA $F_{1,5}=8.929$, $p<.031$) between native and non-native grasses. Future studies with transplants of non-native grasses to native soils will determine if soil chemistry is modified. Microbes from native and non-native soils will be tested for inhibitory properties against each other.

734 **Environmental Science**

Potential distribution of *Cactoblastis cactorum* to south Texas and northern Mexico

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The arrival of *Cactoblastis cactorum* in Florida and its steady spread to other southeastern states in the US has raised concerns over the potential damage it may inflict on native *Opuntia* if it were to reach south Texas and northern Mexico. *Opuntia* is a major crop in these areas and is used for human consumption as well as forage for livestock. Thus, in addition to the ecological problem, the spread of *C. cactorum* would likely lead to devastating economic problems. Along with dramatic climatic changes occurring in these regions, a rapid spread of *C. cactorum* to lands in which *Opuntia* flourishes is something that must be prevented. With the help of bioclimatic mapping through MaxEnt and the Geographical Information System ArcMap, we can predict the potential distributions of *C. cactorum* and determine the factors which enable its spread. Maps created by these programs portray invasive routes which *C. cactorum* is most likely to follow in the near future, as well as those which it is likely to follow in twenty and fifty years, respectively, from present. By utilizing variables such as temperature and precipitation, we established a prediction on whether global warming will contribute to the spread of *C. cactorum*. This research will provide timely information for efforts being developed to prevent wide scale damage to *Opuntia* resources in Texas and Mexico.

P742 **Environmental Science**

The impact of urbanization on day hiker personal and natural experience in central Texas

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Fifteen college students in their early 20s participated in 97 day hikes, oriented toward either: 1) a geographic goal, 2) nature study, or 3) meditation, in either an urban or more natural wooded or wetland environment in central Texas. Subjects responded to statements using a 1 to 5 scale assessing personal, natural, and spiritual experience. Kruskal-Wallis tests (SPSS 17.0), found only 1 of 11 personal experience statements was significantly influenced by type of hike ($p=.05$), while 4 of 11 were significantly influenced by urban versus natural settings. Type of hike significantly influenced 5 of 10 statements concerning experience with nature, and the natural context influenced 9 of 10 including learning experience about nature. Type of hike significantly influenced responses to 9 of 10 statements concerning spiritual experience, while the natural context only significantly influenced 1 of 10. Type of hike did not affect whether the natural environment on the hike was pleasing ($p=.30$), the hike inspired hikers to think about responsibilities to care for the environment ($p=.175$), the hike relieved stress ($p=.33$), hikers felt a sense of accomplishment ($p=.37$), or they considered the hike to be fun ($p=.82$). Urbanization of the

hiking environment did not affect self-reported learning concerning human damage to the environment ($p=.16$), the level of stress relief ($p=.26$), or time spent reflecting on personal relationships ($p=.44$). While the natural settings were superior for most forms of environmental learning, the differences in environmental context were more equivocal concerning self-reflection and actualization.

751 **Environmental Science**

Characterization of nutrient load in the Arroyo Colorado and drains

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The Arroyo Colorado (AC) is a highly eutrophic waterway that drains into the Lower Laguna Madre (LLM), a shallow marine ecosystem that supports extensive seagrass meadows. Nutrients, particularly nitrogen and phosphorus, in the AC increase nutrient levels in the LLM and thereby can affect the LLM ecosystem and particularly the seagrass community. One goal of our study was to characterize the nutrient regimes of the drains of a segment of the AC. Thirteen AC drains and three bridge points were sampled monthly during drought and normal conditions over one year. Quarterly data are presented for ammonium (NH_4^+), nitrate (NO_3^-) / nitrite (NO_2^-), and phosphate (PO_4^{3-}). Selected seston samples were analyzed for δN isotopes and will be utilized to trace nitrogen to characterize the source(s). Ammonium levels ranged from 0.10 μM to 56.70 μM and were especially high at an agricultural drain during the spring and a sewage treatment plant during the summer. Nitrate levels ranged from 1.31 μM to 1358.23 μM but were especially high at a golf course drain during the winter and an agricultural drain during the fall, winter, and spring. Phosphate levels ranged from 1.31 μM to 74.72 μM but were especially high at an agricultural drain during the fall and the winter. Limited N isotope data indicated sewage and ammonium fertilizer were major N sources. Overall, the AC had very high nitrate levels and moderate to high ammonium and phosphate levels. These nutrients enter the tidal portion of the AC where significant algal abundance and problematic levels of dissolved oxygen have been noted.

P766 **Environmental Science**

Global climatic change and the spread of buffelgrass in the northern USA

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Invasive species represent a growing threat to biodiversity. Global climate change is expected to expand the ranges of tropical, exotic species in south Texas, thereby increasing the risk and scope of ecosystem disturbance. Once species are introduced, they become difficult to eradicate, and thus predicting how climate changes will affect biological invasions is a major challenge to land management and conservation planning. Here we developed models of distribution for *Pennisetum ciliare*, a tropical African invasive species known as buffelgrass, in the southern U.S. We created models of potential distributions for this species using 19 different climatic variables and different scenarios of global climate change. Our findings indicate that *P. ciliare* is likely to expand its distribution to the northern part of the USA. However, the species is expected to retreat from areas where it is currently distributed. These predictions will allow opportunities for the planning of future species eradication and vegetation restoration projects.

767 **Environmental Science**

Spread of Chagas disease in North America due to climatic change

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Chagas disease is an important parasitic disease caused by the flagellate protozoan *Trypanosoma cruzi*, bringing great distress to the public health field in the Americas. *T. cruzi* is known for utilizing *Triatominae* insects (kissing bugs) as vectors in areas with tropical humid habitat. In this study, the potential consequences of climate change on the distribution of Chagas disease vectors was analyzed by the creation of models for the prediction of the potential distribution under different climate scenarios for México and south Texas in the present and future (50 years from present). Present and future distributions of six vector species (*T. barberi*, *T. dimidiata*, *T. gerstaeckeri*, *T. longipennis*, *T. mexicana*, and *T. pallidipennis*) were estimated using projected climate change scenarios incorporating 19 climatic variables in MaxEnt software. Each model showed a noticeable change in the distribution of the vectors with a northward shift of vector distribution by 2050. *T. gerstaeckeri*, the most important vector for Chagas disease in this region, demonstrated the most drastic change in future geographic location since the predicted area of distribution included most of the state of Texas.

P770 **Environmental Science**

Biological activity of essential oils against *Caenorhabditis elegans*

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Essential oils are natural plant volatile compounds mainly mono- and sesquiterpenoids, phenylpropanoids, etc. They possess various biological activities, the toxicological or biochemical testing of an essential oil will always be the sum of its constituents which either act in a synergistic or in an antagonistic way with one another. The nematode *C. elegans* has become widely used as a model organism, because it is easy to maintain in Petri dishes grown on agar media and feed on *E. coli*, it is a hermaphrodite with very short life. The toxicity of 34 individual essential oil constituents (monoterpenoid hydrocarbons, monoterpenoid alcohols, monoterpenoid ketones, monoterpenoid phenols, and few others) was investigated using *C. elegans*. Each constituent was dissolved in DMSO, and added to about 2000 stages of *C. elegans* in M9 buffer solution with 50 ppm as the final concentration of each oil. Each treatment was replicated four times, using 24 well plates. Treatment with DMSO only served as control. Toxicity of each terpene expressed as the mortality of *C. elegans* was determined after 24 hours. The toxicity of the tested essential oils varied tremendously, some caused very high mortality such as Thymol 89%, α -Terpinene, and Pseudoionone 87%, Geraniol 81%, limonene 80%, nerolidol 74% and the sesquiterpenoid Farnesol 77%. Other tested chemicals were either not toxic or exhibited low toxicity such as citronellal acid caused 6% mortality, and α -pinene 13%. Tested chemicals showing more than 50% mortality were further tested at series of different concentrations and IC_{50} was determined.

771 **Environmental Science**

The effects of climate change on distribution of the invasive grass *Panicum maximum*

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Panicum maximum, an African plant species commonly known as 'Guinea grass,' has been identified as an invasive species in southern portions of the United States and in tropical regions around the world. Global climate change will likely cause this invasive grass to recede from some areas of its present distribution and expand in others. We modeled *P. maximum* potential distribution in 10 and 40 years from present, correlating its geographic distribution with 19 climatic variables and different climate change scenarios following the Intergovernmental Panel on Climate Change (IPCC). Results show that the species is likely to expand its distribution in North America. However, a retreat in some currently invaded areas is also likely to occur. These findings provide an opportunity to identify areas for ecological restoration. Further work is encouraged in selecting species for restoration efforts in these areas.

P808 Environmental Science

Survey of heavy metal and metalloid content of the seagrass *Thalassia testudinum* in the Lower Laguna Madre of Texas

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Turtle grass (*Thalassia testudinum*) is a predominant seagrass located in the hypersaline lagoon of the Lower Laguna Madre of Texas. This is a rare ecosystem and the seagrass provides the basis for food and shelter for organisms inhabiting the Laguna Madre. Contamination of this ecosystem by heavy metals and metalloids poses a threat to the seagrasses and other organisms present in the Laguna Madre. Seagrasses make an ideal indicator species for the monitoring of contamination in the Laguna Madre. Through the analysis of *T. testudinum* for heavy metals and metalloids, the environment can be monitored for the presence of these contaminants. Seagrass samples were taken from the site ABC in the years from 2004 to 2010 and assayed via Atomic Absorption Spectroscopy (AAS) and/or Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) to determine the content of heavy metals and metalloids present in the seagrass. Additionally a transect of sites from the Arroyo Colorado to South Bay were made and seagrass collected from these sites were analyzed for heavy metals and metalloids to determine distribution of the elements in seagrass present throughout the Laguna Madre. AAS and ICP-AES analysis of the seagrass samples indicated that arsenic cycled up and down in the seagrass leaves during the 2004-2010 time period. Other metals (Cu, Zn, Ni, Mn, Fe) also showed similar cycling trends. Therefore, the monitoring of the Laguna Madre for high levels of heavy metals and metalloids is a valuable indicator of the overall health of the ecosystem.

P810 Environmental Science

Exploration of the mechanisms of copper tolerance in *Mimulus guttatus* var. *Copperopolis*

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In plants, copper plays a vital role in both photosynthetic and respiratory electron transport, and it functions as a cofactor in a variety of enzymatic reactions. The redox-active nature of the copper ion is crucial to its function in both rapid cycling plastidic electron carriers, such as plastocyanin, and high energy enzyme catalysts such as ascorbate oxidase and the copper amine oxidases. While the redox activity of copper makes it an ideal cofactor in cellular energy transfer functions, it also gives the ion the potential to cause tremendous oxidative damage if intracellular concentrations become too high. Free radical hydroxyls formed by the Fenton reaction can cause membrane lipid peroxidation and protein denaturation. In addition, excess copper can displace other divalent cations coordinated with macromolecules causing their inactivation or malfunction. An elucidation of the mechanisms of copper toxicity and tolerance is needed to understand how copper accumulation and toxicity in plant tissues affects plant physiology. The copper tolerance mechanisms of two varieties of the plant *Mimulus guttatus* (Yellow Monkey Flower) were compared and contrasted. One variety, *M. guttatus* var. *Copperopolis* is known to be tolerant to copper, while a closely related variety, *M. guttatus* var. *Arboretum* is sensitive to copper toxicity. Increased tolerance to copper accumulation and increased resistance to oxidative stress are two copper tolerance mechanisms that were examined. Copper treatment causes stress in both *M. guttatus* varieties, however, the *Copperopolis* variety was able to tolerate copper induced oxidative stress much more than the *Arboretum* variety.

P811 Environmental Science

Investigating heavy metal accumulation and oxidative stress tolerance of non-accumulators and hyperaccumulators in the *Brassicaceae* plant family

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The heavy metal elements (Cd, Cu, Pb, Ni and Zn) are the most common metal pollutants introduced into the environment. Heavy metals can cause toxicity to plants via several mechanisms including the generation of reactive oxygen intermediates (ROIs). However, a subset of plants exists that can tolerate heavy metal rich environments. These plant species are known as hyperaccumulators. One possible mechanism to tolerate heavy metal toxicity is the increased resistance 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 twelve days. Physiological and enzymatic analysis indicated that the non-accumulator *A. thaliana* showed an oxidative stress response in all assays except for protein carbonylation. Other non-accumulator plant species also showed a significant difference in oxidative stress response in the TBARS assay; however, for some assays no stress response was evident. The hyperaccumulator plant species showed no significant difference in oxidative stress as indicated by the all of the assays with the exception of *T. montanum* var. *montanum* which showed an increase in the SOD assay. Basal catalase enzyme activity was notably higher in the hyperaccumulators *T. montanum* var. *montanum* and *T. montanum* var. *siskiyouense* as compared to the non-accumulator *A. thaliana*. Results of the oxidative stress assays were also compared to the levels of nickel present in the various plant species. These experiments show that hyperaccumulators may have additional mechanisms that allow them to resist to oxidative stress more effectively than non-accumulators.

836 Environmental Science

Bio-assessment of human health from chronic metal exposure in the urban environment

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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 would serve as an indicator of metal exposure due to environmental risk factors and/or dietary habits. The correlated data will provide valuable information as to what urban factors pose significant risk of trace metals exposures. Secondly, a determination of metal exposure will be studied *in vitro* with human fetal osteoblast (hFOB) cells to determine the metal toxicities to human bone structures. The primary focus of this study is to correlate trace metals exposures of urban children with the urban environmental risk factors to utilize valuable human bioindicators from potential environmental risks of the urban environment. The second objective of this study is to determine effects of metals on hFOB cells such as proliferation, viability, cytotoxicity and functional specialization in comparison to the control. Thus far, deciduous and adult teeth were gathered from a variety of dental offices located in Austin, Texas, and were cataloged and analyzed by Inductively Coupled Plasma Mass Spectrometer. Traces levels of titanium, iron, germanium, platinum, zinc and magnesium ranged from 10ppb- 10,000ppb. Ultra traces levels of lead, arsenic, nickel, copper, chromium, manganese, and uranium ranged from 0.001ppb- 9ppb. In the *in vitro* study exposure of 5 ug/L of $PbSO_4$ and TiO_2 had little effects on cell viability from 0- 96hrs post exposure, but higher dose greater than 200ug/mL showed reduction in cell viability between 24-72hrs post exposure. Further tests and assays with comparable lab standards are needed to support these findings.

837 Environmental Science

Assessment of environmental estrogens in the Galveston Bay Watershed

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Given the number of pharmaceuticals, steroids, and other organic compounds that make their way into wastewater, there is great concern about how well wastewater effluent from treatment plants is decontaminated before it is returned to 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 concentration of EEs in the Lower Galveston Bay Watershed, specifically the 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 poses a significant ecological concern to Galveston Bay ecosystems. The second research objective was to assess the potential impact of the EEs discovered in 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.

843 Environmental Science

Global warming and the spread of dengue in south Texas

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Dengue has become a major subtropical disease in all parts of the world, effecting approximately 2.5 million people. Dengue is a mosquito born infection and can be transmitted from mosquitos to humans. While vectors include *Aedes aegypti* and *Aedes albopictus*, only the former is typically viewed with greater importance in terms of transmission to humans. Dengue is a deadly disease because it does not have a corresponding vaccine or specific treatment and has dramatically increased in frequency within the last few decades. A primary concern with dengue and its vectors is that global warming will lead to an increase in its distribution, colonizing in areas such as South Texas due to climatic changes. We used a maximum entropy algorithm and fifteen variables such as annual mean temperature, mean diurnal range, precipitation warmest month, along with four other parameters (elevation, slope, aspect, and compound topographic index) to predict where dengue will be able to spread successfully by the year 2050. Our findings show that dengue will continue to spread from Mexico into South Texas and other subtropical regions. Our results will guide health practitioners in making the public aware of precautions they can take to prevent dengue infection.

888 Environmental Science

Activation of pro-inflammatory transcription factor by modeled microgravity and high-energy particle radiation

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During space flight, astronauts must endure several conditions when outside the earth's atmosphere including microgravity and space radiation. There are several physiological effects resulting from microgravity and space radiation exposure including changes that result in oxidative stress in the body. Prolonged exposure to a microgravity environment may cause weight-loss, muscle atrophy, as well as bone demineralization. The microgravity environment experienced during space travel can also modulate the activation of transcription factors that regulate gene expression. Space radiation that comprises of high-energy particle radiation is known to induce carcinogenesis. Based on the limited knowledge about the hazards associated with microgravity and high-energy radiation, it is important to research the possible effects and pathways affected by exposure to these stress factors. In this study, we have demonstrated that microgravity and high-energy radiation exposure induced the activation of pro-inflammatory transcription factor.

P894 Environmental Science

Effect of simulated microgravity on the nematode *Caenorhabditis elegans*

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Model organisms have proven very useful in understanding the biological effects of the space environment. *Caenorhabditis elegans* has several advantages for biological studies in space: it is small, requiring little space; it is a self-fertilizing hermaphrodite can live and reproduce in a defined liquid or agar media. Liquid cultures of *C. elegans* are established in the laboratory using the S medium and *E. coli* as source of food. *C. elegans* in liquid cultures were exposed to simulated microgravity using the NASA recommended High Aspect Ratio Vessel (HARV) for different time intervals. The initial and final populations of *C. elegans* (all developmental stages) were determined prior and after the exposure as well as those of the control. Morphology and the morphometrics for each developmental stage (adults, L4, L3, L2, and L1) were studied using the light microscope. Several early life stages as first and second-stage larvae have been isolated and grown on agar medium to study their reproductive potential individually, and to follow their life span (longevity). Results shows that simulated microgravity affects both the reproduction and the growth of *C. elegans*. Reproduction was reduced in the populations exposed to simulated microgravity. The preliminary morphometrics studies and the microscopic investigation revealed that the growth and body measurements were reduced and that the functions of the digestive system were impaired in those exposed to HARV for 16 days. The toxicity of several essential oils from plants was investigated for possible use as antioxidants to counteract the effect of simulated microgravity.

912 Environmental Science

Assay of the *mer* operon as an indicator of bioavailable mercury in marine environments

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Mercury resistant bacteria have adapted to the presence of mercury by evolving enzymatic activity to reduce Hg(II) to Hg(0) (via the *merA* gene) or by the methylation/demethylation of mercury (via the *merB* gene). The presence and bioavailability of mercury in the sediments of marine environments is studied utilizing a genetic approach. Because the *mer* operon is encoded on a transposable element, it was hypothesized that only naturally selected bacteria would carry the *mer* genes, and, further, that the *merA* and *merB* genes would only be expressed in the presence of bioavailable mercury. *merA* and *B* specific primers were used to amplify DNA fragments from sediment cores collected from Lavaca Bay, TX, a site of known contamination, as well as from sites of unknown contamination (East Flats, Laguna Madre and Oso Bay). Surprisingly, *merA* and *merB* amplicons were obtained from some samples from all locations. Sequencing of *merB* amplicons from Lavaca Bay confirmed the identity of the gene. Because the *merB* gene is only present in conjunction with the *merA* gene, these results also validate the previous detection of the *merA* gene. The presence of *mer* genes does not necessarily indicate gene expression; therefore, reverse transcriptase polymerase chain reaction (RT-PCR) will be employed to verify gene expression and thus the bioavailability of mercury.

P917 Environmental Science

Physiological and developmental effects of coal-tar pavement sealant on two freshwater organisms

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According to previous findings, coal-tar sealant is detrimental to macroinvertebrate freshwater organisms on many physiological and developmental levels and thus poses a threat to freshwater ecosystems in urban areas—areas already threatened by many other environmental factors and pollutants. A small-scale microcosm study was set up in the summer of 2010 over the course of 8 days to test the effects of coal-tar based pavement sealant on the development of the fresh water crustacean, *Daphnia magna*, as well as the common fresh-water plant, *Elodea* spp. The study was conducted in the laboratory with replicates (n=8) exposed to three levels of coal-tar based pavement sealant and a control. The coal-tar pavement sealant treatments nominally delivered 3, 30, or 300 mg/kg total PAH (16 parent PAHs). The assessed endpoints included growth of both organisms, the phototactic response in *D. magna*, and the chlorophyll concentration in *Elodea* spp. Growth in *Elodea* spp. showed no difference over the exposure period; chlorophyll concentration showed a significant difference between the high exposure and the control ($P < 0.10$), and there were no differences in *D. magna* growth between the control, low and medium exposures. All *D. magna* in the high exposure treatment died within 72 hours of beginning the experiment. The coal-tar based pavement sealant used in this experiment produced PAH concentrations that are environmentally relevant to PAH concentrations found in urban areas. These data indicate that coal-tar sealant may have adverse effects on both plants and invertebrates in freshwater ecosystems and that further assessment of coal-tar sealant effects should be performed.

P946 Environmental Science

Southeast Texas water district GPS mapping

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In May of 2010, Lamar University began working on a project for the Columbia Regional Geospatial Service Center (CRGSC), on behalf of the Texas Commission on Environmental Quality (TCEQ), to gather GPS information along with point attributes of public water plant facilities for each water district that has a specified range of customers to better prepare TCEQ in the case of an emergency. Facility locations included water storage tanks, water treatment plants, power sources, and water testing locations. Attributes of each facility were also recorded on the GPS, including type of tank, capacity, type of power sources, and water treatment types. An office position was established to contact the assigned water districts, make appointments and answer questions. The other two team members then traveled to each water plant as appointed to collect data. The data was collected using a Trimble GeoXT handheld GPS device running Arcpad. As feature points and attributes were collected, they were imported into Arcmap so that interactive maps of the facilities could be created and attributes of the plant facilities could be viewed simply by clicking on them. With this capability, in case emergency water restoration is needed, TCEQ can easily see where the downed plant is located, and exactly what equipment is needed to restore clean water without having to travel to the site first. They can also prepare for an impending disaster such as a hurricane by knowing how many facilities could be affected and what would be needed to bring them on line.

949 Environmental Science

Relationship between foliar concentrations of arsenic and spectral reflectance by foliage of common sunflower, *Helianthus annuus*

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Research was conducted to evaluate the relationship between foliar concentrations of arsenic (As) and spectral reflectance by foliage of common sunflower, *Helianthus annuus*. Sunflower plants were exposed to selected levels of As V (arsenate) in hydroponic solution (0, 5.0, 7.5 and 10 ppm) under laboratory conditions, and spectral reflectance of visible and near-infrared wavelengths (400-700 and 700-1100 nm, respectively) by sunflower foliage was recorded at weekly intervals from the time treatments began to 3-5 weeks post-treatment. Results indicated 1) a significant direct relationship between levels of As exposure and As concentrations in sunflower foliage ($P < 0.001$), 2) no appreciable effects of As accumulation on reflectance of visible (blue, green and red) wavelengths, and 3) a significant inverse relationship between As concentrations in foliage and reflectance of near-infrared wavelengths ($P < 0.001$). These results indicate that arsenic accumulation by sunflower is associated with one or more physiological changes that alter spectral reflectance by foliage of affected plants (particularly NIR which is not detectable by the human visual system), and that such changes in reflectance may facilitate the use of *H. annuus* as an "indicator" of As contamination of topsoil.

P956 **Environmental Science**

Resource management within a natural preserve located in an urban environment: A GIS approach

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During the past several years, students of the University of Texas - Pan American have participated in the development of a Geographic Information System (GIS) for the Frontera Audubon Thicket, a 5-ha nature preserve located in Weslaco, TX. A base map for the GIS was developed from a 1:5000 scale aerial color-infrared (CIR) photograph acquired by the USDA Agricultural Research Service during 2008. The CIR photograph was scanned to provide a spatial resolution of 1.0-m and was georeferenced to a standard coordinate system (NAD83 UTM Z14N) using ground control points acquired with a mapping-grade GPS receiver with submeter accuracy. A supervised classification of the waveband layers included in the CIR image (green, red and near-infrared) was used to develop a thematic vegetation map that was draped over a digital elevation model developed from survey-grade GPS elevation measurements with centimeter-level accuracy. The GIS provides the means to 1) assess the spatial distribution of native and invasive plant species within the preserve, 2) evaluate the effectiveness of various resource management strategies, 3) identify areas prone to poor drainage or flooding due to topography, and 4) locate points of interest along trail routes which visitors should be able to navigate to using inexpensive handheld GPS receivers. In addition to its aforementioned uses, the Frontera GIS provides a powerful educational tool through which local high school and university students can gain practical experience in the use of GIS technologies which are becoming increasingly important in modern society.

P975 **Environmental Science**

The effect of the mollusk *Corbicula fluminea* and the plant *Lemna minor* on the survivability of *Escherichia coli* in fresh water sediment

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Water quality in recreational waters is increasingly problematic. There has been an increase in the number of beach closures due to fecal bacterial contamination. *Escherichia coli* is one of the most common fecal bacteria and is used as an indication of possible sewage contamination. Understanding the dynamics of an ecological system which has experienced recent sewage exposure is difficult due to the many potential factors that could determine survival rates of the bacteria, including: rainfall, available biomass, temperature, and mechanical disturbance of sediment. Not much is known about the effects of individual organisms on fecal bacteria survival. This research examines the effects of the presence of two species, *Corbicula fluminea* and *Lemna minor*, on the survivability of *E. coli* in sediment over a 4 week period. During this time, data suggests that *C. fluminea* initially inhibits *E. coli* survivability compared to *L. minor*, but the longer term data suggests that the presence of *L. minor* is a more effective ameliorator of the bacteria.

P983 **Environmental Science**

Effects of leaf excision on spectral reflectance by foliage of giant reed, *Arundo donax*

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Studies of spectral reflectance by certain types of plant foliage may be greatly facilitated by the collection of spectral data from excised (rather than attached) leaves, provided that the removal of leaves from stems does not cause appreciable changes in reflectance of visible and near-infrared wavelengths during the period in which spectral measurements are to be made. In an effort to evaluate the effect of leaf excision on foliage of giant reed, *Arundo donax*, spectral measurements of attached and excised leaf blades were collected in the laboratory under artificial (quartz halogen) lighting conditions using a spectroradiometer sensitive to wavelengths extending from the ultraviolet (350-400 nm) through the near-infrared region (700 -1,100 nm). A comparison of spectral measurements obtained from leaves prior to excision and at intervals of 1, 2, 3, 4, 5, and 10 min after detachment revealed no appreciable temporal changes in reflectance of blue (~10%), green (~17%), red (~10%) or near-infrared wavelengths (~50%) by excised foliage and ultimately, no significant differences in reflectance by attached vs excised foliage. These results are consistent with those obtained by one of the authors (Y. P. Gandy) for common sunflower, *Helianthus annuus*, and suggest that accurate and biologically meaningful spectral measurements of *A. donax* may be obtained from excised foliage provided that the timeframe reported herein is not exceeded.

P992 **Environmental Science**

***Lumbriculus variegatus* copper toxicology studies: Temperature effect and catalase expression**

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The toxicology of heavy metals is associated with the production of free radicals and their reactive cellular destructive effects. The biochemical defense against free radicals is the cellular expression of enzymes that neutralize such free radicals. Catalase is one of such enzymes involved in the neutralization of hydrogen peroxide, resulting from increased superoxide dismutase activity. The purpose of this project was to examine the effect of copper on the expression of catalase in the California Blackworm, *Lumbriculus variagatus*. Initial experiments were conducted to determine the maximal copper concentration, which allowed survival of *L. variagatus* such that expression of catalase can be measured over a period of exposure of 3-7 days. Additional data will be presented on the enzymatic levels and gene expression levels (via real time PCR) of catalase in function of temperature and length of exposure.

P995 **Environmental Science**

Urine analysis of human exposure to volatile organic compounds in the greater Houston area using purge and trap extraction with gas chromatography

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Urban air pollution caused by automobile and industrial sources can aggravate many respiratory conditions, and lead to additional acute and chronic health effects. Exposure to volatile organic compounds (VOCs), specifically benzene, toluene, ethylbenzene, and the isomers of xylene (BTEX) is ubiquitous since two common sources are vehicular traffic and tobacco smoke. Biomonitoring of human specimens is one approach to evaluating the toxicological effects of the compounds and their risks to human health. In past studies, the analysis of non-occupational exposure of VOCs has been conducted using blood specimens, or exhaled breath also referred to as "expired air". Few studies have undertaken urine analysis as a viable option for evaluation of non-occupational exposure to VOCs. The evaluation of environmental exposures to VOCs has been conducted by means of solvent extraction and headspace techniques. Solid-phase microextraction (SPME) has proved to be an excellent method for the analysis of semi-volatile and most volatile organic compounds, but purge and trap (PT) remains the technique of choice for the sample prep and analysis for VOCs. The proposed plan is to examine the viability of purge and trap as an extraction method for gas chromatographic (GC) determination of BTEX in urine with mass spectrometric (MS) detection. The aim of this study is to provide data that supports the use of urine analysis as a biomarker in non-occupational VOC exposure. Air quality inside the vehicles of 12-15 volunteers without occupational exposure will be monitored and urine from the volunteers will be analyzed for detectable concentrations of the BTEX compounds to assess human exposure to them.

1007 **Environmental Science**

Modeling the spatial relationship of riparian shade distribution as it relates to aquatic species distribution within the San Marcos River

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The San Marcos Springs discharge around 200 million gallons of water per day providing the baseflow and habitat for an ecosystem which is home to seven federal and state endangered species. Among these endangered species is *Zizania texana*, commonly known as Texas wildrice, endemic to the upper 1.5 miles of the San Marcos River. Rapid growth within central Texas has threatened the vitality of the San Marcos River and its endangered inhabitants. The ramifications of population growth create a critical need for understanding and effectively managing this susceptible ecosystem. Previous research has produced thorough depth and velocity habitat modeling criteria for the San Marcos River, however, there is insufficient data regarding the correlation between riparian shade distribution and aquatic species distribution. Riparian shade is an important aspect that influences temperature, exposure to sunlight, and water quality. This study evaluates riparian shade distribution as it relates to aquatic species distribution from the headwaters of the San Marcos River to the confluence with the Blanco River. This complex spatial relationship was evaluated by synthesizing components of Geographic Information System (GIS) modeling, hydraulic modeling, LiDAR returns, densiometer readings, and field observations. Results will be used to identify suitable habitat areas for *Zizania texana* based on depth, velocity, substrate, and distribution of riparian shade.

P1015 **Environmental Science**

Closing the gaps: Field training, research experiences and environmental science curriculum for community college students in inner city Dallas

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The majority of tomorrow's decision-makers are today's urban youths with increasing minority composition, but minimal contact with natural resources. Although diversity is an important feature of ecological communities, there is very low diversity among ecologists. Several elements are essential to becoming an ecologist/environmental scientist, including an understanding of the science and careers available, ability to succeed academically, and experience of doing research. ECC and TTU are establishing new articulated 2 + 2 transfer agreements which will open pathways to degrees and careers in Environmental Science, targeting Hispanic and other low income students in central Dallas. Our goals with this project are to: 1) increase degree awards and capacity to transfer minority/low income students in STEM fields, 2) renovate lab space and equipment to provide infrastructure for curriculum, research and training experiences, 3) strengthen curriculum, and 4) pilot student research opportunities and diversify field experiences. To achieve goals: 1) new environmental courses added to curriculum at ECC, including a student transfer guide highlighting the transfer process from ECC to TTU, 2) internships to ECC students to engage in field studies at TRAC, 3) lab space and equipment upgraded at all partner institutions, 4) an Environmental Biology Club established at ECC and 5) a research symposium planned for ECC students at LRFS, including an environmental career workshop, advanced research and communication training. Early results show our innovative approach offers students opportunities that motivate learning, increases participation in authentic problem solving, and focuses, guides and enhances the undergraduate experience.

1040 **Environmental Science**

Advancement of water treatment using carbon nanotubes

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This research represents a novel approach to water treatment using photocatalytic carbon nanotubes (CNTs) with antimicrobial properties to combat the problems associated with infectious microorganisms in drinking water. Oxidation of titanium metal to titanium dioxide (TiO₂) on the surface of CNTs has been achieved by a proprietary electrochemical deposition method. The TiO₂-CNT was characterized using scanning electron microscope (SEM), inductive-coupled plasma mass spectrometer (ICP/MS) and thermogravimetric analysis (TGA). The electrodeposition was conducted in a proprietary 3-electrode setting potassium iodide as the reference electrode and platinum counter electrode. Linear sweep voltammetry (LSV) was performed at various scan rates to vary the morphology of the coating. This TiO₂-CNT will be used to study the bactericidal growth rate of six different strains of gram positive (*Bacillus subtilis*, *Staphylococcus aureus* and *Staphylococcus epidermis*) and gram negative (*Escherichia coli*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa*). These data will be utilized in the development of a water treatment system and for future advancement in water treatment science and technology which is becoming increasingly important in the face of pending global water shortages.

1044 Environmental Science

Cuticle nails as potential bioindicators of trace metal exposure using Inductively Coupled Plasma Mass Spectrometry

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In the urban environment, toxic trace metals are found in abundant levels. The environmental risk factors are the urban population proximities to superfund sites, industry operation, automobile exhaust and solid waste sites. Human exposure to metals may be through diet, water supply, or inhalation. High exposures to trace or heavy metals can be toxic to the body. If reproducible levels of trace metals can be determined from human cuticle samples, then fingernails and toenails may be suitable bioindicators of toxic metal exposures. The objectives of this research are 1) perform a QAQC study of the analytical capability of the ICPMS, 2) to investigate whether cuticle nail samples would give reproducible trace metal ICP/MS results, 3) to analyze and compare toenails and fingernails to determine the preferable bioindicators of trace metal exposures. The cuticle samples were collected from random donors. During the collection process a brief survey was administered. Afterwards the samples were sanitized and ashed. The ashed samples were acid digested, and analyzed by ICP-MS. The results were then compared to the acceptable values published by the EPA. This study shows that people were being exposed to arsenic, magnesium, and lead. Preliminary results indicate fingernails and toenails maybe used as effective bio-indicators of trace metal exposure. Further investigation is required to validate this study.

1047 Environmental Science

Studies of single-walled carbon nanotubes and oxidative stress

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Single-walled carbon nanotubes (SWCNT) show unique properties find applications in micro devices; electronics to biological systems specially drug delivery and gene therapy. However the manufacture and extensive use of nanotubes raises concern about its safe use and human health and limits their use. Therefore, extensive toxicological studies using *in vitro* and *in vivo* models are necessary to establish safe manufacturing guidelines for the use of SWCNT. The present study investigates the toxicity exhibited by SWCNT in rat lung epithelial cells and also *in vivo* model systems. Lung epithelial cells (LE cells) were cultured with or without SWCNT and reactive oxygen species (ROS) produced were measured by change in fluorescence using dichloro fluorescein (DCF). The cell culture work was followed by inhalation studies of live mouse models. The results show increased ROS on exposure to SWCNT in a dose and time dependent manner. The decrease in glutathione content suggested the depletion and loss of protective mechanism against ROS in SWCNT treated cells. Studies carried out on the effect of SWCNT on superoxide dismutase (SOD-1 and SOD-2) levels, indicates that these enzyme levels decreased by 24 hours. The increased ROS induced by SWCNT decreased by treating the cells with 1 mM of glutathione, *N*-Acetyl Cysteine, and Vitamin C. These results further prove that SWCNT induces oxidative stress in LE cells and shows loss of antioxidants. Additional, the data suggest that the inhaled carbon nanotube does not pass the blood-air barrier to become systemic in the exposed mouse model.

P693 Freshwater Science

Environmental factors influencing distribution, occurrence and success of phyllopods and ostracods in playas of the Texas southern high plains playas

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The length of the wet phase is important to the fugitive species that must hatch, grow and reproduce before the playa dries once again. Temporary playas fill with water and go dry in a highly unpredictable manner. In what appears to be similar playas, the distribution and occurrence of freshwater crustacean inhabitants is often unpredictable and unexpected. Soil texture of the playa bottom mud, turbidity, and the usual environmental parameters such as temperature, pH, light penetration, salinity, ionic composition and oxygen tension, all influenced by the erratic patterns of rainfall, likely affect the unpredictable patterns of phyllopod and ostracod distribution. The distribution and diversity of eight genera of playa phyllopods and ostracods collected from the South Plains of 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 to the length of the wet dry cycles and how they impact the occurrence of several unique fresh crustaceans.

701 Freshwater Science

Gregarine parasitism of Texas dragonflies: A viable system with excellent research opportunities

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Eugregarine parasites (Apicomplexa: Eugregarinorida) infect a wide variety of invertebrates. These parasites have been described as rather harmless to their hosts, but recent studies suggest otherwise. Some authors report that eugregarines rarely infect dragonflies, but damselflies have been more frequently surveyed among odonates than dragonflies. We surveyed adult dragonfly populations for eugregarines at a constructed, flow-through wetland system and two reservoirs in central Texas for three years. Populations were sampled weekly through the flight seasons, and we assessed fitness costs of infection in a common and widespread dragonfly host species, *Erythemis simplicicollis* (Libellulidae). Measured host fitness parameters included wing load, egg size, clutch size, and total egg count. Of the 37 dragonfly species surveyed, 14 (38%) hosted eugregarines, and 13 of these dragonfly species were previously undocumented as hosts. Among host species, parasite prevalences ranged from 2% – 52%. Intensities ranged from 1 – 201 parasites. Parasites were aggregated in dragonfly host populations. Prevalence and intensity was strongly seasonal at one of the reservoirs, but no seasonal trend was detected at the wetland. The fitness parameters were not correlated with the presence or intensity of eugregarines, suggesting that either eugregarines do not affect wing loading and egg production in *E. simplicicollis*, or that virulence depends on specific eugregarine species infecting the hosts. This parasite-host system offers excellent research opportunities – variation is manageable, and significant dragonfly parasitism and life history patterns await description.

P814 Freshwater Science

High nutrient conditions promote faster mercury reduction in the tissues of green sunfish (*Lepomis cyanellus*) transplanted from a high- to a low-mercury environment

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Mercury (Hg) is a toxic pollutant that biomagnifies in aquatic food webs. Although contamination of fish with Hg as a result of anthropogenic Hg pollution has been documented, the potential for fisheries to recover in response to an environmental reduction in Hg pollution is not well understood. In summer 2010 we conducted an experiment in which we transplanted juvenile green sunfish (*Lepomis cyanellus*) from a Hg-contaminated pond to 500-L mesocosms with low levels of Hg contamination. The experimental design consisted of two levels of nitrogen and phosphorus addition: with nutrient addition (6 tanks) and without nutrient addition (7 tanks). After 77 days, we removed the green sunfish, measured their length and wet mass, and analyzed their tissue for total Hg concentration. Fish from both treatments grew over the course of the experiment but fish from the nutrient-addition treatment grew faster. Average Hg concentrations of fish from both mesocosm treatments were significantly lower than fish from the Hg-contaminated pond. However, fish from the nutrient-addition treatment had significantly lower concentrations of Hg than fish from the no-nutrient treatment. These data suggest that Hg-contaminated fisheries may recover faster in high-nutrient ecosystems than in lower-nutrient ecosystems as a result of Hg pollution controls.

P821 Freshwater Science

Survey of mercury concentrations in largemouth bass (*Micropterus salmoides*), white bass (*Morone chrysops*), and white crappie (*Pomoxis annularis*) from six Dallas-Fort Worth area reservoirs

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Largemouth bass (*Micropterus salmoides*) are routinely monitored for mercury (Hg) in Texas reservoirs. Other piscivorous game-fish that may have high concentrations of Hg, such as white bass (*Morone chrysops*) and white crappie (*Pomoxis annularis*), are monitored less frequently because they are difficult to capture. We examined Hg concentrations in largemouth bass, white bass, and white crappie from six Dallas-Fort Worth area reservoirs: Benbrook Lake, Eagle Mountain Lake, Grapevine Lake, Lake Lewisville, Joe Pool Lake, and Lake Ray Hubbard. Fish were collected using electroshocking, trap nets and hook and line. For all species Hg concentrations were positively correlated with total length. Hg concentrations of each species were significantly different between reservoirs, indicating that some reservoirs were more contaminated with Hg than others. In the majority of reservoirs Hg concentrations in largemouth bass did not differ from Hg concentrations in white bass and white crappie. These data suggest that Hg concentrations in largemouth bass may be representative of Hg concentration in other piscivorous game-fish and is an appropriate target species for monitoring studies.

864 Freshwater Science

Bioassessment of Lake Mexia, Limestone County

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Lake Mexia is the first reservoir in Texas to have biological data collected for assessing aquatic life use attainment for regulatory purposes. In Texas, aquatic life use attainment in reservoirs is primarily assessed using dissolved oxygen data. Natural resource agencies outside of Texas have found success in using biological data to assess reservoirs. Biological metrics used by other states may have some applicability in Texas. Lake Mexia, a shallow eutrophic reservoir in Limestone County, was included on the 2002 Texas list of impaired water bodies due to depressed dissolved oxygen concentrations. To address this and to evaluate whether biological data from the reservoir has utility in assessing aquatic life use attainment, a dissolved oxygen monitoring project and concurrent bioassessment were conducted by the Texas Commission on Environmental Quality (TCEQ) and Texas Parks and Wildlife Department (TPWD) in 2002 and 2003. Fish, benthic macroinvertebrate, zooplankton, and aquatic macrophyte communities and shoreline habitat were sampled. The fish and benthic macroinvertebrate community data were most helpful in assessing aquatic life use attainment. The study found 30 species of fish, including two species classified as intolerant to pollution. TPWD Inland Fisheries electrofishing effort in combination with seining was successful in characterizing the fish community. The benthic macroinvertebrate data corresponded well to shallow reservoirs categorized as eutrophic in an Oklahoma analysis of benthic metrics for biotic health.

872 Freshwater Science

Incredible, edible eggs: Predation of apple snail (*Pomacea insularum*) eggs by a native riparian predator, the red-eared slider (*Trachemys scripta elegans*)

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Riparian predators, or species that occupy unique positions in both aquatic and terrestrial food webs, rely upon aquatic invertebrates as a main energy source. The egg stage of development, when organisms remain most vulnerable to predation, occurs under water for most prey species as aquatic environments protect eggs from multiple stresses. However, recent introductions of an exotic, invasive, aquatic prey species (i.e., island apple snails, *Pomacea insularum*) challenges traditional understanding of predator-avoidance strategies of aquatic invertebrates. A member of the Ampullariidae family, *P. insularum* females lay bright pink eggs above the water on emergent substrates. Despite this “flashy” color, eggs rarely exhibit damage in the field, potentially indicating unique predator avoidance strategies. To investigate the potential predatory relationship between *P. insularum* eggs and a native riparian predator, we conducted a series of non-choice experiments involving adult and juvenile red-eared slider turtles (*Trachemys scripta elegans*) and real and fake *P. insularum* eggs. Over a five day period, turtles received random treatments of 20 individual real eggs or 20 individual fake eggs for duration of six hours. We created the fake eggs using 15 mL of H₂O, 5 mL of sodium alginate and dried, ground powder of *P. insularum* eggs that we dropped into CaCl₂. Our initial results suggest that *P. insularum* eggs do not deter riparian predators, such as adult and juvenile red-eared slider turtles. On-going work examines whether turtles develop any avoidance of *P. insularum* eggs over time and the mechanisms underlying consumption.

P875 Freshwater Science

Effect of season and reproductive strategy on the infection of parasites in mollies from the Rio Grande Valley, Texas

Adrian Silva*, Edwin Quintero, Brian L Fredensborg, The University of Texas-Pan American, Edinburg, TX

The evolution and maintenance of sex may be driven by a selective advantage of maintaining a high genetic diversity to evolve in response to parasites and infectious disease (the Red Queen Hypothesis). Since very few asexual vertebrate species exist, empirical data supporting the Red Queen Hypothesis among vertebrates are lacking. In this study, we compared the parasite fauna of two closely related mollies (Poeciliidae) co-existing in South Texas. *Poecilia formosa* exclusively reproduces asexually while *P. latipinna* only reproduces sexually. A previous study conducted in late summer showed that sexually reproducing mollies harbored more parasites compared to their asexual relatives contradicting the Red Queen Hypothesis. In this study we included data on fish collected in winter to examine the effect of season on the parasite load of the two mollies. We collected at least 20 specimens of each species by seining from five irrigation canals in the Rio Grande Valley in the early fall of 2009 and again in winter 2010. Three species of debilitating parasites were considered: The gill-encysting *Centrocestus formosanus*, the eyefluke *Diplostomum* sp., and two unidentified heart-encysting trematodes. All of those were widely distributed in both *P. formosa* and *P. latipinna*. We found significant effects of both location and season. Thus, winter samples of both species contained significantly fewer parasites compared to the summer samples indicating a die-off of heavily infected individuals. Similar to a previous study the asexual mollies did not harbor more parasites compared to sexually reproducing close relatives.

903 Freshwater Science

Seasonal and spatial variability of bacteria levels in the Lower Rio Grande

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The Rio Grande is one of the most impacted freshwater rivers in the United States. Treated and untreated waste water is introduced to the river by point and nonpoint sources causing a potential hazard to people who use the water for agricultural, municipal and recreational use. A previous study done on an upstream segment of the river found a positive correlation between river flow and microbial abundance, but no recent bacteria studies have been done on the Lower Rio Grande (LRG). The goal of this study was to determine a temporal and spatial pattern in microbial abundance in the LRG. The study was performed at two river sites above and below the McAllen-Reynosa urban area from January 2010 to December 2010. Water samples were collected monthly and tested for total microbial, total coliform, and *E. coli* abundance using MPN assays with three different media. Water samples were also collected and analyzed for dissolved phosphate, ammonium, nitrate-nitrite and water column chlorophyll *a* levels. Total microbial and total coliform counts were generally higher at the downstream site up through June 2010 but after Hurricane Alex, the pattern reversed through November 2010.

909 Freshwater Science

Native macrophyte restoration in the San Marcos River, San Marcos, Texas

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Many Texas rivers have been degraded due to human withdrawal of water from the system, point and non-point pollution, habitat modification, flow alteration, introduction of non-native species, recreational impacts, and sedimentation. Restoration of these rivers is important for recreational, aesthetic, and ecological reasons. In San Marcos, Texas, the San Marcos River is a heavily used recreational venue and is habitat for five endangered species, but the aquatic plant community in much of the river is currently dominated by exotic species. Its restoration is therefore a high priority among local, state, and federal governments and various non-governmental organizations. Restoring diverse native macrophyte populations is often an important part of river restoration. We are testing new transplantation methods for three native plants in the San Marcos River to augment native plants in portions of the river either devoid of macrophytes or dominated by exotics. We are also examining whether the level of sunlight received and the presence or absence of other plants affects these plants' survival rates.

921 Freshwater Science

Feasibility of robust feedback control laws for size specification of freshwater fish populations

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It is well known that the logistics equation describes the population dynamics of species interacting with their environment. The purpose of this presentation is to investigate the feasibility of designing feedback control laws, for one such realization of the logistics equation, to produce a desired fish population. This desired population size may exist for many reasons; for example the need to limit the numbers of a particularly aggressive species. Through application of Lyapunov's second method, with harvesting/stocking effort the control variable, a control law is formulated that is quite successful in delivering the desired population size, despite disturbances that inherently exist in any mathematical model of a dynamic system. Considered disturbances include deviations or unknowns in the harvesting/stocking effort, among others. Two primary contributions arise from this study. First is the specification, under certain conditions, of a robust feedback control law influenced by initial and desired population size, intrinsic growth rate, and carrying capacity which yields the desired population size with knowledge only of upper and lower bounds of the disturbance. Secondly, a forthright discussion of the issues to be addressed and challenges overcome if such control laws are to be implemented in practice. Analytical results and numerical simulations will be presented to illustrate the theoretical potential of the proposed methodology. These same results will provide a backdrop for discussion of the challenges to be addressed prior to and during any realistic implementation phase of the control law.

936 **Freshwater Science**

Disturbing environments: Nutrient enrichment negatively impacts water stressed *Pomacea insularum* hatchlings

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Anthropogenic activity threatens the natural state of ecosystems through two types of pollution: biological and chemical, which can both result in disturbance. Introduction of exotic invasive species directly reflects biological pollution. Nonpoint runoff of excess inorganic nitrogen into waterways indirectly leads to chemical pollution. *Pomacea insularum*, an apple snail native to South America, first occurred in Texas in 1989 and quickly established robust reproductive populations. While previous studies investigated *P. insularum* clutch hatching efficiency under water stress, effects of nutrient enrichment or "chemical pollution" on water stressed hatchling apple snails remain unknown. Therefore, to study mortality, growth and quality of hatchlings, we incorporated pre-condition water stress and post-condition nutrient stress into a 3 x 4 factorial experimental design. Whole clutches either experienced no water stress, low water stress (floating), or high water stress (submersion). After hatching, we placed ten neonate snails into containers with no nutrient enrichment, 0.5 M NaNO₃, 0.5 M KH₂PO₄, or 0.5 M NaNO₃ + 0.5 M KH₂PO₄. Mortality and quality assessment occurred on Day 2 and 7. Surprisingly, pre-condition water stress did not affect hatchling mortality or quality. In contrast, we found significantly higher hatchling mortality with nitrogen + phosphorus exposure on Day 7 and significantly lower quality hatchlings in all three nutrient treatments compared with the control. This work suggests that nutrient enrichment in suburban Texas waterways acts as a disturbance, negatively affecting the survival of *P. insularum* hatchlings. We recommend that future work examine impacts of chemical pollution on invasive abilities of apple snails.

955 **Freshwater Science**

Effect of parasites on reproductive investment in three species of livebearing fishes (Family Poeciliidae)

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Livebearing fishes in the family Poeciliidae are highly susceptible to a variety of parasites. Moreover, several poeciliids inhabit streams and rivers in close proximity, providing an excellent opportunity to comparatively test the effects of parasites on hosts. Here, we investigated the potential for parasitic infection to influence host reproduction for both males and females of three livebearers (*Gambusia affinis*, *Gambusia geiseri*, and *Poecilia latipinna*) in Texas. We compared the effects of parasites on reproductive investment across two populations for each species. We found no differences in parasite infection across populations for any of our focal species. But, *G. affinis* and *G. geiseri* were more infected overall than *P. latipinna*. Contrary to our expectations, we found no strong relationship between parasite load and host reproduction except for *G. affinis* females. In both the San Marcos and Blanco Rivers, parasite load explained about 12 % of the variation in female reproductive investments (measured as GSI). In general, parasites do not appear to be strong predictors of reproduction in some livebearers, but this affect may vary seasonally and calls for future investigation.

P960 **Freshwater Science**

Habitat selection of two potentially competing tadpole species on Los Horcones River, Mexico

Aaron Haynes*, Justin Meaders, Justin Williams, Raelynn Deaton, Sam Houston State University

The Los Horcones River is located in the Southern Pacific Slope, Mexico, and runs through the Sierra Madre Mountains. It has been proclaimed by locals that agricultural pesticides had previously decimated the diversity of the river. As a result, vertebrate diversity and abundance are low and limited to a few species of frogs and fishes. Amphibians have shown some resilience by inhabiting pools scattered throughout the river including the species marine toad (*Bufo marinus*) and white striped frog (*Lithobates pustulosus*). We investigated the following questions: 1) What are the population densities of the two species along a 1 km stretch of river (20 pools); 2) what are the preferred habitats of each species in each pool; and 3) what abiotic factors influence distribution of these two species? First, we measured flow, current, water temperature, substrate, depth and area of each pool. Second, when possible, we collected and identified all individuals of each species of tadpole in each pool via seine and snorkeling. Alternatively, we estimated numbers of tadpoles by using a 1x1 meter grid when densities were too high for total counts. Finally, we collected and identified fish and invertebrate species coexisting in each pool as a measure of potential predators. Data analyses are currently being conducted to test for habitat preference and potential partitioning of each species. In addition, we will present population estimates for each species, and determine which (if any) abiotic factors are influencing the distribution of either *B. marinus* or *L. pustulosus* in this river drainage.

962 **Freshwater Science**

Correlating climatological data with community basking trends among Waco Creek turtles (*Pseudemys*, *Trachemys*, and *Graptemys*)

Jeff Bardwell*, Richard Duhrkopf, Baylor University, Waco, TX

This purpose of this preliminary study was to examine the relationship between weather patterns and turtle basking among a community of emydid turtles in Waco Creek, Texas. We assessed the feasibility of utilizing local daily ASOS weather station data coupled with concurrent turtle basking behavior to correlate large scale climatological trends with microcosm weather-mediated behavior. In previous studies of basking behavior, designated microcosm weather stations or hobos provided accurate, though geographically limited, data. This new method addressed the need to broaden such geographic limitations to better reflect the ubiquitous range of many emydid species and also gauge the accuracy of potential historical indices between turtle trap and climatological records. While several climatological trends weakly correlated with 2010 seasonal community basking behavior, comparative analysis between microcosm hobo and macrocosm weather station methodology and ecologically parsing the individual climatological effects on community versus individual basking variability require additional study.

964 **Freshwater Science**

Reproductive assessment across several isolated spring populations of *Gambusia geiseri*

Janalyn West*, Rachel Martin, Joseph Reeve and Raelynn Deaton, Sam Houston State University, Huntsville, TX.

Life history components help to elucidate the broad features of an organism's life cycle such as growth rate, age at maturity, reproductive rate, and age at mortality. One life history trait that deserves empirical attention is fecundity, the potential reproductive capacity of an individual. Because fecundity and testes mass are often correlated with fitness, they are important surrogate measures for reproductive investment in life history studies. Livebearing fishes are a good model system to investigate reproductive investment because they exhibit internal fertilization and are viviparous. In 1996 Clark Hubbs conducted a life history study on isolated populations of three *Gambusia* spp. (the largespring mosquitofish, *Gambusia geiseri*; the western mosquitofish, *Gambusia affinis*; and the Pecos mosquitofish, *Gambusia nobilis*) at varying geographic locations; however, he did not report measures of female fecundity or male testes mass. Thus, our objective for this study was to collect and compare reproductive investment data for both males and females across several isolated populations of *Gambusia geiseri*. We assessed female fecundity by determining female brood size and embryo stages in addition to measuring female gonadosomatic index (GSI) and standard length (SL) for each population. Furthermore, we assessed male GSI using testes mass relative to body size. We are presently analyzing our data and will present our current findings.

P972 **Freshwater Science**

Comparative effects of female resistance on male mating success in livebearing fishes

Janalyn West*, Center for Biological Field Studies & Department of Biological Sciences Sam Houston State University, Huntsville, TX

Livebearing fishes provide an excellent system for studies on sexual selection, specifically those concerning female choice and its role in the maintenance of male secondary sex traits and mating strategies. Originally, female choice was thought to be completely absent in coercive systems; however, recent work has showed that females may be choosier than once believed. Deaton et al. demonstrated a major role for female choice in sexual conflict via resistance to male harassment in *Gambusia affinis*. Although not viewed as overt female choice, mechanisms such as resistance may be important in determining male reproductive success. Therefore, using a comparative approach, I have conducted a study using several species of livebearers that employ coercive and courting mating strategies to determine if females of different genera use resistance as means of choosing mates or controlling male mating success. My overall objective was to quantify the effects of female resistance on male mating success across several poeciliid fishes, which vary in their mating strategies. I have chosen several species of livebearers mating tactics which range from species with only coercive males (*Gambusia geiseri*) to species that have both coercive small males and courting large males (*Heterophallus milleri*, *Poecilia latipinna*, *Poecilia mexicana*, *Xiphophorus hellerii*, and *Xiphophorus multilineatus*). I predict that female resistance will affect male mating success (number of male mating attempts) depending on the level of male courtship.

977 **Freshwater Science**

Distribution and physical habitat characteristics of *Hygrophila polysperma* along the San Marcos River Hays County, Texas

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Hygrophila polysperma (Roxb.) T. Anders (Acanthaceae), is an old world species native to Asia that has become well established in the San Marcos River Hays County, Texas. Little is known regarding the introduction and dispersal of the species in regards to the San Marcos River system. One study suggests the plant may have been introduced via the aquatic plant trade and has continued its expansion along the San Marcos River for at least 25 years. Characteristics such as fragmentation, auxiliary rooting and rapid growth allow *H. polysperma* to possibly displace native species such as *Ludwigia repens* and *Zizania texana*, an endangered species. *H. polysperma* has been labeled a Federal Noxious Weed by the USDA and is reportedly a major pest in Florida and Virginia. However, *H. polysperma* has also been labeled suitable habitat for the endangered fountain darter, *Ethiostoma fonticola*, a Texas endemic. My research seeks to understand the requirements needed for the sustained growth of the species in the San Marcos River system and its distribution along the upper reaches of the San Marcos River. Both in situ data and geospatial models were used to determine if the plant shows preferences in regards to water velocity, water depth and light intensity. On going research will look at hydro soil type in areas with *H. polysperma* and nutrient analysis of the soils will be conducted.

P980 **Freshwater Science**

Genetic isolation of the Peck's cave amphipod, *Stygobromus pecki*

Josh Ethridge* and Chris Nice, Texas State University, San Marcos, TX

We examined genetic variation within the endangered Peck's cave amphipod, *Stygobromus pecki*, to assess population structure within the species. We estimated the degree to which the sampling localities of this endangered species were differentiated or isolated from each other. We also examined genetic variation and structure within three congeneric species: *S. longipes*, *S. dejectus* and *S. russelli*. Data from these three species were used as a basis of comparison with *S. pecki* and to examine the phylogenetic relationships among these species. Data from mitochondrial DNA (mtDNA) sequences indicated high levels of differentiation within and among most *Stygobromus* localities. *S. pecki* populations fit this pattern, but were unexpectedly found to contain sequences from two distinct haplotype groups. These two haplotype groups were separated by a mean of 2.6% sequence divergence. Despite this deep divergence, there was no evidence of geographical structure with respect to the two groups. Most sampled localities of *S. pecki* contained haplotypes from both groups in roughly equal proportions. This observation raises several possible explanations, including the presence of two cryptic species within the nominal species *S. pecki*. This hypothesis was tested using markers from the nuclear genome. The evolution of *Stygobromus* in central Texas as revealed by genetic sequence data is a complex story of ancient speciation events, long periods of isolation and potential cryptic species facilitated by evolutionary convergence of morphological characters in these troglomorphic amphipods.

P989 **Freshwater Science**

The impact of turbidity and visual versus chemical cues on predator avoidance by fountain darters, *Etheostoma fonticola*

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The San Marcos and Comal Rivers are unique aquatic ecosystems to the southwestern United States. These waters are constant in temperature and flow and thus make an excellent home for many endemic flora and fauna, including seven threatened and endangered species. However, these ecosystems are currently facing many anthropogenic threats and are at risk of losing biodiversity. This project will examine the effect of one anthropogenic threat, increased turbidity, on one federally endangered species endemic to the San Marcos and Comal Rivers, the fountain darter, *Etheostoma fonticola*. Rising turbidity can have tremendous and often devastating impacts on aquatic ecosystems. Turbidity degrades the quality and transmission of visual information, which can impair an animal's ability to forage, select a mate, or respond to a predator. Specifically, this study tests the impact of turbidity on predator recognition and response in *E. fonticola*. I will examine the response of *E. fonticola* to chemical and or visual cues of a native predator, the green sunfish (*Lepomis cyanellus*). I will measure response in four predator cue treatments (chemical, visual, combination, and no predator cues) in both clear and turbid waters. I expect that turbidity will significantly affect *E. fonticola*'s response to visual cues of a predator. Pollution, recreational, and industrial activities can all lead to rising turbidity in *E. fonticola* habitat. From a conservation standpoint, the results of this study can be applied to help managers make decisions regarding restoration practices that will best benefit this species as well as other benthic stenothermic fishes.

990 **Freshwater Science**

The effects of abiotic and biotic factors on male fitness across disjunct populations of the largespring Gambusia, *Gambusia geiseri*

Richard H. Lewis*, Sam Houston Sate University

Disjunct populations can provide insights into how environmental pressures affect individual fitness. For example, the largespring gambusia, *Gambusia geiseri*, was introduced across Texas for mosquito control; however, this species only persisted in isolated head waters, which differ in several abiotic factors and parasite regimes. Herein, I investigated the effects of differing environmental pressures on male fitness across six isolated populations of *G. geiseri* (San Marcos River, Comal River, South Concho River, Anson Spring, East Sandia Spring, and San Soloman Spring). I correlated abiotic factors and parasite load on fluctuating asymmetry (FA) using digital pictures on imaging software. More specifically, I completed the following two objectives: 1) I measured abiotic factors of the six spring habitats, 2) assessed endo-parasite loads of males, and tested for effects of parasites on FA. The San Marcos River had the highest parasite load of my six sites. Thus, I decided to use it as my source population for parasite to FA correlations, so that I could have the highest potential of observing the effects of FA on *G. geiseri* male fitness from a natural system.

P991 **Freshwater Science**

A new species of *Gambusia*?

Stacy B Stoops*(SHSU), Wilfredo Matamoros (LSU) and Raelynn Deaton(SHSU)

The genus *Gambusia* (Family: Poeciliidae, Order: Cyprinodontiformes) contains over 40 species of fish found primarily in freshwater habitats, although some are found in estuaries and saltwater habitats. Also, because of their tolerance for a variety of environments, they have a global distribution. There are three species of *Gambusia* endemic in Honduras to date: *Gambusia luma* (Rosen and Baily, 1963), *Gambusia nicaraguensis* (Gunther, 1866) and *Gambusia yucatanana* (Regan, 1914). However, while on a collection trip in 2010, several *Gambusia*, not matching the description to the previous species, were found. Here, we will present our results to either confirm range expansion for one of the 3 endemic species or propose a new species that has been found in Honduras.

998 **Freshwater Science**

Determining how common carp (*Cyprinus carpio*) affect aquatic ecosystem dynamics in a warm water northeastern lake

Chris Kroll* (SHSU), Jessica Sanchez (SHSU), David Legget (SHSU), Jeffery Wozniak (SHSU TRIES)

Sanctuary Lake is a shallow, warm water lake in northwestern Pennsylvania and is overpopulated with common carp (*Cyprinus carpio*; average CPUE = 1.29). During the late spring and early summer months, carp congregate in shallow water habitats to feed and spawn, resulting in a highly disturbed and turbid water column. Most of the littoral and shallow water habitats in the lake are comprised of a monoculture of *Nuphar* sp. To determine the effects of carp on these vegetated habitats, we designed an experiment that included nine 9m² experimental enclosures (3x3x3 design). Three enclosures were constructed from silt fence (barrier allowing only water to pass) and three made of 2 inch mesh (permeable barrier that allowed sediment, inverts, and small fishes through, but not large carp). In addition, three sites were monitored with no enclosures as controls. We collected time series data on the number of plant species present, plant and algal cover, benthic invertebrate abundance, and water quality parameters (pH, temperature, D.O., turbidity, etc.). Preliminary analyses indicate a significant increase in the number of plant species in the solid barrier enclosures where carp were not present as compared to control and

permeable sites. In addition, in the absence of large carp, water column turbidity drastically decreased. While Sanctuary Lake is a highly managed system, these results indicate that the exclusion of carp from the shallow vegetated areas of the lake could result in a significant shift from a highly turbid, monoculture habitat, to a more desirable clear water, multi-species habitat.

P1001 **Freshwater Science**

Maintenance of a unisexual-bisexual mating complex: Importance of behavioral syndromes

James J. Muraco, Jr.* and Caitlin R. Gabor, Department of Biology, Texas State University

Amazon mollies, *Poecilia formosa*, are a clonal, all female species of live-bearing fish of hybrid origin. Amazons require sperm from one of their parental species, sailfin mollies (*P. latipinna*) or Atlantic mollies (*P. mexicana*) to start embryogenesis. However, inheritance is strictly maternal. Males prefer to mate with and prime more sperm for conspecifics over Amazons, yet Amazons have persisted for ~100,000 years. Recently, studies have started to examine the relationship between functionally different behavioral categories and have found that suites of behaviors are often correlated (i.e. behavioral syndromes). Studies of behavioral syndromes have found high inter-individual variation in "behavioral type" but low intra-individual variation, suggesting that individuals will generally maintain a consistent pattern of behavior. Therefore, it is possible that males of either *P. latipinna* or *P. mexicana* that mate with Amazons (*P. formosa*) may have a predictable behavioral syndrome. (e.g., bold males may be more aggressive in mating and therefore more likely to mismatch). I predict that males will exhibit a correlation between their behavioral syndrome and mate preference. I tested male sailfin and Atlantic mollies (n=60 each) in three experiments to examine various contexts [a functional behavioral category (e.g., boldness)] within and across situations. Preliminary results suggest that individuals can be distinguished based on behavioral type. Further testing is planned to determine the relationship between behavioral type and mate preference.

1013 **Freshwater Science**

Using benthic invertebrate abundance to determine the efficacy of wetland management practices

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Wetlands are highly productive systems that provide a wide range of ecosystem goods and services including the maintenance of water quality, the promotion of biodiversity, and critical habitat to migratory waterfowl. Over the past century the global distribution and abundance of wetlands has decreased drastically, resulting in the parallel loss of aquatic habitat and ecological function. When a wetland is destroyed, it is difficult to quantify the functional loss; and it is even more difficult to replace / restore a wetland to its original functional level. However, previous studies have shown that benthic invertebrate abundance is a strong surrogate for both wetland function and biological integrity. In this study, we investigate the effects of wetland management on benthic invertebrate abundance in six highly managed wetlands in Northwestern Pennsylvania. Factors including wetland size, drawdown regime (timing and magnitude) and vegetation type were considered. The results allow us to determine how specific management interventions influence benthic invertebrate abundance over long-term time steps. More broadly, these results may be important for future enhancement of aquatic habitats utilized by migratory waterfowl in the greater northeastern flyway.

1017 **Freshwater Science**

Water and watershed stewardship in the Texas Hill Country: Innovative multiple approaches and stakeholders at the Llano River Field Station

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The Texas Hill Country is vast, biologically diverse and rich in natural resources. However, an ironic disconnect exists where private landowners, who own over 96% of soil and have direct, immediate effects on the land, contrast with 85% of our population and youth living in urban environments - tomorrow's voter, and dependent on rural water and natural resources. As resources become increasingly limited, how can either group be advocates for the environment without the tools to make decisions or understanding of the ecosystems in their own backyard or on which they depend? Llano River Field Station (LRFS) has transformed much of the 411-acre property, bisected by the pristine South Llano River, into a series of demonstration sites for K-12 curriculum development, informal youth education, landowner habitat manipulation examples, and a Texas Public Radio Water Symposium Series with expert panelists discussing the complexities of various water issues. The demonstration projects are used in our Outdoor School standards based STEM curriculum and workshops (youth range and 4-H, landowner range, watershed and conservation best practices). The different demonstration sites are comprised of a Hill Country and 11 natural regions of Texas native plant gardens, a rainwater catchment system to water the gardens, and habitat manipulation plots using a combination of enclosures, prescribed fire, chemical, and mechanical treatments. A new pending initiative under EPA's Healthy Watersheds Framework is to protect the Upper Llano River watershed and prevent impacts to its aquatic ecosystem through: stakeholder coordination, watershed assessment and modeling, development of a watershed protection plan and public outreach and education.

P1018 **Freshwater Science**

***Fundulus herminiamatildae* a new species (Teleostei: Fundulidae) from the Rio Soto La Marina Basin, Aramberri, Nuevo León, Mexico**

María Elena García-Ramírez*, Salvador Contreras -Balderas y María de Lourdes Lozano -Vilano, Cd. Universitaria, San Nicolas de los Garza Nuevo León, Mexico

Fundulus herminiamatildae sp. nov. is endemic in the Marmolejo stream of the Río Soto La Marina basin, Aramberri, Nuevo León, México. Geologically, it is located in the Northeastern province of México, specifically in the Sierra Madre Oriental subprovince. The cold water habitat is a determinant and important factor for the differentiation of the species. Its closest relative is *F. philpisteri*. *Fundulus herminiamatildae* is characterized by a large number of conspicuous and simple lateral bars, long body depth, big snout of 2.5-2.9 (2.7), small eyes of 4.1-4.9 (4.5), large pre-orbital length of 2.7-3.1 (2.9), all in times of the cephalic length.

P1033 **Freshwater Science****A proposed study on the gravid spot as a potential fertility indicator for coercive male mosquitofish**

Shelly McCain*, Sarah Sendelbach, and Raelynn Deaton

Males should favor females that possess recognition cues that identify fecundity, or the number of embryos ready for fertilization. The need for such mating cues may be even stronger in promiscuous systems where females and males mate multiply, females can store sperm, and male-male competition is high. Therefore, an obvious fertility indicator to males may be essential to assess a female's reproductive state, which would directly increase fitness of both sexes. Livebearing fishes (family Poeciliids) are an excellent model for such studies, as females of some species (mosquitofishes; Genus *Gambusia*) have a small pigmented spot dorsal to the anus (gravid spot), which changes in size and intensity with the ovarian cycle. Further, the gravid spot serves as a target for male courtship. However, no studies to date have tested this experimentally. Therefore, we will manipulate the size and location of gravid spots on female western mosquitofish to test the hypothesis that this morphological feature serves as a fertility indicator to males. Here we present our proposed study to test this hypothesis.

P1034 **Freshwater Science****Do coercive male mosquitofish discriminate against females with which they have already mated?**

Clint Anders*, Craig Sargent and Raelynn Deaton, Dept Biology, Sam Houston State University

In two repeated measures experiments, we tested whether coercive male mosquitofish (*Gambusia affinis*) discriminate against females with which they were already mated. We presented one male with one female in an aquarium and allowed the dyad to mate for 10 minutes. During this time we recorded the number of copulation attempts toward the female. We then separated the pair for 24-hours and allowed them to mate again under the same conditions. However, during the second trial, half of the females were those with which the males were already tested and half were novel females. Again, we recorded number of copulation attempts toward the female to evaluate whether the male's behaviors increased or decreased toward novel or previously mated females. There was no difference between male behaviors toward either type of female, suggesting that 24 hours is too long of an isolation period for males to remember which females to which he had previously been exposed. Our second experiment was similar to the first except we isolated the pair for only 30-minutes before retesting. Results from this experiment currently are being analyzed and also will be presented. Thus far, our results suggest that males do not discriminate between females with which they have already mated compared to novel females when isolated for a 24 hours. Guppy males can remember females up to about 5 hours, so mosquitofish may show similar patterns. This study provides insight into coercive males cognitive abilities in relation to costs of mating.

702 **Geosciences*****Mahgarita* cf. *m. stevensi* in the middle Eocene Laredo formation: Oldest record of a cercopithecine primate in North America**

James Westgate*, Dept. of Earth & Space Sciences, Lamar University, Texas State University System, Beaumont, TX and Vertebrate Paleontology Lab, Texas Natural Science Center, University of Texas-Austin; Dana Cope, Dept. of Sociology and Anthropology, College of Charleston; & Christopher Beard, Vertebrate Paleontology Section, Carnegie Museum of Natural History.

A nearly unworn right M2 of *Mahgarita* cf. *M. stevensi* from the Laredo Formation at Laredo, Texas, indicates that the primate was a member of the late middle Eocene (late Uintan) Casa Blanca community. *Mahgarita* is a cercopithecine primate which displays traits of European and Egyptian adapoids rather than typical North American notharctids. It has been discovered previously only in an early Duchesnean stratum in the Devil's Graveyard Formation, in the Agua Fria-Green Valley area in Brewster County, Texas. Earlier workers hypothesized that *Mahgarita* entered the Trans-Pecos region following colonization of eastern North America after dispersal from the Old World. The presence of *Mahgarita* cf. *M. stevensi* in the Casa Blanca community indicates that the cercopithecine dispersal into North America happened as early as the Uintan land mammal age. Some Casa Blanca community taxa including the mangrove palm *Nypa*, the aquatic turtle cf. *Allaeocheilus* sp., the marine snake *Pterospheus schucherti*, the tiger shark *Galeocerdo eaglesomei*, the wrasse *Diaphodus*, and an unnamed tarpon, indicate the Texas Gulf Coast had significant Old World Tethyan influences. Pollen, fruits and leaves found in the same stratum as the vertebrates, indicates the *Nypa* mangrove at Laredo fringed a tropical rain forest. *Mahgarita* may have inhabited either or both environments. The absence of *Notharctus* and *Mahgarita*'s presence in the Casa Blanca fauna suggests that *Mahgarita* either replaced or displaced *Notharctus* in its adapoid ecologic niche. Several omomyid primate species were also in the Casa Blanca community and are currently under study.

721 **Geosciences****Correlation of Dakota sandstone and lower Mancos shale in the San Juan basin, northwestern New Mexico**

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The Dakota Sandstone of the Four Corners Platform northwest of the San Juan Basin proper, in stratigraphic order, consists of a thick basal White Rock Mesa Member on the K-3 unconformity. The White Rock Mesa is overlain by thin westward edges of the Whitewater Arroyo Shale Member of the Mancos and the Twowells Sandstone Members of the Dakota. The Twowells is overlain by the complete Graneros Shale and the Greenhorn Limestone Members of the Mancos Shale in the study area. Well logs from the study area and to the east show gamma-ray peaks of four volcanic ash-rich clay bentonite layers, one of which is in the Graneros Shale, with the other three in the Greenhorn Limestone. In the San Juan Basin to the east a marine section between the K-2 and K-3 unconformities contains two lower bentonites ("A" and "X") within the Dakota-Mancos interbedded section-these are also quite useful for correlation. The A bentonite is in the Oak Canyon Member of the Dakota, and the X bentonite, which is widespread in the southern part of the Cretaceous Western Interior Seaway, is in the lower part of the Whitewater Arroyo Member of the Mancos.

761 **Geosciences****New southern African rodent niche models for use in taxonomic habit indices**

Timothy L. Campbell*, Texas A&M University, Patrick J. Lewis, Justin K. Williams and Monte L. Thies, Sam Houston State University

Paleoenvironmental reconstructions utilizing modern faunas as proxies for past environmental conditions are based on the principle of actualism. This concept employs the assumption that environmental tolerances of extant taxa are similar to fossil taxa they morphologically resemble. Consequently, accurate neontological data on environmental tolerance limits based on a taxon's modern geographic range are prerequisites for any actualistic approach. One method for reconstructing past environments that utilizes data on extant taxa habitat usage is through the construction of a Taxonomic Habitat Index (THI). In constructing a THI, the habitat use throughout a taxon's range is partitioned into discreet habitat classes so that the sum total of all habitats occupied equals 1.00. Also known as niche models, weighted values for each habitat class by taxa are summed and then divided by the number of taxa to produce a THI. Unfortunately, no clear methodology has been proposed for excluding habitat usage among various classes. Furthermore, the selection of habitat classes is largely dependent on the area being examined, thus inhibiting direct comparisons between studies. Here we present a Geographic Information Systems analysis using museum specimens of the habitats utilized by modern rodents throughout South Africa, Lesotho, and Swaziland. Taxa distributions are georeferenced at the generic level and plotted along with the latest treatment of the vegetation at the level of biome and bioregion. These data represent a quantitative analysis that can be used to standardize niche model values applied to subsequent studies of sites within the area.

P799 **Geosciences**

Petrography of intrusions in northern Big Bend National Park supports passive emplacement mechanism

Victor P. Siller* and Joseph I. Satterfield, Angelo State University, San Angelo, TX.

Big Bend region intrusive igneous rocks display diverse compositions and ways of making space for themselves. Henry and others (1989) proposed that low-viscosity mafic igneous magma intruded passively while high-viscosity felsic magma forcefully intruded pre-existing rocks. To test this hypothesis, we described mineral compositions and textures of several passively emplaced Tertiary intrusions within Sierra del Carmen in northeastern Big Bend National Park. These intrusives have similar compositions which differ from the composition of the forcefully-emplaced McKinney Hills laccolith 12 km to the south. Dagger Mountain sills (DM) and the South Persimmon Gap pluton (SPG) contain four felsic minerals: nepheline in 0.6 mm-long crystals, leucite in 1.3 mm-long crystals, plagioclase feldspar in 1.7 mm-long crystals, and potassium feldspar in 1.7 mm-long crystals. Felspathoids comprise 10-40% of DM samples and 8-20% of SPG samples. DM and SPG contain four mafic minerals: biotite in 1.7 mm-long crystals, hornblende in 2.1 mm-long crystals, clinopyroxene in 1.8 mm-long crystals, and olivine in 0.5 mm-long crystals. Mafic minerals comprise 40 - 45% of DM samples and 31 - 33% of SPG samples. Although most samples are highly altered, recognizable igneous textures include zoned, embayed, poikilitic, anhedral, and subhedral crystals. Mineral compositions constrain DM samples to be leuciteolite and nepheline monzodiorite and SPG samples to be nepheline gabbro and nepheline monzodiorite. One felsic intrusion within a mafic DM sill is a nepheline monzosyenite. In contrast, the forcefully emplaced McKinney Hills laccolith includes alkali-feldspar syenite, alkali-feldspar quartz syenite, and riebeckite-rich alkali-feldspar granite (Martin, 2007).

800 **Geosciences**

Field study of the Susan Peak Oil Field, eastern shelf of the Permian basin, Tom Green County, Texas

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The Susan Peak Oil Field, approximately 20 miles southeast of San Angelo, lies on the Eastern Shelf of the Permian basin within the Fort Chadbourne fault zone. From 1948 through 1982 the field produced 16 million barrels of oil from three major reservoirs of Pennsylvanian age: Lower Strawn Group limestone, Upper Strawn Group limestone, and Canyon Group calcareous sandstone (Holmberg, 1987). The field was discovered by mapping a northeast-trending anticline in surface exposures of Cretaceous Edwards Group limestone (Graham, 1953). We have scanned 62 electric logs, made cross-sections, and constructed structure contour maps of Cretaceous and Pennsylvanian horizons. Work confirms the geometry of northeast-trending doubly plunging anticline described by Graham (1953) and Holmberg (1987), and adds new details that indicate timing and origin of the structure. First, Pennsylvanian Canyon sandstone beds thin and pinch-out on the crest of the anticline, documenting that the structure was active in the late Pennsylvanian. Second, the base of the Cretaceous section is broadly folded, which indicates a second phase of deformation no older than Cretaceous. This second phase could be a northwest-striking Laramide folding event that produced double plunges in northeast-trending Paleozoic structures. Alternatively, the second phase may be a reactivation of the strike-slip Fort Chadbourne fault zone that produced en echelon anticlines above this basement fault. Future work includes adding more well data to maps and cross-sections, making three-dimensional computer-generated fence and block diagrams, measuring strikes and dips of surface exposures, and exploring for faults in Pennsylvanian and younger beds.

P851 **Geosciences**

Earth science learning styles in 6-12 and higher education students

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Students in the Earth Sciences learn in a variety of different ways depending on their background and interests. This study proposes to evaluate how students in the Earth Sciences learn using various approaches such as: logical, linguistic, bodily-kinesthetic, musical, spatial, interpersonal, intrapersonal, naturalistic, or a combination of two or more. The main objective will be to evaluate the hypothesis that students in Earth Sciences learn using spatial, bodily-kinesthetic and naturalistic approaches when learning. Students that learn using spatial approaches are well equipped when using maps and navigating. Students that learn using bodily-kinesthetic approaches use their bodies similar to athletes and prefer hands-on activities. Students that learn using naturalistic approaches are well equipped to understand different aspects of the environment and nature. Phase I of this study is an evaluation of Gardner's Theory of Multiple Intelligences and its applications. Phase II consists of conducting a learning style survey provided by North Carolina State University (NCSU). Students in grades 6-12, as well as college students will be asked to participate in this survey. The survey is completed online by the student after which the results are sent to NCSU. Students will print out their completed survey analysis for further evaluation. With these results it can be determined if Earth Science students fall within the predicted learning styles. Determination of learning styles for students that are not Earth Science students may also be assessed with this survey.

870 **Geosciences**

Fossil turtles from the Devil's Graveyard Formation of Southwest Texas: Large terrestrial turtles and a geographic range extension for carettochelyid turtles

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Ongoing paleontological field research in the Devil's Graveyard Formation of Southwest Texas has yielded numerous fossilized turtle bones. These fossils are of late middle-Eocene (Uintan) age and provide important new insights into the Paleogene turtle diversity of West Texas. Field crews have collected an abundance of material, most of which is fragmentary in nature. Laboratory preparation continues and, to date, has resulted in the reconstruction of fragments into more complete specimens. At least two taxa have been identified from the material collected: a large robust terrestrial turtle (possibly tortoise) of uncertain taxonomic affinity and an unidentified taxon of *Carettochelyidae*. More taxa are likely represented, but interpretation of this material remains difficult. *Carettochelys insculpta* is the only extant member of *Carettochelyidae* and is restricted to New Guinea and northern Australia. The group was more diverse and widespread during the Tertiary, with records from North America, Europe, and Asia. This record from Texas extends the North American record, which includes material from the Paleogene of Saskatchewan, South Dakota, Utah, and Wyoming. In addition to providing this important geographic range extension for *Carettochelyidae*, our further goal is to refine taxonomic identifications through the application of apomorphic characters. This approach is difficult with such fragmentary material, but it provides the most uniform comparative basis necessary for comparison with contemporaneous faunal deposits from North America.

911 Geosciences

Permian strata of the San Angelo area contain systematic fracture sets

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The Permian San Angelo and Blaine Formations in the San Angelo area display at least two systematic subvertical joint or shear fracture sets: one strikes 358 and the other strikes 085. The north-striking set is found in Cenozoic caliche-cemented limestone conglomerate directly overlying Permian strata. E-W fractures formed after the Permian Blaine Formation was deposited and before the late Cenozoic. N-S fractures formed after Cenozoic gravel was cemented by caliche. Neither fracture set is typically mineralized; we are searching for shear-sense indicators. The San Angelo and lower Blaine Formations consist of sandstone and interstratified brick-red claystone. Thick, fine-grained quartz sandstone beds are commonly laminated, locally crossbedded, with abundant hematite concretions. Overlying Cenozoic clast-supported conglomerate contains subrounded limestone and sparse chert clasts several cm in diameter cemented by finely crystalline calcite. The Permian formations were deposited on the Eastern Shelf of the Midland basin, an eastern part of the Permian basin. Systematic joints in Permian and Triassic strata in the adjacent Palo Duro basin strike 275-295 and 305-320 (Collins and Luneau, 1986). E-W fractures in the San Angelo Formation may be correlative with the E-W set in the Palo Duro basin and caused by folding during Late Paleozoic Ouachita mountain-building. N-S fractures might be related to 10-0 Ma NW-SE Basin and Range extension. In this on-going study, data will be collected from San Angelo State Park exposures, the Twin Buttes Reservoir Spillway, and Lake Nasworthy Dam outcrops.

930 Geosciences

A water budget and analysis of water chemistry for the Pine Canyon Watershed, Big Bend National Park, Texas

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The Pine Canyon Caldera is located on the eastern side of the Chisos Mountains, Big Bend National Park, Texas. Water budget and controls on groundwater quality for the Pine Canyon aquifer system are of interest due to the pristine nature of the system, the semi-arid climate, and the geologic complexity of the aquifer. A water budget for the Pine Canyon groundwater system with all hydrologic variables was established to obtain an understanding of the system over a seven year period (1997-2003). The annual water budgets were averaged together to form a complete seven year water budget for the Pine Canyon system, demonstrating a surplus of 29.86 acre-ft of water to the system. Groundwater chemistry of the Pine Canyon system is controlled by: 1) original composition of precipitation, 2) evaporative concentration, 3) mineral dissolution, 4) cation exchange, and/or 5) complexing of ions. Evaporative concentration is the major contributing factor to spring water chemistry, combined with mineral dissolution and complexing to a lesser extent. The overall chemistry of the springs and groundwaters sampled exhibit mean Total Dissolved Solids (TDS) below 1000 mg/L (ppm), meeting drinking water standards set forth by the Environmental Protection Agency. Procedures developed for this research can be applied to a variety of similar regions in West Texas, to provide an understanding of aquifer function in semi-arid settings. It is vital that aquifer systems be quantified prior to exploitation to ensure sustainability of groundwater resources in the West Texas region.

934 Geosciences

Deposition, orogeny, erosion: The geologic story of Pedernales Falls State Park, Texas

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Pedernales Falls State Park contains a spectacular unconformity between tilted Paleozoic strata of Pennsylvanian Marble Falls Limestone and flat-lying Cretaceous rocks of the Sycamore, Hammett, Cow Creek, Hansel and Glen Rose Formations. Deposition of the Marble Falls Limestone occurred on a Pennsylvanian shelf, which contained abundant crinoids and sponges. Deformation of the Ouachita Orogeny tilted these rocks during the late Paleozoic Era. This deformation of the Paleozoic strata may have produced joints and tension gashes. Later erosion during the early Mesozoic truncated the tilted Paleozoic rocks and produced a relatively flat surface. Cretaceous seas during the Zuni transgressive cycle deposited clastic and carbonate strata horizontally over the tilted Paleozoic beds. Later uplift of the area during the Tertiary allowed the Pedernales River to cut down through and expose the angular unconformity. This caused a reorganization of the local drainage from dendritic to trellis pattern. Groundwater, passing through Paleozoic rocks, dissolved the limestone, produced caves, and reappears at the surface as springs below Pedernales Falls. Water in the Pedernales River flowing over the Marble Falls Formation, has cut sinuous channels and deep potholes in the limestone. Dissolution and differential erosion of the Marble Falls Formation has produced microkarst features and exposed chert layers. These and other features will be seen on a TAS field trip to this area.

963 Geosciences

New geoscience BS degree at Angelo State University

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Only two geoscience programs in West Texas exclusively concentrate on undergraduate education: Midwestern State University and Angelo State University (ASU). ASU Physics Department has offered an Earth Science minor since 2005. The first students declared a BS in Geoscience in August 2010; twenty-seven students now major in the field. An additional ~100 students major in Physics in our department. Program goals are to: prepare students for graduate study in diverse geoscience fields, prepare students to pass the National Association of State Boards of Geology (ASBOG) Fundamentals of Geology exam, and attract Hispanic and first-generation college students from our region. Our degree requires these courses: Physical Geology, Historical Geology, Stratigraphy and Sedimentation, Hydrology, Structural Geology, Petrology, Geochemistry, Planetary Geology or GIS, Field Methods, field camp, and Advanced Hydrogeology or Environmental Geology or Research. All students take ten hours of calculus, calculus-based physics, and Technical Writing. Students minor in Physics, Mathematics, English, or other fields. Our program emphasizes field work (Trans-Pecos Texas and Llano uplift exposures are accessible for weekend field trips) and undergraduate research (most students will complete a research project). Two full-time teaching faculty conduct research in structural geology, stratigraphy, hydrogeology, and geochemistry. Four part-time faculty specialize in planetary geology, GIS, science education, geomorphology, and hydrogeology. We collaborate with the USGS San Angelo office, San Angelo Independent School District, and the San Angelo Geological Society. Challenges include recruiting students, teaching increasing numbers, publishing research projects with students, and helping non-traditional students succeed in a rigorous science program.

979 Geosciences

Classic geology at Enchanted Rock: A physical geology course in a single outcrop?

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Enchanted Rock is an exfoliation dome developed on a granite pluton in the Llano Uplift of central Texas. It was implaced during the Grenville orogeny and the assembly of the supercontinent Rodinia. In the Tertiary, it was reexposed by the current erosional cycle. As a field trip stop for geology majors and nonmajors, it offers a wide range of opportunities to discuss basic and advanced geologic concepts. On the TAS field trip to Enchanted Rock State Park we will discuss the tectonic processes that created the granites, evidence for their episodic uplift and their exposure/reburial history during a series of major transgressions. In and around the pluton we will examine xenolith inclusions, possible rapakivi textures, magmatic foliation, hoodoos, exfoliation jointing, vernal pools, fault brecciation zones and the unusual mineralogy of proximal pegmatite dikes. The persistence of arkosic sediment in nearby streams and the development of contact migmatites in regionally metamorphosed Packsaddle Schist on the edge of the pluton will also be considered. Lastly, we will examine a group of exfoliation slab caves at the back of Enchanted Rock. This is an opportunity to revisit a scenic and classic geologic area. It is not quite an entire physical geology course in a single outcrop, but it touches on many topics.

1002 Geosciences

Vulnerability of the Carrizo-Wilcox aquifer in central Texas

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The majority of the earth's freshwater resources are contained in groundwater systems and are extremely important in areas where surface water is previously allocated or unreliable. In many areas these systems are in peril of becoming polluted due to various types of development. These systems have the ability to naturally attenuate most potential pollutants. This ability is dependent upon many characteristics such as type of aquifer, depth to water, and the structural and lithological makeup of both the unsaturated and saturated zones. In Central Texas, most surface water resources are previously allocated and the Edward's Aquifer is tightly managed due to endangered and threatened species which rely on the aquifer. The Carrizo-Wilcox Aquifer in Central Texas is a sand aquifer interbedded with gravels, lignite, silt and clays of Eocene age. The Carrizo-Wilcox Aquifer is being considered for a fresh water supply for the rapidly developing Interstate Highway 35 corridor between San Antonito and Waco. Development in this area is inclusive of parts of the Carrizo-Wilcox recharge zone and raises concerns about the vulnerability of the aquifer to various types of pollutants.

1014 Geosciences

Edwards plateau, Texas cave deposits—results and questions

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Quaternary deposits in caves on the Edwards Plateau are a rich source of vertebrate fossils. These fossils have provided insights into the structure of the vertebrate faunas of that area over the last 25,000 years. One cave has a detailed record of faunal change over the last 17,000 years. Another has provided unique information on the structure and growth of the scimitar cat *Homotherium*. The mammalian component of the fossil faunas clearly shows non-analog associations. The rarity of faunas older than 15,000 years is puzzling probably indicating that caves do not stay open to the surface very long in this area. Only two older cave faunas are known, one from Laubach Cave, locality 3 dated 23,000 BP and one from sediments with reversed magnetic orientation at Fyllan Cave at least 780,000 BP. These were found in the course of excavations. The age of cave formation is probably no older than the age of the Balcones faulting, about 21 million years ago, that broke the aquifers allowing water to move through the rock formations and exit along the fault. It is not known when the caves would have first opened to the surface to accumulate deposits and remains of animals. It is likely that there are potentially very old (Pliocene and early Quaternary) cave deposits in this area. These deposits are likely to be found only through excavations such as quarries and road cuts.

1035 Geosciences

A review of the Goniopholidae and new crocodile fossils recovered from the Woodbine formation at the Arlington Archosaur Site

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The goniopholid crocodiles are a distinct group of extinct neosuchian crocodylians. They have been discovered on nearly every continent, holding a near global biogeographic distribution and a broad biostratigraphic range (Late Jurassic –Late Cretaceous). The purpose of this project is to review the crocodiles reported as *Goniopholis*, ascertain how many are still considered valid, and compare the characters that define *Goniopholis* to *Woodbinesuchus* and crocodile material recovered from the Woodbine Formation at the Arlington Archosaur Site (AAS). A review of the literature produced 27 goniopholids, but only 10 of these remain valid. The characters regarded as goniopholid are discussed and then applied to specimens recovered from the AAS. Characters presented in this analysis include: (1) subrectangular, flat, and uniformly pitted osteoderms with distinct pegs, (2) presence of a deep groove along nasal bones, and (3) teeth that show lateral carinae and serrations. Currently, the only crocodylian from the Woodbine Formation is *Woodbinesuchus*. Lee (1997) described it as a small, gharial-like crocodylian. It had a long slender snout, gracile skull, and long thin teeth, similar to predators that feed upon fish. The crocodylian recovered from the Woodbine at the AAS is uniquely different. The AAS crocodile has a broad, triangular snout, typical of turtle crushing crocodylians. Fossils found at a site in 2010, the “Turtle Buffet”, support this feeding adaptation as broken turtle shell with crocodile teeth marks were recovered. This study is a preliminary analysis, yet it appears that a new goniopholid crocodile has been recovered from the AAS.

P1036 Geosciences

Excavating Cretaceous crocodiles at the Arlington Archosaur Site: A method for mapping fossil quarries

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The Arlington Archosaur Site (AAS) in Tarrant County is an urban fossil site that has produced the remains of numerous Cretaceous vertebrates. The vertebrates range from dinosauria, crocodylian, chelonian and dipnoan, with crocodile being the most common. All of the AAS fossils occur within the coastal Cretaceous (Cenomanian; 95 Mya) Woodbine Formation. The paleoenvironment of the Woodbine at the AAS was a coastal delta plain; mudstone overlying peat. In 2009, a large Cretaceous crocodile was excavated in a hectic one week dig. A field team was assembled within 24 hrs to work the excavation in what is now called *Crocorama*. The site was mapped using a Cartesian coordinate system. A 5.0 x 2.5m grid system was established around the Crocorama dig. Fossils were drawn into the map grid with a 50 cm x 50 cm square grid and given Cartesian coordinates. The use of a Cartesian coordinate system not only allowed for the recording of the location of each fossil, but also allowed for the expansion of the map in any direction by simply adding more grids. Using this system, the original Crocorama dig site was expanded into a 100 x 25 m linear map over the 2010 field season. Fossils from new sites discovered at the AAS in 2010 were easily added into the map system. As yet, there is no standard mapping method used in vertebrate paleontology. The methods developed at the AAS could be used as a standard field mapping method for vertebrate paleontology.

1043 Geosciences

***Bison antiquus* and *B. latifrons* from the latest Pleistocene Nueces River Valley, South Texas**

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Two extinct species of bison, *B. latifrons* and *B. antiquus*, were present in South Texas during the latest Pleistocene (13 ka). Most previous studies conclude that *B. latifrons* was ancestral to *B. antiquus* and went extinct by 20 ka, well before the end of the Wisconsinan. Fossils were collected from the valley fill deposits in the Nueces River Valley at the Wright Materials gravel pits in western Nueces County. Only complete or nearly complete postcranial elements were used for the study. *Bison antiquus* is represented by 244 elements: 44 metacarpals, 25 metatarsals, 146 astragali, 24 calcanea, 4 radii, and 1 humerus. *Bison latifrons* is represented by 39 complete postcrania: 9 metacarpals, 15 metatarsals, 2 astragali, 1 calcaneum, 9 radii, 1 humerus, 1 tibia, and 1 femur. A principal component analysis of the 42 metacarpals of *B. antiquus* identified 24 as female and 18 as male. In addition, 50 partial and 8 relatively complete horn cores of *B. antiquus*, and 7 partial horn cores of *B. latifrons* were identified.

686 Marine Science

Effects of exopolymeric substances (EPS) on engineered nanoparticle transport (EN) into marine phytoplankton cells Phase I: Dissolution kinetics of quantum dots in aquatic systems

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Although quantum dots (QDs) are becoming more common in biomedical applications, they can be toxic to many organisms. However, the mechanisms of toxicity remain unknown. Little research has been done on fate and effects of quantum dots as they are released into the environment. This study attempts to determine how QD's dissolution kinetics is affected by physicochemical factors, e.g., ionic strength and presence of natural organic matter compounds. We found that the QDs readily dissolved in nanopure water and in seawater, with a somewhat higher solubility in the former. However, surface functionalization of QDs had no effect on dissolution. A high protein containing exopolymeric substance from a marine phytoplankton species appeared to exhibit a protective effect by causing the QDs to aggregate.

692 Marine Science

Arsenic exposure and the efficacy of shoreflies (*Diptera: Ephydriidae*) and tiger beetles (*Coleoptera: Cicindelidae*) as bioindicators of the Laguna Madre, Texas

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Studies of ambient water quality and arsenic levels of the Laguna Madre, Texas focus most on non-insect, aquatic bioindicator species living in this hypersaline lagoon. Immature shoreline insects inhabiting the benthic zone and terrestrial adults of the supralittoral zone experience potential arsenic exposure through dermal contact and ingestion pathways. This study measured arsenic levels in water, porewater, wet and dry sediment, algae, and bacteria and presents pathways of how arsenic enters the food web of shoreline insects. The efficacy of shoreflies (*Diptera: Ephydriidae*) and tiger beetles (*Coleoptera: Cicindelidae*) to act as bioindicators of arsenic exposure is evaluated and discussed.

695 Marine Science

Shellfish restoration headwinds: Parasites and predators

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Major efforts are either ongoing or planned to restore oyster reefs that are in decline due to anthropogenic and natural causes. Often, restorers consider overfishing and pollution as the primary causes of the decline with little regard for shellfish enemies. Examples of restoration efforts in Texas and Maryland, in which success is at risk from disease and predation of target species, will be presented.

P704 Marine Science**Nutrient limitation of phytoplankton in the Brazos-Santiago Pass, South Padre Island, Texas**

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Nutrient limitation of phytoplankton in the Brazos-Santiago Pass, South Padre Island, Texas. Nutrients like nitrogen and phosphorus are needed for photosynthesis. When there are inadequate amounts of nutrients primary production can be limited. In order to determine which nutrient (or combination) may limit phytoplankton primary productivity in a South Texas tidal pass, we sampled the waters of the Brazos-Santiago Pass, Texas during June 2010 and initiated a microcosm experiment to assess the effects of addition of nitrogen (+N), phosphorus (+P), nitrogen and phosphorus combined (N+P), and urea, an organic form of nitrogen (+U), on plankton primary production rates. Quadruplicate two liter samples per treatment were incubated for two 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. There were significant differences among all treatments (One-Way ANOVA $F_{10,4} = 7.93$, $P = 0.004$). The +N treatment yielded the highest photosynthetic rates, adjusted for chlorophyll ($0.036 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$, $SE = 0.013$), followed by the N+P ($0.023 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$, $SE = 0.017$), and then +P ($0.005 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$, $SE = 0.013$), though post-hoc tests (Holm-Sidak) revealed no differences between these treatments, including the control (C) ($0.014 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$, $SE = 0.003$). The source of significant difference in treatments came from the +U treatment, which had a net negative photosynthetic rate ($-0.054 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$, $SE = 0.014$), possibly due to stimulation of bacterial respiration due to urea addition, a carbon source. The phytoplankton community in the water of the Brazos-Santiago Pass were found to be limited by nitrogen during June 2010, consistent with classical theory. Marine phytoplankton are typically thought to be nitrogen limited so our result was not surprising, although we have previously found that shifts in nutrient limitation have shifted to co-limitation of N+P during other years and during different times of the year as a result of the interactive variability of nutrient availability, temperature and salinity.

P705 Marine Science**Primary productivity in the Lower Laguna Madre, Texas, from Port Mansfield to the Gulf of Mexico**

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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 estuarine 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. We measured primary production by the light/dark bottle method 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 June 2010 cruise. Primary production measurements were at 5 locations using ship board incubations (3 hrs or less) that took place between 0900 and 1500. Sites near the AC (ASP2, DB203, and GF) had production rates between $0.013 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$ to $0.019 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$. An oligotrophic seagrass site (ABC) had negative production rates ($-0.30 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$), while the Brazos-Santiago Pass (BS) site had production rates 85 to 89% greater than all others ($0.12 \text{ mg O}_2 \mu\text{g chl } a \text{ l}^{-1} \text{ hr}^{-1}$), possibly due to tidal flushing at the BS Pass. Cumulatively, there was no significant difference among sites ($F_{15,4} = 0.39$, $P = 0.81$), however, exclusion of the ABC site does reveal statistically significant differences between remaining sites ($F_{12,3} = 18.62$, $P < 0.001$). Exclusion of the BS data showed no statistically significant differences between sites adjacent to the AC, despite 12 to 36% differences between sites. The data still suggest that the AC is a major contributor to phytoplankton primary productivity in certain areas of the LLM and it is possible that macroalgal production and biomass will mirror this pattern.

P706 Marine Science**Water column chlorophyll decrease as an indicator of filtering capacity of the eastern oyster, *Crassostrea virginica*, Lower Laguna Madre, Texas**

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Oysters, as filter feeders, have great capacity to clarify the water column, as well as provide valuable physical three-dimensional reef structure utilized by numerous small estuarine organisms. The Lower Laguna Madre of Texas (LLM) has been home to substantial populations of the Eastern Oyster, *Crassostrea virginica*, which can filter large volumes of water as it feeds. Some studies have used turbidity and total suspended solids (TSS) concentrations as dependent variables to assess filtering rates. We utilized water column chlorophyll *a* (Chl) as an indicator of filtration (grazing) rates and compared it to the TSS method in four 20 liter mesocosms of unfiltered seawater from the site where the oysters were collected. We also examined the efficacy of filtration rates of both methods as a function of oyster size (equal number of individuals). Overall, mean filtration rate for the Chl method was 3.41 ng Chl l⁻¹ hr⁻¹ g⁻¹ oyster tissue (SE = 0.39), and ranged from 2.35 to 4.57 ng Chl l⁻¹ hr⁻¹ g⁻¹ oyster tissue. Filtration rate for the TSS method was 384.52 μg l⁻¹ hr⁻¹ g⁻¹ oyster tissue (SE = 0.59), and ranged from 150.78 to 589.29 μg Chl l⁻¹ hr⁻¹ g⁻¹ oyster tissue. TSS filtration rate was significantly faster than the rate for Chl ($t_7 = -6.39$, $P < 0.001$), although the coefficient of variation (CV) was greater with the TSS method (0.44), compared to the CV for Chl (0.33). Grazing pressure was strong enough to cause a significant difference in both Chl and TSS concentrations between the beginning (Chl = 0.97 μg l⁻¹; TSS = 179.87 μg l⁻¹) and end (Chl = 0.01 μg l⁻¹; TSS = 68.87 μg l⁻¹) of the experimental period (15.2 hrs) (Chl: $t_{14} = 195.09$, $P < 0.001$; TSS:). Large oysters filtered significantly faster ($H = 5.33$, $DF = 1$, $P = 0.03$) than smaller oysters (mean = 28.04, SE = 0.21; mean = 15.49, SE = 0.06, respectively). Grazing rate was not significantly dependent on oyster size regardless of method ($F_{7, 1} = 0.009$, $P = 0.92$). Regardless of method, oysters are capable of significant removal of TSS and Chl and increasing transparency of the water column.

709 Marine Science

Processed waste water: Potential tool for promoting oyster reefs in high-salinity waters

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A pilot study is underway to determine the feasibility of using the daily production of 10 to 12 million gallons of processed industrial waste water to manage (reduce) the ambient salinity in a small embayment (Swan Lake) in lower Galveston Bay, Texas. The proximity of Gulf Coast Waste Disposal Authority (GCWDA) facility to Swan Lake provides an excellent site for testing this proposal. The oyster population in Swan Lake is heavily impacted by Dermo disease (*Perkinsus marinus*) and the Southern Oyster Drill (*Stramonita (Thais) haemastoma*). This multi-year study includes hydrographic measurements, oyster recruitment, oyster meat index, Dermo disease level and assessments of phytoplankton population at several sites in and adjacent to Swan Lake (surface area: 259 hectares (630 acres)). Also, comments concerning oyster reef restoration in the Gulf of Mexico will be presented.

764 Marine Science

Post-hurricane Alex effects of phytoplankton primary production of the Lower Laguna Madre

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Hurricane Alex, the first tropical cyclone of the 2010 hurricane season, struck Northern Mexico on 1 July and deposited substantial rain within the Rio Grande watershed below El Paso and seaward. Through direct precipitation, runoff, and flood control diversion through the Arroyo Colorado (AC), significant freshwater entered the Lower Laguna Madre (LLM). From July through September, we documented the effects of this extreme high freshwater flow event on the biological characteristics (water column chlorophyll and primary productivity) of the LLM during eight cruises along the north-south axis of the LLM, from the Brazos-Santiago Pass northward to near Port Mansfield Pass. Chlorophyll and primary production exhibited temporal or spatial trends. Salinity was between 0 and 5 PSU from 22 July to 21 August at most sites. Water column chlorophyll concentrations were between 1 and 5 μg l⁻¹ nearer the Brazos-Santiago Pass, while bloom concentrations of more than 20 μg l⁻¹ were found near the Port Mansfield Pass. Net community primary productivity estimates were highly variable spatially and temporally. Mean production rate was greatest at the Arroyo Colorado upstream site (0.063 mg O₂ μg⁻¹ Chl *a* l⁻¹ hr⁻¹; SE = 0.020) and least at sites south of the AC (0.012 mg O₂ μg⁻¹ Chl *a* l⁻¹ hr⁻¹; SE = 0.002), suggesting that bloom conditions and greater productivity were supported by inputs from floodwaters supplementing the system.

789 Marine Science

Protecting Texas seagrasses from wastewater discharges

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Seagrass beds are critical nursery habitat for estuarine fisheries and wildlife, providing food for fish, waterfowl and sea turtles, cycling nutrients, and stabilizing sediments. Increasing development along the Texas coast threatens seagrass habitat in many ways, one of which is the discharge of wastewater into seagrass areas. A residential development planned for the Port Bay area (Aransas County) includes a proposed domestic wastewater discharge near seagrass beds in Port Bay. In Texas, wastewater discharges are permitted by the Texas Commission on Environmental Quality (TCEQ). Permits are written to ensure compliance with the state's water quality standards. The TCEQ writes stringent nutrient limits (nitrogen and phosphorus) into wastewater permits which discharge to seagrass beds, based on best professional judgment. No studies have been performed to find whether these permit limits are, in fact, protective of seagrasses. Seagrass beds in Port Bay were sampled using protocols recommended by seagrass researchers (Dunton et al 2007) to determine seagrass condition and evaluate environmental stressors. The study included three major components: landscape monitoring using aerial photography, seagrass condition and water quality indicators, and fluorometric epiphyte analysis. A second site, East Flats, is located in Corpus Christi Bay near Port Aransas, and was sampled using the same protocols and level of effort, as a point of reference. This data set will be considered a baseline for seagrass and environmental conditions in the area, and the study will be repeated using the same protocols and sampling stations after the wastewater discharge commences.

820 Marine Science

Estimating incidence of multiple paternity of Kemp's ridley sea turtles on South Padre Island, Texas

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Despite extensive protection of the Kemp's ridley sea turtle, *Lepidochelys kempii*, little is known about the genetic mating system. Jensen et al. (2006) found a positive relationship between the incidence of multiple paternity (MP) and the estimated population size of rookeries, especially for the genus *Lepidochelys*. Jensen et al. (2006) hypothesize that large aggregations of females near a rookery result in higher levels of MP. In a study of the olive ridley, Jensen et al. (2006) found 30% of nests at a solitary nesting rookery exhibited MP, whereas 92% of nests at a high-density rookery exhibited MP. The only study to date of MP in the Kemp's ridley, in the high density Rancho Nuevo rookery, estimated 81% of nests were multiply sired (Kichler et al. 1999, Wang 2004). If MP is positively related to nesting female density, then MP in Kemp's ridley should be lower on a low-density nesting beach on South Padre Island, Texas (SPI) than in the much larger nesting population of Rancho Nuevo. We tested this hypothesis by genotyping tissue samples from dead hatchlings and embryos from Kemp's ridley nests on SPI at 14 microsatellite loci. During the 2010 nesting season, we collected 156 tissue samples from 25 nests from approximately 22 females. Models by Kichler et al. (1999) suggest that the minimum sample size required to detect MP is three per nest. Preliminary results using full sibship reconstruction as implemented in COLONY indicated that 46% of nests with three or more samples (7 of 15) exhibited MP. These data suggest that the incidence of MP at this nesting beach is lower than the higher-density nesting colony in Mexico, consistent with the female density hypothesis.

P824 Marine Science

Mercury concentrations in four species of snapper (*Lutjanus spp.*) from the northern Gulf of Mexico

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The presence of methyl mercury (MeHg) in fish tissue, and the potential associated health risks, has become a global concern. Studies on marine food webs and MeHg accumulation are lacking, especially in the Gulf of Mexico (GOM). We examined total mercury (Hg) concentrations in four species of snapper: red (*Lutjanus campechanus*, n = 150), mangrove (*Lutjanus griseus*, n=44), lane (*Lutjanus synagris*, n = 26) and vermilion (*Rhomboplites aurorubens*, n=101). Fish were collected from five regions of the Northern GOM (Destin and Tampa, Florida, Louisiana, Alabama, and Texas). The locations from which we collected fish samples in the Northern GOM had no significant effect on the average Hg concentrations of the four snapper species. Hg concentrations in red, mangrove and lane snapper were significantly higher than in vermilion snapper. We used nitrogen ($\delta^{15}\text{N}$) stable isotope values to investigate differences of Hg bioaccumulation among species. Total average $\delta^{15}\text{N}$ values were highest for mangrove and lane snapper and lowest for red and vermilion snapper, with vermilion having the lowest average $\delta^{15}\text{N}$ values. We hypothesize that the low Hg concentrations we observed for vermilion may be explained by their low trophic position. Thirteen-percent of red and 5% of mangrove snapper had Hg concentrations at or above the US Environmental Protection Agency's (EPA) benchmark for the protection of human health, while none of the vermilion or lane samples had concentrations above the benchmark.

841 Marine Science

The effects of freshwater discharge on the Lower Laguna Madre following landfall of hurricane Alex, July 2010

Joseph Kowalski*, and Hudson DeYoe, Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American, Edinburg, Texas.

Hurricane Alex was the first tropical cyclone of the 2010 hurricane season. It struck Northern Mexico on 1 July and deposited substantial rain within that part of the Rio Grande watershed below the El Paso area and seaward. Direct precipitation, runoff, and flood control diversion actions at Amistad and Falcon Reservoirs, channeled floodwater eventually into the Lower Laguna Madre (LLM) by way of the Arroyo Colorado (AC), a distributary of the Rio Grande. From July through September we investigated the effects of this high freshwater flow event on the hydrographic (dissolved oxygen-DO, pH, salinity, turbidity, and Secchi depth) and biological characteristics (water column Chl and primary productivity) of the LLM during eight cruises along the long axis of the LLM, from the Brazos-Santiago Pass northward to near Mansfield Pass. Although significant, the only parameters which revealed any degree of temporal or spatial trend were pH, salinity, Secchi depth, and the biological parameters, of all factors tested. DO was never monitored below the hypoxic threshold and was generally between 5 and 7.2 mg l⁻¹. pH, though spatial values varied greatly, tended to be much higher (7.9 to 8.2) at sites away from those nearer the Brazos-Santiago Pass (7.8 to 7.9) to the south. Salinity was highly variable, though it displayed strong spatial trends with lowest salinities nearest the mouth of the AC. The extent of freshwater intrusion into the LLM was sufficient to depress salinities to between 0 and 5 PSU by 6 August at 10 of our 13 sample stations. Secchi depth ranged from around 1 m at sites nearer to the Brazos-Santiago Pass, but dropped to 0.3 to 0.6 m northward. The greatest single impact from this freshwater disturbance may very well be the effect depressed salinities had on the seagrasses of the LLM. This event was of sufficient magnitude and duration to adversely affect seagrass distribution and abundance of LLM seagrasses, as we witnessed great rafts of floating leaves on many of the cruises. If decimated, much of the benthos of the LLM may enter into a new phase of secondary succession.

844 Marine Science

Green sea turtle (*Chelonia mydas*) assemblages in Texas' Lower Laguna Madre

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Texas waters provide essential habitat to five protected sea turtle species, including the green turtle (*Chelonia mydas*). Population dynamics of Texas' green turtle assemblage are virtually unknown to management agencies, despite the likelihood constituent stocks represent the largest northern Gulf concentration of conspecifics west of Florida. To fill this informational void, entanglement netting, visual surveys and satellite telemetry were utilized across four seasonal periods to assess abundance, distribution, and habitat use of greens within seagrass and jettied habitats of the Lower Laguna Madre (LLM). These efforts provided evidence for an exponentially increasing abundance of green turtles in Texas waters since 1991, with this population concentrated in lower reaches of the LLM. Visual sightings of post-pelagic greens at the Brazos-Santiago Pass jetties during 2009 were roughly nine times those reported by Coyne (1994) for comparable months in 1992-1993. This population growth included the increased frequency of smaller individuals in study-wide catches since 2006, likely an artifact of enhanced recruitment from elevated nesting productivity at beaches in Mexico, Florida, and the Caribbean. Two greens satellite tracked during this study made seasonal migrations into Mexican waters following passage of strong cold fronts. However, many greens may

overwinter in the LLM as evidenced by a record-breaking cold-stunning event in January 2010 that involved hundreds of green turtles and heightened concern for its impact on this species' population status in Texas.

P865 Marine Science

Synoptic survey of water and sediment quality of the Lower Laguna Madre, TX

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The Lower Laguna Madre (LLM) is one of the lesser studied coastal bays in Texas. In an effort to establish baseline data for the lagoon, we performed a synoptic survey in May 2010 consisting of eight sites distributed along the entire length of the LLM. At each site, routine water quality data was recorded and samples of water, sediment, seagrass and algae were collected. Water samples were analyzed for chlorophyll, TSS, ammonium, nitrate and phosphate. Sediment samples were analyzed for ammonium, sediment grain size and ash-free dry weight. Algae and seagrass data will be reported elsewhere. Highest chlorophyll and nitrate levels were reported at the Arroyo Colorado site which is known to have high nutrient loading while lowest levels of these parameters were found at ABC, a hydrographically isolated segment of the LLM. Dissolved phosphate levels varied the least among the water quality parameters ranging from 7.8 to 22.7 micromolar. Sediment grain size varied significantly among sites with coarser sediments at the sites north of the Arroyo Colorado. Sediment ammonium levels ranged from 142 to 2837 micromolar and were negatively correlated (-0.8) with % ash-free dry weight. Based on this study, it is clear that water and sediment quality varies significantly within the basin and so management plans should reflect these differences.

P868 Marine Science

Plankton primary productivity of the tidal segment of the Rio Grande, TX

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The Rio Grande is heavily utilized and manipulated by man but has ecological value to the region. There is little ecological data for the river. This study was initiated to collect quarterly data on the primary productivity of the river plankton at 2-3 sites in the tidal segment. Primary productivity of the plankton was measured at the UTPA campus using the light/dark bottle method and measuring dissolved oxygen concentrations before and after an incubation period ranging from 2-3 hrs. Plankton chlorophyll level was measured by acetone extraction and quantification by fluorometry. During water collection, typical field data was recorded and samples collected for nutrient analysis. Primary productivity was measured twice in the fall- 26 Oct 2010 while river level was high due to post-hurricane flows and 23 November 2010 after river level had returned to near normal level. Net and gross chlorophyll adjusted primary productivity values were about ten times higher for the November samples compared to the Oct samples (net 0.16 vs 1.19, gross 0.12 vs 1.22 mg O₂/μg chl/hr). Incubation temperatures for October and November measurements ranged from 24.5 to 26.5 °C. From October to November collections, salinity increased slightly (0.42 to 0.72 PSU) while nitrate increased from 33 to 52 μM and ammonium and phosphate did not change appreciably. These results suggest that the phytoplankton were nitrogen-limited in the fall.

P873 Marine Science

How specialized is a specialist? The use of fish hosts by a behavior-manipulating parasite

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Ecological theory predicts that specialization increases the exploitation of a suitable niche at the expense of the number of suitable niches. The degree of host specificity of *Euhaplorchis sp.*, a specialist parasite encysting on the brain and manipulating its fish host behavior, was tested based on the phylogeny of five fish species; the Sheepshead Minnow (*Cyprinodon variegatus*), Longnose Killifish (*Fundulus similis*), Gulf Killifish (*Fundulus grandis*), Rainwater Killifish (*Lucania Parva*) and the Amazon Molly (*Poecilia formosa*). Wild-caught fish were measured, weighed, and dissected to assess the number of *Euhaplorchis* on the brain and in the liver. Out of the five species that were dissected, only three of them contained *Euhaplorchis sp.* on the brain; the Longnose Killifish, Gulf Killifish, and the Amazon Molly. While two of the three species are closely related (*F. similis* and *F. grandis*), *P. formosa* is relatively distantly related to the other two suggesting that *Euhaplorchis sp.* may not be as host specific as previously thought. Experimental infections and behavioral studies are needed to verify our observational data.

P874 Marine Science

Transmission of potential zoonotic parasite to oysters (*Crassostrea virginica*) in the Lower Laguna Madre, South Texas

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Oyster beds provide vital ecosystem services and are habitat to a diverse group of organisms in Texas coastal bays and estuaries. A recent study from the Lower Laguna Madre, South Texas showed that the common oyster, *Crassostrea virginica* is infected with the trematode, *Acanthoparyphium spinulosum*. This parasite potentially infects humans if infected oysters are eaten raw. The objective of this study was twofold. Firstly, we measured the abundance of *A. spinulosum* from a South Padre Island site. Secondly, we used an experimental approach to measure the effect of oyster density and distance from the shore line on the transmission of the parasite to *C. virginica*. Oysters were collected in February and May of 2010. A total of eight oyster clumps were collected; four clumps of low density (five oysters per clump) and other four clumps of high density (20 oysters per clump). The experiment was left for a period of three months and oysters were subsequently dissected for parasitic quantification under a compound microscope. Approximately 90% of all oysters were infected with *A. spinulosum* and each oyster harbored five infective cysts on average. There was no significant effect of oyster density on the mean abundance of parasites in individual oysters. However, proximity to the shoreline was a critical factor affecting the likelihood of parasite transmission to oysters. This study is the first to systematically study the transmission of *A. spinulosum* to oysters in South Texas and it provides baseline information on the risk of human infection in the area.

891 Marine Science

Cloning & sequencing housekeeping genes towards the development of molecular stress response markers in seagrasses

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Seagrass meadows are important primary producers and habitats in estuaries and near shore marine environments, but many populations are in decline due to anthropogenic influences. Measurements of biomass are commonly used to gauge the physiological status of seagrass meadows, but these are "lagging indicators" of the underlying causal event(s) and have not answered questions about why, despite attempts to correlate with seagrasses to stresses. We propose transcriptomic measurements of gene expression to assess relative long term stress levels between impacted and nonimpacted seagrasses. Control (*Act1*, *Gapdh*) and stress genes (*Apx1*, non-symbiotic *Hb1*, and *Pall*) were first identified by literature search using rice (*Oryza sativa*) genome as a model. Multiple alignments were performed to identify conserved regions and degenerate PCR primers used for cloning and sequencing from five seagrass species: *Halodule wrightii*, *Thalassia testudinum*, *Halophila englemanni*, *Ruppia maritima*, and *Cymodocea filiformis*. Actin gene fragments (1-1.8 kb) for exons 2-4 were amplified from five species, and *Gapdh* (exons 5-9) was amplified from *H. wrightii*. Intron length varied for actin with *C. filiformis* containing the largest introns. Splicing junctions were verified comparing cDNA sequences from *H. wrightii*. We were unsuccessful amplifying the desired stress-related genes from seagrasses. *Hb1* primers yielded PCR products from *H. wrightii* around the expected size (~759 bp), but sequence analysis has identified this as a bacterial-like NAD/NADP octopine/nopaline dehydrogenase.

P913 Marine Science

Evaluation of the distribution and fate of arsenic in the Lower Laguna Madre food web

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Arsenic is a naturally occurring element that can be found in U.S. lakes, rivers, and estuaries. Over the past few decades it has become an anthropogenic pollutant, mainly due to agricultural run-off from pesticide use. There is a growing concern that arsenic may accumulate in higher trophic levels and disproportionately affect top predators including humans. The Rio Grande and Arroyo Colorado rivers experience elevated levels of pesticides from run-off and it is likely that the biota of Laguna Madre contains high concentrations of arsenic. The purpose of this study was twofold. First, we examined the widespread white shrimp, *Litopenaeus setiferus* collected along a North-South transect in the Lower Laguna Madre to determine the spatial distribution of arsenic in the Lower Laguna Madre. Secondly, we systematically sampled three different trophic groups and four trophic levels from one site to determine the fate of arsenic as it moves through the food web. The samples were processed using chemical digestion followed by measurements on an Inductively Coupled Plasma (ICP) Atomic Emission Spectrometer. The results indicated that the arsenic concentration varies significantly among sites in the Laguna Madre (range: 4.0 to 12.3 ppm (µg/g)). The results also indicated that arsenic accumulated in animals compared to water, sediment and seagrass. Analyses of arsenic concentration among trophic levels to examine the rate of bioaccumulation are in progress.

P914 Marine Science

Larval tapeworm infects the nervous system and increases activity of commercially harvested white shrimp (*Litopenaeus setiferus*)

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Larval tapeworms (*Polyocephalus* sp.) reside within the central nervous system of decapod crustaceans. Living within the nervous system would seem to create an excellent opportunity for the parasites to manipulate the behavior of their hosts, so we tested the hypothesis that behavior of one host, white shrimp (*Litopenaeus setiferus*), would be correlated with the level of parasitic infection. We videorecorded the behavior of *L. setiferus* for 8 hours, then examined the nervous system and digestive glands for parasitic infection. Larval *Polyocephalus* sp. were found in the nerve cord, often in large numbers, but only very rarely in the digestive gland, which was typically infected by the nematode, *Hysterothylacium* sp. There were significantly more *Polyocephalus* larvae in the abdominal and thoracic ganglia than the subesophageal ganglia and brain. Shrimp activity (composite measure of walking and swimming) was significantly and positively related to the number of *Polyocephalus* sp. lodged in nervous tissue as well as shrimp carapace length. *Polyocephalus* sp. is one of only a few parasites residing inside the host nervous system and this parasite may therefore be suitable for investigating mechanisms of parasite manipulation of invertebrate host behavior.

941 Marine Science

Unique assemblages of epiphytic bacteria on seagrasses from an estuary and a hypersaline lagoon on the South Texas Coast

Valerie Chilton*, Kirk Cammarata, Texas A&M University - Corpus Christi

There is concern for the global decline of seagrass beds due to their ecological importance. Epiphytic biofilms of bacteria and algae may contribute to the decline of seagrasses by shading the light required for photosynthesis. Eutrophication and other environmental changes may affect the overall quantity, diversity and species richness of these epiphytes. Because microbial populations can be indicators of biogeochemical conditions, characterization of the epiphytic organisms, particularly bacteria, will provide insight into environmental conditions. Representative bacterial epiphyte species assemblages on both *Halodule wrightii* and cellulose substrates were compared between the Corpus Christi Bay estuary (East Flats) and a hypersaline lagoon (Upper Laguna Madre). Species assemblage profiles were generated by denaturing gradient gel electrophoresis (DGGE) following amplification of 16S rRNA genes using primers for alphaproteobacteria, gammaproteobacteria, cyanobacteria, and bacteroidetes. Unique diversity was observed (MDS plots) for bacterial assemblages from the estuary versus hypersaline lagoon and from seagrass leaves versus substrates at each site for some bacterial groups. A rarefaction curve constructed from clone library sequences indicates a highly diverse environment which has not been fully characterized. Comparison of library sequences to Ribosomal Database Project II indicates the presence of methanotrophs, nitrogen fixers, nitrifiers, sulfide oxidizers, and other species indicative of an interface between aerobic and anaerobic conditions.

974 Marine Science

Nature of water exchange processes at the Aransas Pass tidal inlet, TX, observed by simultaneous currents and water property measurements

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Ecosystem health of the Aransas estuary system is affected by dynamic water exchange processes between incoming seawater from the Gulf of Mexico and local bay waters. Freshwater inflow is usually low in this region resulting in poor mixing efficiency and long residence time, except during episodic flood events. The Aransas Pass tidal inlet at Port Aransas, TX is an ideal place to monitor the nature of water exchange processes between offshore and estuarine waters in Texas Coastal Bend. A 1-MHz acoustic Doppler current profiler and a multi-parameter profiling data sonde have been deployed at the University of Texas Marine Science Institute pier at the inlet during the summer to winter season of 2010 to simultaneously record the current and water property characteristics throughout the water column. The alternating current direction due to tidal forcing was accompanied by corresponding salinity changes throughout the water column. Biogeochemical properties, such as dissolved oxygen and pH, were also influenced by the tidal exchanges. The strength of the currents varied by depth and by time according to the tidal cycle. Whether ebb and flood currents are balanced, how turbulent the water is at the inlet site, and how far the alternating waters can travel into the bay system will be discussed. Continuous observation of high-resolution currents and water properties at a critical coastal location will provide us with better understanding of long-term processes as well as episodic events, and their impacts on coastal ecosystem.

P985 Marine Science

Competition between the algae *Penicillus capitatus* and the seagrass *Thalassia testudinum*

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Seagrasses are an integral component of many coastal ecosystems including the Laguna Madre of Texas. Seagrasses compete with each other for space on the bay bottom but a new potential competitor appeared in 2006, the green alga, *Penicillus capitatus* which has spread rapidly in the Lower Laguna Madre. The goal of our study was to determine if *Penicillus* is effectively competing with the seagrass *Thalassia* for space. A field study was designed which consisted of spring (June) and fall (October) sampling. During each period, a survey was performed in three areas (A, B, C) where *Thalassia* and *Penicillus* co-occur. Two transects were established in each of the three study areas. Using a 10cm X 20cm quadrat, *Thalassia* and *Penicillus* counts were made in a contiguous 2m strip from the *Penicillus* zone through the transition zone to the *Thalassia* zone. Biomass cores were collected in the *Thalassia*, transition and *Penicillus* zones. Shoot growth of *Thalassia* was estimated using the leaf marking method while measurement of thallus growth of *Penicillus* was attempted by staining thalli with Alizarin Red. The transect survey indicated that *Thalassia* density decreased along the transects in a consistent manner while *Penicillus* density seemed to drop abruptly once *Thalassia* was present. Much of the *Thalassia* below-ground biomass was not near the surface (0-5 cm) but in the 5-20 cm segment of the sediment perhaps due to competition with *Penicillus*. In contrast to biomass, *Thalassia* leaf elongation rate was not different between the *Thalassia* and the transition zones suggesting no effect due to competition. *Penicillus* growth rates could not be reliably measured.

1021 Marine Science

T-tide harmonic analysis and model validation: Ashdod, Hadera and Tel Aviv, Israel

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The components of tides based of the Mediterranean Sea on the Israeli Coast based on observed data, have not been studied extensively, if at all, in current scientific literature. Knowledge of the tidal components is essential for future understanding of wind induced variation in sea levels as well modeling the physical, chemical and biological characteristics of the Mediterranean Sea. Tidal data was collected via sensors placed off the coast of Ashdod, Hadera and Tel Aviv, Israel. The tidal data was imported into MATLAB and bin averaging applied to decrease the effect of non-tidal variability in the tidal signal. The resultant data had simple harmonic analysis with nodal correction applied using the T-Tide harmonic analysis package for MATLAB. This analysis revealed that tides at these sites in Israel are dominated by semi-diurnal components. The Tide Model Driver maintained by Oregon State University was used in conjunction with the Mediterranean model available from their website to generate the modeled tidal amplitude and phase for the M2, S2, K2, N2, K1, O1, P1 and Q1. The observed tidal data was compared to the modeled tidal data for the available components, revealing a strong correlation between the two data sets. The Mediterranean model is accurate for these sites and will probably accurately model other sites on the Israeli coast of the Mediterranean sea.

P1062 Marine Science

Distribution and morphological variation of estuarine three species of *Palaemonetes* (Crustacea: Decapoda) from Laguna Madre of Mexico

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The caridean shrimps of the genus *Palaemonetes* are found in freshwater and estuarine environments around the world. Eleven species are recorded in Mexico, which *P. intermedius*, *P. pugio* and *P. vulgaris*, are inhabitants of estuarine ecosystems along of Gulf of Mexico. These species were the object of this study, which was divided in two parts. First, to determine their ecological distribution in the Laguna Madre of Mexico and second aim was to analyze the morphological variation of six diagnostic features used in the identification of each species. The specimens were obtained of deposited material in collections and field work during 2007 to 2010. These species inhabit every type of habitat, mainly seagrass community and oyster banks. *P. pugio* was the species more common in the Laguna Madre. The last species and *P. vulgaris* were found occasionally together at some sites. In all species the shape and ornamentation of rostrum and shape of apex of fifth pleura were the morphological characters with greatest degree of variation. The poor knowledge of the variation in morphology of *P. pugio*, *P. vulgaris* and *P. intermedius* can make taxonomic identification difficult resulting in misidentification.

677 Mathematics

Applications of Jensen's Inequality

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

Jensen's Inequality creates a fundamental link between the notion of convexity and the theory of inequalities. Through the use of Jensen's Inequality and some astute observations, two posed problems have straightforward solutions.

687 **Mathematics**

The Lorenz System and the Butterfly Effect

Jesus F. Hermosillo*, Sul Ross State University

The Lorenz System is a system of three autonomous first-order ordinary differential equations formulated in 1963 by MIT meteorologist Edward Norton Lorenz (May 23, 1917-April 16, 2008). The system was formulated in connection with convective flow. Some properties of the Lorenz system will be discussed.

749 **Mathematics**

Hat guessing games

James Reid*, Angelo State University, San Angelo, TX

In a hat game, each of n players tries to guess the color of his or her hat by looking at a portion of the hats worn by the other players. Before the game begins, the players must develop a public, deterministic strategy based on the hats. In this talk, strategies that yield an optimal number of correct guesses will be discussed. In addition, the conditions required to guarantee that at least one player will guess correctly will be investigated.

762 **Mathematics**

Digital nonlinear controller design: Backstepping with cancellation and domination

Jeff Langston*, Dr. Chunjiang Qian, The University of Texas at San Antonio, San Antonio TX, and Dr. Michael Frye, University of the Incarnate Word, San Antonio, TX

This paper examines the problem of nonlinear digital control of a continuous nonlinear system. Due to the prevalence of digital controllers, the problem of controlling continuous systems through the use of digital controls is an important application area. This paper examines the use of two types of backstepping controller: one using a cancellation design to cancel out the nonlinearities, and one using a feedback domination design to dominate, rather than cancel, the undesired nonlinearities. The feedback domination design is found to be faster in convergence. The nonlinear controller allows for negating the effects of nonlinear terms not previously accounted for due to the use of a linear digital control of continuous systems. The significance of this result is that little information about the nonlinear system is required to stabilize this system.

741 **Physics**

Distribution of energy within interference patterns

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In order to perform optical imaging and crystallography, one needs to examine the diffraction pattern produced by various samples. Light diffracted by many slits interferes and produces a pattern enshrouded by one diffraction envelope. In this paper we report a careful analysis of diffraction-interference patterns and investigate the energy conservation using a few adjacent slits and nettings. Theory based on the wave characteristic of light suggests that the energy distributed within the central maximum of diffraction is re-distributed among the interference fringes enshrouded by this diffraction envelope. Due to the renewed interest in accurate optical imaging and crystallography, as well as for fundamental science where the interference phenomenon is used as evidence for a wave characteristic, including matter waves, we re-analyze the energy conservation problem comparing the wave theory with our accurate measurements. The topic of energy conservation in interference patterns was recently addressed with an interesting suggestion that dark energy could be responsible for redistributing the electromagnetic energy in the double slit interference pattern. Our research project was done under a NSF-DUE-sponsored program called STAIRSTEP, which engages STEM undergraduate students in high-quality research in several fields of science, including physics.

832 **Physics**

Using electrical properties to predict geometry of quartz nanopores

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The electrical properties of quartz nanopipettes are being characterized by measurements of ionic current through the pipette pore. Nanopipettes are hollow conical structures with pore sizes of less than 100 nm at the tip. We are interested in ion current through the nanopipette tip, as it is the signaling mechanism in a STING (Signal Transduction by Ion Nano-Gating) sensor. This versatile sensor is easy to fabricate and can detect many types of particles in solution. If we can control tip size and geometry, and thus electrical properties in nanopipettes, we can improve performance of the biosensor. Methods to analyze size and shape of the tip are limited to electron microscopy, which is expensive and difficult. Ultimately, we want to predict the size and shape of nanopipettes by measuring only ion current. To build a model, we are using ion current and current rectification together with electron microscopy to view shape and size. Data from the electrical detection method will be amplified and recorded as a current-vs.-voltage (I-V) curve to highlight the relationship between an electrical current and corresponding voltage. This information will be correlated with electron microscopy data to create a model of how the various shapes and sizes of different nanopipettes affect ion current.

935 **Physics**

Energy transfer between filament-forming laser beams in liquid methanol

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We demonstrate energy exchange between two filament-forming femtosecond laser beams in liquid methanol. Our results are consistent with those of previous works documenting coupling between filaments in air; in addition, we identify an unreported phenomenon in which the direction of energy exchange oscillates at increments in the relative pulse delay equal to an optical period (2.6 fs). Energy transfer from one filament to another may be used in remote sensing and spectroscopic applications utilizing laser filaments in water and air.

1041 **Physics****How cephalopods use optics to camouflage**

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One of the great enigmas of cephalopods is their remarkable ability to camouflage with astonishing speed and precision. They are capable of matching the colors, patterns and even the textures of their surroundings and are also responsive to the polarization of the light field. The fundamental processes involved are the light interaction with the coloration cells (chromatophores, iridophores, and leucophores) in their skin. To understand this complicated optical process, we obtained the Muller matrix, which contains all the information one can obtain from a scattering particle, for each cell by numerical calculations dependent on the size of the particle and includes techniques such as the Improved Geometric Optics Method (IGOM), the Finite Difference Time Domain Method (FDTD) and the Discrete Dipole Approximation (DDA) method. The influences of size, shape, orientation, and interaction between multiple cells on the scattering properties are discussed and justified. These parameters are then used to calculate and predict the polarized reflectance distribution of light from cephalopod skin using a Monte Carlo simulation, which is based on 3D vector Radiative Transfer equations. This method can be used to then calculate the dynamic behavior of camouflage by the dynamic behavior of both chromatophores and iridophores. We will present results of spectral skin reflectance distributions for various compositions of skin structure and underwater light conditions. The coloration of skin will be obtained by use of the tristimulus values of the human eye combined with the spectral reflectance of the skin to calculate the chromaticity coordinates.

1069 **Physics****Mathematical Model of the Late Heavy Bombardment Period (Early Solar System)**

Jeffrey W. Davis*, Hardin-Simmons University

The Late Heavy Bombardment Period (LHBP) occurred in the solar system 4.1 to 3.8 Gy ago. It is believed that many of the impact craters seen on the Moon today are a result of this bombardment. Earth along with the other inner planets (Mercury, Venus, and Mars) are believed to have been affected, as well. One hypothesis to explain this flux increase of asteroidal and cometary material to the inner solar system is that the outer planets (Jupiter, Saturn, Uranus, and Neptune) dispersed the left-over material from their formation. This dispersal of material, which included ice-laden boulders encased in organic matter, is thought to be one mechanism whereby water and organic matter were delivered to pre-biotic Earth. Assuming the outer planets were the delivery mechanism for the LHBP, I built a mathematical model to estimate the density of the material in the outer solar system that was projected into the inner solar system. Rather than absolute figures, I define density as a comparative estimate of the amount of outer solar system material that would be encountered by objects in different locations (orbits) about the Sun.

P813 **Science Education****Rapid escape reflexes of the Madagascar hissing cockroach, *Gromphadorhina portentosa*: A science laboratory activity developed for use in the middle school classroom**

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National and state testing demonstrate time and again that students often perform poorly in science and math. One of the most prevalent issues is lack of enthusiasm. Many students admit that they believe science is boring. As biologists, we wanted to develop an activity that would reignite interest in scientific learning. We chose a biological system that most students, particularly those living in Texas, would have some background experience with – the cockroach. Students are guided on a journey through the cockroach nervous system; focusing on “form and function” – a progression from neural anatomy to output of neural circuits which underlie behavior. The behavior investigated is the rapid escape reflex – an escape mechanism that many students are familiar with. To develop understanding of the escape reflex arc we developed a cost effective experiment using *Gromphadorhina portentosa*, Madagascar hissing cockroaches. This escape reflex involves a simple circuit including activation of the sensory neurons found in the cerci, the giant interneuron (giant nerve fiber), the central nervous system pattern generator, and ultimately results in the firing of motor neurons which control movement. Overall, we believe that this lab activity will inspire students’ interest in science and demonstrate that science is relative to their daily lives. In short, science is cool!

P822 **Science Education****An overall assessment of “Biology of the Arachnids”; a two and a half week mini-course (June 2010) conducted at the Texas Tech Llano River Field Station in Junction, Texas**

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This presentation reviews the background, planning and teaching of a two and a half week mini-course on the “Biology of the Arachnids” which was conducted at the Texas Tech Llano River Field Station in Junction, Texas in late June of 2010. Course content, format, and amount of time devoted to classroom lecture, laboratory exercises and field trips will be outlined. Lecture material included a review of the early evolution of the major arthropod groups and was followed with a survey of the major morphological characteristics, life cycles, and distributions of the 11 major ordinal groups. Preserved specimens of all ordinal groups were observed in the laboratory. High resolution detailed digital photographs of living material of all groups constituted a principal component of both lecture presentations and laboratory exercises. Weekend field trips to the Seminole Canyon and Pandale areas of Val Verde County and the Big Bend region of west Texas were conducted to familiarize the students with both collecting techniques and the local Texas fauna. A post-course assessment will be given along with a number of changes planned for future offerings of this course.

882 Science Education

Bacteria discovery laboratory increases secondary student content knowledge but not career goals

Veronica Lopez*, Dr. Patricia Baynham, St. Edward's University, Austin, TX

Currently, only six percent of young college graduates in the United States have science or engineering degrees while the average for other developed countries is ten percent. In order for the U.S to become more competitive with regard to science performance, currently ranking 21 out of 30 developed nations based on international scientific exams, science literacy and interest must be increased. Research has shown that the more engaged a student is in learning, the more effective this experience is in promoting knowledge gains and retention. This project involved an undergraduate biology major engaging one local high school biology class (24 students) in a two class period microbiology lab and lecture activity and then evaluating the impact of the experience. Quizzes/surveys were administered before and after the activity to assess the impact on student interest in science and specific content knowledge. All 24 students were able to take the first assessment while the second one was completed by only 18 of the students. The results suggest that this activity did not impact student interest in science as a career but did improve student science knowledge. Future directions include using a second class of students that did not participate in the discovery activity as a control. This would show whether the activity was more effective with regard to knowledge gains than a traditional format. As students feel more scientifically competent they may become more interested in science at a later time.

890 Science Education

Beginning teacher induction and mentoring

L. Fuller and S. West, Texas State University

The Texas Beginning Teacher Induction and Mentoring (BTIM) project's goals are to mentor first and second year science and math teachers. Such mentoring can potentially pay long-term benefits in the areas of improved teacher effectiveness and retention. This paper aims to add to our understanding of mentoring beginning teachers, by documenting the experiences of 20 teachers who participated in this innovative mentoring program. Data gathered through applications, surveys and focus groups reflecting the views and voices of these new teachers and their mentors support the notion that carefully-designed mentoring, including subject-specific, trained mentors will be presented.

901 Science Education

Angling for water quality: Using a recreational approach to increasing environmental literacy, aquatic stewardship, and science learning of teachers and students in under-served major metropolitan areas of Texas

Zack Thomas*, Tom Arsuffi, Texas Tech University-Junction, Junction, TX

The goal of this project is to increase environmental literacy and aquatic stewardship of 4th-8th grade teachers and their students by connecting new anglers and angling to a larger environmental context and educational pedagogy involving sciences and natural resources. The objectives of this project are 1) adapt existing Texas Essential Knowledge and Skills (TEKS) state-mandated aquatic science curricula for use in classroom instruction that will be integrated with TPWD's Angler Education program, 2) implement and disseminate the combined aquatic science and Angler Education program through a series of teacher workshops, 3) follow up teacher workshops through school fishing field trips to affect teacher and student knowledge, skills and attitudes about water resources and 4) evaluate outputs and outcomes through qualitative and quantitative surveys. The teachers participating in this project will learn how to teach TEKS-based aquatic science integrated with a popular recreational activity, observe educational theory and pedagogical practices implemented in an outdoor classroom setting with diverse student learners, learn critical Science, Technology, Engineering, Math (STEM) content and use of scientific equipment, scientific method, and hypothesis testing. The project will provide 3, 1-day instructional workshops to teachers. Workshops will be held in 3 locations: 1) Dallas/Fort Worth, 2) Houston, and 3) Junction, Texas to maximize accessibility for teachers within each metroplex. After workshops, teachers will return to their classrooms to integrate the new angling and aquatic science curricula.

902 Science Education

Correlated Physics & Math

Jessica Hart* and Dr. Sandra West, Texas State University, San Marcos, TX

Correlated Science & Math (CSM) is a new model of professional development that links science and math instruction in a unique method. Integrating science and math typically means science teachers using math as a tool or math teachers using a science as an application of a math concept. However, the CSM model aims to teach science and math teacher teams to make more connections between science & math and to use the proper language of each discipline. Syllabi and a sample lesson will be presented. Teachers improved their understanding of selected physics concepts ($p < .05$). Student math performance improved ($p < .05$). However, no improvement in student performance in science was detected at a statistically significant level.

916 Science Education

Teaching scientific method: Keeping an eye on color

Patricia Ritschel-Trifilo*, Hardin-Simmons University

Scientific method is an essential life skill used to investigate various phenomena around us, and is taught in life science classes. Most non-science majors, especially freshmen, see no value in learning about this skill because they associate it with elaborate scientific research. Demonstrating scientific method use in everyday life helps in its understanding, but does little to develop skills in gathering observable, empirical and measurable evidence, basic reasoning, and evaluation of data. In life science classes, the eye can be used as a research subject. Most students are curious about how the eye works, and how one sees color and patterns. There is also a plethora of information on the eye easily obtained in books and on the web. This presentation will exhibit a scientific method study done by high school seniors/college freshman, using the human eye and cone distribution on the retina. Using prior knowledge, peer reviewed articles, and newly learned knowledge of the eye, groups of students developed testable hypotheses, and experiments. They learned about dependent and independent variables, conclusions about data, and presentation of results. The participant should come away with a specific teaching tool, and several ideas for teaching scientific method in the classroom.

P922 **Science Education****African violet and begonia GAPC gene sequencing: Implementation of the Bio-Rad cloning and sequencing explorer series™ in an undergraduate research course**

Christy MacKinnon*, Jessica Hernandez, Frank Torralva, University of the Incarnate Word, San Antonio, TX.

Implementation of genomics and bioinformatics presents special challenges to an undergraduate genetics curriculum. The unusually rapid increase in technology and databases limits the effectiveness of traditional genetics laboratory activities. Fortunately, there are several genomics/bioinformatics programs available for the acquisition and analysis of authentic data that can be analyzed directly by students in a hands-on learning approach. However, most of these programs require acceptance to comprehensive faculty development workshops for successful classroom implementation of activities. For faculty who have limited time and/or funds for professional development, the Bio-Rad Cloning and Sequencing Explorer Series™ provide activities that can be easily incorporated into an existing curriculum. We present information about classroom implementation of the Bio-Rad Explorer Series, and present BLAST analyses of *GAPC* gene sequence data. We present adapted versions of bioinformatics activities used to supplement the Explorer Series, and summary responses of students' experience with the research course.

924 **Science Education****Ecological restoration of the headwaters of the San Antonio River: Integrating science across the university**

Bonnie McCormick*, Alakananda Chaudhuri, William Thomann, University of the Incarnate Word, San Antonio, TX

There is general agreement among many organizations that undergraduate science teaching should provide students with opportunities to learn through inquiry and to investigate real-world problems. The University of the Incarnate Word is working in collaboration with their sponsoring congregation to provide authentic problem solving through the ecological restoration of the Headwaters of the San Antonio River adjacent to the campus. This resource is being utilized across science disciplines to teach biology, chemistry, geology, engineering, environmental science, and graduate courses in science teaching. An important element of ecological restoration is the history and cultural connections to the land, so the project also provides opportunities for students enrolled in humanities courses. Student participation in the project through coursework in the sciences not only introduces students to science concepts, it provides an opportunity to participate in problem solving, data acquisition, data analysis, and interventions that are necessary steps in a long-term ecological restoration project. Students in introductory classes for non-science majors, advanced science courses, undergraduate research experiences, and graduate students in professional development courses for science teachers are able to contribute to the restoration of this important community resource. Ecological restoration is a multistep process that requires expertise from a wide variety of disciplines so that students outside of the sciences can contribute to the project. Restoration of the Headwaters of the San Antonio River provides a unifying theme and a collaborative research opportunity for students across all disciplines of the university.

929 **Science Education****Mixed Up: Confusing language in science and math**

S. West*, Tx State University – San Marcos and S. Browning, University of Houston – Clear Lake

Use of the *Correlated Science & Math (CSM)* professional development model has allowed the identification of language that is confusing to science and math students and teachers. There are synonyms and homonyms that are not identified in textbooks. Having a clear understanding of definitions plays a prominent role in content reading and vocabulary strategies for improving student performance, particularly with English Language Proficiency students. Everything a student has learned and experienced with a given concept is symbolized through words. A word that is associated with a general meaning that is shared by most people is considered denotative. For example, the word 'range' Its denotative meaning, in mathematical terms, would be the difference between the least and most number in a set of numbers. In scientific terms it could mean mountain range or the distance a charged particle travels before stopping. In connotative terms, it could mean a limitation, shortfall, or impossibility.

P993 **Science Education****PlantingScience: Fostering student research through scientific inquiry and online mentorship**

Michael A. Grusak*, USDA-ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX

PlantingScience (www.plantingscience.org) is an inquiry and science mentorship program led by the Botanical Society of America and supported by 14 Scientific Society partners that brings together students (middle school through high school), plant scientists (as mentors), and teachers from across the nation. Using several learning modules as guides, students engage in hands-on plant investigations in the classroom and collaborate online with peers and scientist mentors. Student teams work together to develop their research question; they then establish an experimental design and make research predictions, with guidance from the mentor. Students generate their own data and post results and conclusions on their Team page at the PlantingScience.org web site. During 3-8 week spring and fall sessions, students and their assigned scientist mentor use the web portal (almost daily) to discuss the Team projects. Communication between scientists and teachers is also facilitated at the web site. For students and teachers, the program fulfills three concepts recognized by the National Research Council to facilitate science learning: 1) hands-on, inquiry based activities, 2) team learning, and 3) mentorship support from subject experts. For scientist mentors, the program offers an outreach opportunity to share knowledge and enthusiasm for plants with actively engaged students and teachers. In this poster presentation, the presenter (a current PlantingScience mentor and the Crop Science Society of America liaison to the PlantingScience Steering Committee) will provide an overview of the program, along with information on how to become a volunteer mentor and how to sign up as a participating teacher with student teams.

P1003 **Science Education****Hydrophobicity measurements of modified and native silk proteins using the contact angle method: a biophysical chemistry experiment for undergraduate labs**

Hong Zhe* and David E. Coleman, University of the Incarnate Word

Native silk fibroin protein is primarily composed of (-Gly-Ala-) repeats, and is highly hydrophobic. However, previous work has shown that the presence of a small number of tyrosine residues permits chemical modification of a soluble form of silk fibroin, and these alterations can alter its hydrophobicity. The hydrophobicity of native and modified silks can be characterized using the contact angle method. The contact angle method uses a contact angle goniometer to measure the contact angle formed between a water / solid interface, which can be directly related to the hydrophobicity of the solid. This work describes a laboratory experiment that uses the contact angle method to characterize the hydrophobicity of native and modified silk fibroin, and is suitable for undergraduate physical chemistry, biochemistry, or biophysical chemistry labs.

P1049 **Science Education**

NSF GK-12 project Flowing Waters: Secondary student attitudes towards science after the GK-12 experience

Kristina Dame* and Julie Westerlund, Texas State University- San Marcos

This study examined the relationships between Project Flowing Waters GK-12 Fellows ("resident scientists"), students and science teachers in five partnerships. In 2009/10, data was gathered from multiple sources; fellow's weekly journals, secondary student pre and post surveys that utilized the NSF SWEPTS study Anonymous Student Attitude Survey (<http://www.sweptstudy.org/instruments.html>) and open-ended questions concerning the resident scientists, science and the San Marcos ecosystems. This survey was administered in pre/post test fashion in 09/10. Matched pre and post student attitude surveys were obtained from five partnerships. There was a positive significant difference ($p < .05$, paired T test) in pre/post test scores concerning "Beliefs about Science Work and Careers" in three of the five teachers surveyed.

1050 **Science Education**

Building a national collaboration- Students' attitudes about science after GK-12

Kristina Dame and Julie Westerlund*, Texas State University- San Marcos

In this session participants will be invited to join a national NSF GK-12 collaboration that uses quantitative measurements to determine whether secondary students' attitudes towards science and achievement in science improves after being in NSF GK-12 classrooms. Results from Project Flowing Waters student attitude data will be presented that utilized the NSF SWEPTS study Anonymous Student Attitude Survey (<http://www.sweptstudy.org/instruments.html>). This survey was administered in pre/post test fashion in 09/10. Results indicated a positive significant change in secondary student attitudes towards the dimension beliefs about science work and careers. Matched pre and post student attitude surveys were obtained from five partnerships in 09/10. There was a significant difference ($p < .05$, paired T test) in pre/post test scores concerning "Beliefs about Science Work and Careers" in three of the five teachers surveyed. This session is intended for those interested in joining a collaboration to study the impact of GK-12 on secondary students.

1058 **Science Education**

Get SMArT: Introduction of Science and Math Achiever Teams

Meredith Liebl*, Kate Roberts, Suzanna Pukys and Romi Burks. Office of Civic Engagement and Department of Biology, Southwestern University

SMArTeams, Science and Math Achiever Teams, embodies a partnership between Southwestern University and an after school program at local elementary schools to encourage exploration of science and math concepts through methods of inquiry. The program structure pairs an undergraduate college student mentor with an elementary school student (3rd – 5th grade) and encourages them to explore the young student's own inquiry. Ten to twelve pairs participate in the program each semester. The Day Coordinator helps brainstorm ideas, organizes the matching of the mentor and elementary school student pairs, supervises the method of exploration chosen by the pair and gathers supplies as needed. The program focuses on increasing interest in the sciences and introducing implementation of the scientific method to solve problems and answer questions in young students. While this talk will provide examples of projects and anecdotal evidence that positively supports the success of this program, we also desire quantitative evidence to validate the program's continued success. Therefore, throughout the 2011 spring semester, a research study will be conducted to evaluate the social and learning outcomes of students enrolled in the SMArT program. Using qualitative and quantitative research methods, the research will explore how participation in the SMArT program impacts students' attitudes towards science, perceived knowledge and skills, and problem solving capabilities. Specific research methods employed will include pre- and post- program questionnaires and problem solving exercises, ethnographic observation, and semi-structured follow up interviews. We will present our initial findings and seek feedback on how to further assess our program.

P1060 **Science Education**

Draw-A-Scientist-Test [DAST]: Altering stereotypical misperceptions at an elementary level

Angela Aukes*, Kirsten Barnett*, Kelsey Abbott, and Wendi Moran, Hardin-Simmons University

The Draw-A-Scientist-Test [DAST] was first developed in the 1960's and has been a tool used to identify misperceptions and characteristic stereotypes of scientists at a variety of educational institutions and grade levels. Here we compare previous studies to a four year collection of results from a local university in Texas to determine what percentage of the stereotypes are the same or have changed with time. We believe that very little has changed with respect to physical characteristic perceptions and propose ways to begin altering this stereotypical misperception at an elementary school level.

1061 **Science Education**

Draw-A-Scientist-Test [DAST]: A psychological analysis of shifting gender roles and stereotypes of the scientist

Kelsey Abbott*, Angela Aukes, Kirsten Barnett, and Wendi Moran; Hardin-Simmons University

The Draw-A-Scientist-Test [DAST] has been a tool used to identify misperceptions and characteristic stereotypes of scientists at a variety of educational institutions and grade levels. We believe that gender based results should show a significant change due to the historical and psychological development of gender roles. In comparing previous studies to a four year collection of results from a local university in Texas, we found that the percentage of gender role stereotypes has not significantly changed with time as expected. Here we review possible ways to break the negative perceptions and stereotypes associated with the scientist. In addition, we address the benefits for society in redirecting these misperceptions and stereotypes toward scientists.

P1063 Science Education

Opportunities for acholarly activities in Germany via scholarships from the Germans

Rick C. White*, Department of Chemistry, Sam Houston State University

Students in an increasingly global marketplace should have experience with other cultures as part of their educational training. A number of opportunities exist for undergraduates in all sciences to get this kind of experience through scholarships from the Deutscher Akademischer Austausch Dienst (DAAD, German Academic Exchange Service). The RISE (Research Internships in Science and Engineering) program provides funds for students in all sciences to spend a summer, a semester, or a year in Germany to carry out scholarly activities. Students get the experience of living in another country, traveling in another country, doing top of the line research and making life long contacts. This poster will outline the advantages of these activities, and tips for making these proposals successful. Because most research meetings are held in English, there should be no language concerns, but some German would be helpful for day to day things such as bakery visits, etc.

P740 Symposium on Engineering

Portable power for a construction site: A mobile photovoltaic cart

Dr. Alison Whittemore, Saul Meza, Neal Jackson, Francisco Segura, Andrew Mocio; The University of the Incarnate Word, San Antonio, Texas

The engineering students at the University of the Incarnate Word are in the process of designing and building a small LEED Platinum certified house on campus. When finished, the house will have the capability of being completely off the power grid, using an array of photovoltaic cells and wind turbines. The building site, however, is located far from an active power supply, and will need an electrical supply for tools, lighting, fans, etc. It would be possible to rent a generator during construction, but the students decided to go green all the way, and they created a photovoltaic mobile power source for the electrical needs of the construction site. Using a small poly-crystalline panel and simple materials from a local hardware store, they created a system that will easily supply over 10 kW of electricity, more than enough for the power needs of the job site. The photovoltaic panel was mounted on brackets that allow for changes in angle to maximize the exposure of the sun as the seasons change. Students installed a battery storage system, a charge controller, a power inverter, 110 volt outlets, and protective panels. After construction is done, the cart will be used as an educational tool for visitors to the house. The poster will describe the design process and the finished cart. If there is room, the students will bring the cart itself to demonstrate the photovoltaic system.

P1059 Symposium on Neuroscience

Timing in the absence of supraspinal input: A qRT-PCR analysis of the effects of temporally regular stimulation on the spinal cord

Kuan H. Lee*, Sandra M. Garraway, Kyle M. Baumbauer, James W. Grau, Texas A&M University

A basic property of neural systems involves the abstraction and storage of information about the temporal distribution of events over time. Events that occur at regular (fixed) intervals are predictable, whereas stimuli that occur in a variable manner cannot be anticipated. Prior work has shown that spinal neurons can discriminate fixed versus variable stimulation; variable stimulation inhibits learning about response-outcome (instrumental) relations whereas fixed stimulation fosters learning and can both prevent and reverse the adverse consequences of variable stimulation. Previous studies have focused on the beneficial effects of instrumental control on learning and have linked these to the expression of brain-derived neurotrophic factor (BDNF; Gomez-Pinilla et al., 2007). The adverse effects of uncontrollable stimulation have been tied to the expression of tumor necrosis factor alpha (TNF α). The present experiment used RT-PCR to examine whether these factors are also affected by temporal regularity in Sprague-Dawley rats after spinal transection. A number of primers were used to examine the transcripts for BDNF and TNF α , as well as neurotrophic tyrosine kinase receptor (TrkB), c-Fos, c-Jun. The expression levels of each target were normalized to beta-actin. The results indicated fixed and variable stimulation differentially affect mRNA expression. Both shock schedules induced c-Fos expression immediately and 30 min after stimulation. Both c-Jun and TNF α transcripts were increased by shock immediately after treatment, but only fixed spaced stimulation enhanced expression of c-fos, c-Jun and TNF α transcripts 30 min after treatment. Additional experiments are being conducted to examine how fixed versus variable stimulation affects protein levels.

668 Systematics and Evolutionary Biology

Rapid evolution of female polymorphism in an invasive damselfly

Eben J. Gering*, Section of Integrative Biology, The University of Texas at Austin

Recent theory suggests that we have underestimated the incidence and importance of female variability in nature. The invasion of a female polymorphic damselfly into the Hawaiian Islands provides replicated, well-chronicled ecological experiments that can be used to determine what drives female-limited variation. Here I combine population genetic analyses, field surveys, and experimental population studies to test how sexual conflict, abiotic environment, and demographic history shape color morph frequencies within invasive populations. Completed work shows that density-dependent sexual conflict likely selects on female color, but that responses may be modulated by other environmental factors, and by invasion history.

673 Systematics and Evolutionary Biology

Maternal care in *Santinezia serratobialis* (Opiliones: Cranida) in Trinidad

Allan W. Hook*, St. Edward's University

Harvestmen or daddy longlegs (Opiliones) have received more attention of late due to a number of tropical taxa that exhibit either maternal or paternal egg guarding. Four females of *Santinezia serratobialis* were found guarding egg masses at two localities in the northern range of Trinidad, West Indies during July 2010. Egg masses were found along road cuts, under protruding rocks and under an overhanging dirt bank. Maternal care was unknown in this family until 2006 when two guarded egg masses were reported on from Trinidad. The earlier report found egg masses of 38 and 70 eggs. The present study found egg masses of 52, 67, 91 and 117 eggs. Females remain with egg masses until all the eggs hatch and first instar nymphs disperse, soon after hatching. Fungus was the largest mortality factor, destroying all the eggs in one mass, but only one egg in the three other masses. Egg guarding in *S. serratobialis* will be compared to other tropical opilione taxa.

679 Systematics and Evolutionary Biology

The effects of advanced maternal age on the spacing of dorsal respiratory appendages in *Drosophila melanogaster*

Jenna Rozacky* and Lisa M. Goering., St. Edward's University Austin, TX

An offspring's viability can be greatly affected by the age of the mother. In both humans and other species, data suggests that the older the mother, the less fit the offspring. The aim of this study is to find out if maternal age has any effect on eggshell patterning in *Drosophila melanogaster*. Dorsal respiratory appendages (DA) are extensions of the eggshell that help deliver oxygen to developing embryos. Placement of the DA along the dorsal-ventral axis of the eggshell is dependent on signaling through the EGFR pathway. Previous research dealing specifically with DA spacing has shown that there is naturally occurring genetic variation that results in phenotypic differences in DA spacing. Since DAs are a maternal phenotype being produced by the mother's follicle cells, they are an excellent trait to look at for a possible correlation between the age of the mother and DA spacing. During this experiment, two different lines of flies with average DA spacing were used. Three replicates were collected from each line and eggs were collected from aged mated females at the following time points: 6, 14 and 21 days post-eclosion. DA spacing was measured and the data suggests that maternal age reduces DA spacing as age increases.

P681 Systematics and Evolutionary Biology

Temperature effects on male mating and female nesting behavior in *Bembecinus neglectus* (Hymenoptera: Crabronidae: Bembecinae)

Matthew Perez* and Richard Patrock, St. Edward's University

This study investigated the influence of surface and ambient temperatures on male and female activity in the solitary ground nesting wasp, *Bembecinus neglectus*. For males, the effect of temperature was examined for level of activity, the amount of time they spent on the surface, and the number of "fly-ups" per timed interval. There was a significant negative relationship between male activity levels and temperature. For fly-ups at high surface temperatures there was a significant negative relationship. We also investigated if male color polymorphism influenced their ability to thermoregulate. Mating ball duration (an outcome of the mating system – scramble competition polygyny) was examined to see if there was a temperature affect. Mating ball duration showed no relationship with temperature. Finally we examined whether temperature influenced the time it took for a prey-laden female to enter its nest. There was a significant positive relationship between surface temperature and the time it took a female to enter its nest.

P682 Systematics and Evolutionary Biology

Observations on the nesting ethology of *Microbembex monodonta* (Hymenoptera: Crabronidae: Bembecinae) in Central Texas

Paloma Reinoso* and Allan Hook, St. Edward's University

Microbembex is unique among all solitary wasps in that they provision their nests with dead and dying arthropods. *Microbembex monodonta* is a sand wasp that is distributed from Canada to Central America, and has thus received more study than other species of this genus. Even so, most of these studies are superficial and thus have not illuminated the full extent of this species' behavioral repertoires. This study examined the nesting biology of this wasp in Pedernales Falls State Park (PFSP), Blanco Co., Texas. Results were obtained on nest digging behavior, nest architecture, provisioning, prey type and weight, and on nest parasites. Consistent with the previous summer's work on *M. monodonta*, fire ant gynes made up a majority of prey items. However, in 2010 spiders composed 12% of all prey items, which were not found as prey in 2009. Further, cell depths differed significantly between years as did rainfall.

P700 Systematics and Evolutionary Biology

Assessing body sizes and wing loads of the monarch butterfly during the fall migration through central Texas: does size really matter?

Joshua S. Huckabee*, Jakob Russell and Jason L. Locklin, Temple College, Temple, TX.

The demands of long-distance flight represent a strong selective force that operates on the physical characteristics of migrating species. Monarch butterflies are widely distributed throughout North America and are well-known for annual migrations. During the fall, a single generation flies up to 4,000 km from their breeding areas in the United States and Canada to mountainous areas of central Mexico where they overwinter and exhibit a reproductive diapause. In March, survivors fly back to the United States mating and laying eggs along the way. Two or three summer generations repopulate the eastern United States and Canada before a fall generation returns to Mexico. We monitored the fall migration through central Texas, developed regression equations to estimate wing surface areas of migrants, and assessed body sizes and wing loads of individuals captured through time. To census the population, daily counts were made on the Temple College campus. Regression equations were produced to efficiently estimate total wing surface area using forewing length measurements of each specimen. Wing loads were assessed using the wing area estimates and specimen weights (mg). Monarchs were observed from October through November. Migration peaked at the end of October. Butterfly sizes did not change, but wing loads decreased through the migration, i.e. early arrivers had the heaviest wing loads and late arrivers had the lightest. Although it seems maladaptive for long and energetically costly flight, heavy wing loads may lead to faster powered flight which should be advantageous during long migrations.

737 Systematics and Evolutionary Biology

The comparative osteology, phylogeny, and biogeography of lepidosirenid lungfish

Katharine E. Criswell*, Jackson School of Geosciences, The University of Texas at Austin, Austin, TX

Lepidosirenid lungfish are a clade of freshwater fishes comprising the South American *Lepidosiren paradoxa* and four African species of the genus *Protopterus*. These two genera were geographically separated during the Early Cretaceous rifting of Gondwana, but they display similar life histories and skeletal morphologies. The lepidosirenid species traditionally were distinguished from each other by a combination of features such as head-to-body ratios, the number of vertebral ribs, and the presence or absence of external gills, but no discrete skeletal characteristics were ever identified. I used High Resolution X-Ray Computed Tomography, X-Ray photography, and alcoholic, cleared-and-stained, and dry skeletal specimens from museum collections to describe the range of lepidosirenid skeletal morphology in a comparative context. I digitally disarticulated each bone in each scan to compile a comprehensive atlas of the cranial and pectoral elements of all extant lungfish. I discovered the presence of the anocleithrum in *Lepidosiren paradoxa*, which previously was thought to be absent. I also identified interspecific skeletal differences in the frontoparietal, supraorbital, and suboperculum. I incorporated these new characters into a phylogenetic analysis to reconstruct lepidosirenid relationships. The analysis yielded a hypothesis in which *Protopterus dolloi* is the most basal species of *Protopterus*, and *Protopterus annectens* and *Protopterus aethiopicus* are sister taxa. The present geographic distributions of *Protopterus dolloi* and *Lepidosiren paradoxa* would have been continuous in the Early Cretaceous, and these two taxa share several plesiomorphic characters.

739 **Systematics and Evolutionary Biology**

A molecular approach to the phylogenetic position of the naked bat, *Cheiromeles* (Chiroptera: Molossidae)

T. Marie Tipps*, Dana N. Lee, Loren K. Ammerman, Angelo State University, San Angelo, TX

Previous phylogenetic studies on the family of free-tail bats, Molossidae, have used only morphological data to show the evolutionary relationships among the different genera. These morphological data consistently show that *Cheiromeles*, the naked or hairless bat, is the most basal or primitive group. This study used molecular data to test this hypothesis. Data from two genes, Recombination Activating Gene (RAG2) and NADH Dehydrogenase (ND1), have been collected and analyzed using parsimony, likelihood, and Bayesian analyses. A combined data set using four genes (RAG2, ND1, Dentin Matrix Protein 1, β Fibrinogen) was also analyzed using BEAST to test evolutionary histories. Data from RAG2 show significant support for the hypothesis that *Cheiromeles* is the most basal group in this family, while data from ND1 leave the relationship unresolved. Furthermore, BEAST analyses support the hypothesis that this is the most primitive species with a divergence time of 43.5 MYA. Based on these data, we conclude that *Cheiromeles* is the most primitive species in the family Molossidae shown not only by differences in morphology but also by our molecular analysis.

P744 **Systematics and Evolutionary Biology**

Morphological and molecular variation in domestic rabbit breeds (*Oryctolagus cuniculus*) with a comparison to wild stock

Katy Estill*, Monte Thies, Sam Houston State University, Huntsville, Tx.

Domestication of rabbits began 1,500 years ago with captive breeding of the European wild rabbit, *Oryctolagus cuniculus*. Selective breeding resulted in a high degree of variability in external morphology and pelage, with 47 breeds of rabbits currently recognized in the US. These breeds, designated by the American Rabbit Breeders Association (ARBA), are often inaccurately described in scientific literature and are commonly described by size alone, or with an incorrect breed name. Without correctly defining the breed being used, research cannot be reliably replicated. This study is focused toward answering several questions regarding the systematics of domestic rabbits. I hypothesize that: 1) significant variation among domestic rabbit breeds can be quantified through morphometric studies of the cranium; 2) measurable cranial variation will also be present among European rabbits and domestic breeds; and 3) variation among breeds may be identifiable by molecular methods. I will complete a comparison among domestic breeds and wild stock based on cranial morphology using standard cranial measurements, as well as a molecular investigation. Using calipers and digital photographs, measurements of crania will be taken for analyses using appropriate statistics methods. Currently there is no collection of domestic breeds and ARBA breed standards are only weakly defined. This project would provide a museum collection and a quantifiable base for defining rabbit breeds. Preliminary morphometric analysis has been completed on two breeds, the Californian and the Dwarf Hotot. With results showing a significant difference in skulls by breed using both raw data and data that were scaled for size.

P760 **Systematics and Evolutionary Biology**

Genetic analysis of the 5'utr of bovine viral diarrhea virus

Candace Frerich*, Loren K. Ammerman, Angelo State University, San Angelo, Tx and Dale Weise, Texas Vet Labs, Inc., San Angelo, Tx

Bovine Viral Diarrhea Virus (BVDV) is responsible for notable economic losses to commercial cattle industries worldwide, making it an important subject of study. The objective of the proposed project was to characterize the frequency and genetic divergence of the different subgenotypes of BVDV that have been isolated from commercial cattle yards. Viral isolates were extracted and amplified using reverse transcriptase PCR. Sequences of the 5' untranslated region were collected and aligned with MEGA4; phylogenetic analysis was conducted using neighbor-joining criteria. The significance of nodes was analyzed using 1000 bootstrap replicates. Two major clades were recovered corresponding to the two genotypes: BVDV 1 and BVDV 2. Most of the 91 isolates were identified as subgenotype 1b; with genetic divergence between subgenotypes ranging from 8.6% to 25.9%. Subgenotypic differences between viral isolates can be enough to negate vaccine effectiveness, making genetic surveillance of the virus necessary.

846 **Systematics and Evolutionary Biology**

The use of microsatellite markers to determine population structure of feral pigs, *Sus scrofa*, in west central Texas

Diane Irby Beckham*, Stephanie McNabb, and Andrea B. Jensen, Hardin-Simmons University, Abilene, TX

Invasive species are a growing problem within the West Central Texas ecoregion, including the feral pig, *Sus scrofa*. This invasive pest destroys agricultural land, runs off and out-competes native species, and spreads diseases to humans and other animal species. Many management techniques focus upon known feral pig populations, but there is always the problem of re-introduction. This may be due to lack of information concerning the actual boundaries of the feral pig populations. With the use of microsatellite markers we are able to define population size and range of these pests more accurately than with use of non invasive ecological techniques. The data collected can then be incorporated into designing more effective management techniques. Feral pig specimens have been collected from various counties in West Central Texas, scored for microsatellite alleles, and analyzed for population structure. The goals of this project are to determine the population sizes and ranges of feral pigs in the West Central Texas area with the intent that the information will have application to future management practices.

860 Systematics and Evolutionary Biology

A reassessment of the tetrapod assemblage at the base of the Late Triassic sequence of Texas, and revised diversity and age estimates of the Otis Chalk localities

Michelle R. Stocker*, The University of Texas at Austin, Austin, TX

Understanding the taxonomic components of fossil assemblages recognized as chronologically older in the Late Triassic is important because of recent implementation of the 'long Norian', which compressed the duration of the early Late Triassic. The Otis Chalk faunal assemblage includes an exceptional diversity of Late Triassic vertebrates, and it forms the type assemblage for the Otischalkian land vertebrate faunachron. This assemblage preserves fossils that are poorly represented or absent elsewhere, hampering correlations with the numerically-dated Chinle Formation. Biostratigraphy and faunal similarity suggested the localities are basal in the Dockum Group within the Carnian; however, no absolute dates exist for this portion of the Dockum Group to independently test this age assignment. I reexamined the Otis Chalk specimens with a specific goal of identifying taxa based on evolutionarily derived characters (apomorphies). My reexamination revealed that specimens identified as index taxa (i.e., *Paleorhinus*) were recognized by primitive characters, and those identifications can no longer be justified. Therefore, the Otis Chalk assemblage cannot be tied to the type Carnian marine deposits using '*Paleorhinus*'. Recognition of new occurrences of a drepanosaur, a dinosauro-morph, a silesaurid, a basal dinosaur, and a unique archosauromorph provide important new records from Otis Chalk that are testable and increase local diversity. This new apomorphic approach to the taxonomic content of the Otis Chalk tetrapod assemblage provides an enhanced ability to accurately compare Late Triassic faunal assemblages on a broader scale, recognizing that Late Triassic terrestrial assemblages cannot be assigned a Carnian age based solely on the presence of '*Paleorhinus*'.

P866 Systematics and Evolutionary Biology

Assessment of introgressive hybridization between three species of *Juniperus*: Evidence from morphological and genetic data

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Previous studies examining hybridization in Utah juniper (*Juniperus osteosperma*) have relied on samples from only one of two other species potentially involved, i. e., western juniper (*J. occidentalis*), despite morphological evidence that introgression between grand juniper (*J. grandis*) and populations of Utah juniper may be occurring over a relatively large geographic area in extreme western Nevada. In this study, we extend previous assessments of hybridization by sampling grand juniper, as well as by expanding the sampling of both western and Utah juniper. Relationships between variation in non-coding chloroplast DNA sequences and nine taxonomically-important morphological features are explored in an attempt to document and better understand the geographic extent and biological importance of interspecific gene flow between these taxa.

P871 Systematics and Evolutionary Biology

Molecular phylogeny of *Aspergillus* species based on the internal transcribed spacer region

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DNA segments that have unique characteristics that can be used in identification and delineation of phylotypes in organisms. These markers contribute to the study of phylogenetic diversity of microorganisms, 95 percent of which cannot be successfully cultured. Ongoing research efforts show success in recognizing markers for many organisms, such as 16S rRNA for bacteria and cytochrome oxidase I for animals. The Internal Transcribed Spacer (ITS) region has been gaining popularity as a marker in fungal species identification. The question arises from the ability of ITS to discriminate among geographic populations within the same phylotype. Because of the importance of phylogenetic systematics and the use of appropriate molecular markers in biology, medicine, and agriculture, we developed a refined protocol for amplifying ITS and used this protocol for 20 species of *Aspergillus*. We collected an additional 20 *Aspergillus* ITS conspecific sequences with those sequenced in the lab. The methodology included obtaining samples of different *Aspergillus* (along with a few *Penicillium* and non-related fungal species), DNA extraction, PCR amplification, DNA purification, and phylogenetic analysis of the DNA sequences. After reporting these results, we will discuss if ITS can be used to differentiate phylogenetic relationships among and within the *Aspergillus* spp. One criterion for an effective marker relies on the ability to discriminate among different species and geographic isolates within the same phylotype. Maximum parsimony, distance, and maximum likelihood methods, coupled with bootstrap analysis will be employed to assess the rate evolution and the level of variability within and between phylotypes.

897 Systematics and Evolutionary Biology

A test for congruence among mitochondrial, AFLP, and microsatellite markers

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Morphological studies have failed to yield congruent resolution for the number of species within the genus *Dermanura* (Chiroptera: Phyllostomidae). Because of the lack of congruence among previous methods, we selected the genetically defined monophyletic bat genus *Dermanura* to test the resolving power of three distinct molecular markers for distinguishing species groups. Species delineated based on morphological characteristics have ranged from one to ten. Phylogenetic analyses of the mitochondrial cytochrome-b gene recovered 11 statistically supported monophyletic species groups. Implementation of new molecular methods utilizing DNA provides a substantially more sophisticated resolution to questions of species presence/absence as well as species boundaries. To identify species presence/absence and species boundaries we used the same morphologically identified specimens for each marker. Nuclear data were generated for two markers, amplified fragment length polymorphisms (AFLP) and cross-species amplified microsatellites, for comparison to the previously published cytochrome-b gene tree. Contrasting preliminary results were recovered among the nuclear markers. The nuclear data sets are limited to fewer species than were present in the cytochrome-b gene tree. The AFLP phylogeny produced the same species groups, but the deep branching pattern was not congruent. The microsatellite analysis did not produce monophyletic species groups. These contrasting results may be due to the discrepancy in the number of AFLP bands (i.e., >100) versus the number of microsatellite loci (i.e., five) among the two different molecular markers. Future research will increase the number of cross-species amplified microsatellite loci as well as the number of individuals and species evaluated in both nuclear phylogenies.

P927 Systematics and Evolutionary Biology

The Diagnosis of South African Microfauna Using Femoral Morphology

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Micromammals are informative environmental indicators due to their ecological specificity, sensitivity to environmental change, and small habitat ranges. As such, small mammal assemblages are often useful in paleoenvironmental reconstructions, particularly in cave localities which frequently preserve large samples. While species composition and relative abundance of these fossil assemblages are needed to reliably reconstruct paleoenvironments, lower-level taxonomic identification using mandibles, maxilla and teeth can be ambiguous due to overlapping morphologies. Data from postcranial elements is often overlooked as a source of apomorphies. In order to test the value of micromammal postcrania in identifying taxa from a Pleistocene fossil assemblage from northwestern Botswana, an examination of 14 known modern species trapped at the Koanaka Hills locality of Ngamiland Province was undertaken. Results from this analysis indicate that the femur displays genus-specific morphological features. While individual features tend to overlap between genera, the suite of these characteristics allowed confident diagnosis of the genera examined. A principal components analysis displayed separation between micromammal genera, which supports the utility of femoral morphology in the diagnosis of microfauna. An examination of small mammal femora collected from owl pellets from the Koanaka Hills of Botswana yielded identification of Crocidurines (white-toothed shrews), Murines (Old World rats and mice), Gerbillines (gerbils) and Cricetomyines (pouched rats), indicating that the postcranial elements may allow for more confident micromammal identification. Many of the taxa studied in this analysis are widespread in southern Africa and are known to occur at many fossil localities in the region.

P988 Systematics and Evolutionary Biology

A molecular analysis of owl prey from Koanaka Hills, Botswana

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The objective of this study is to determine small mammal species representation in owl pellets using molecular analyses. Owl pellets examined in this study originated from the Koanaka Hills of northwestern Botswana, that contains a cave system with fossiliferous deposits dating through the last 2 million years. Because rodents from this locality have been very difficult to identify to the species level using morphological characters alone, molecular tools will be applied to more confidently determine the taxa represented in the owl pellets, and will potentially aid in the identification of fossil material found at the site. The recovery of DNA from owl pellets is problematic because DNA is subject to a number of processes that degrade it postmortem such as lysosomal nucleases released within the cell that act on DNA. We successfully refined a protocol that enabled amplification of a fragment of the mitochondrial 12S rRNA gene and a fragment of the mitochondrial cytochrome *b* gene from DNA extracted from a modern rodent cranium. The sequences were compared against the NCBI database, and the BLASTN searches were used to identify DNA sequences of closely related species previously deposited in the database. Molecular phylogenetic analysis of DNA sequences from the unidentified specimens obtained from owl pellet will be compared with data from live trapped specimens, we will better understand owl prey preference and, therefore, be better able to interpret the fossil fauna.

996 Systematics and Evolutionary Biology

Phylogeographic variation in the cottonmouth, *Agkistrodon piscivorus*, using AFLP and venom protein profiles

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The cottonmouth is found throughout the southeastern United States along bodies of water. Due to its semi-aquatic habitat and generalist feeding behavior, it makes an ideal study organism to examine population genetic structure and venom protein variation because they can be geographically isolated. The objective of this study was to determine the level of genetic and venom protein variation in cottonmouths in Texas and to put the genetic variation in context with variation across the rest of its range. We hypothesized that genetic and venom variation will have similar patterns as expected based on the central dogma, but due to the natural selection pressures acting directly on venom, there will be less variation in the venom proteins. For the genetic study, Amplified Fragment Length Polymorphism (AFLP) was used. Venom protein variation was tested using reverse-phase high performance liquid chromatography (RP-HPLC). For the genetic study, 77 samples were used with a total of ten primer combinations. This generated a PCoA plot showing separation between Texas individuals and individuals from the rest of the range (LA, MS, GA, SC, FL) as well as isolation of the Concho Valley individuals from the other Texas individuals. Venom data from 86 samples showed that there was separation between populations in Texas ($p > .001$). However, the separation was not as distinct in the venom PCA as it was in the genetic PCoA. The cottonmouth has genetic and venom protein structure that follows a geographic pattern, but due to direct selection pressures (e.g. diet), venom is less variable.

P1022 **Systematics and Evolutionary Biology****Phylogenetic and morphometric investigation of genital divergence: A meta-analysis**

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It is widely accepted that genital structures, mostly those of males, evolve divergently across taxa; especially in those taxa with internal fertilization. Several models of evolution have been proposed to explain patterns of genital evolution: lock and key, pleiotropy, genital recognition, mechanical conflict of interest, and female mate choice. We believe that each of these evolutionary pathways will have a distinct morphological signal that can be interpreted through phylogenetic and morphometric analysis. By mapping male and female genital traits onto an independently generated molecular phylogeny, we investigate tempo and mode of genital evolution with the goal of gaining a better understanding of the driving forces behind the divergent nature of genital evolution.

678 **Terrestrial Ecology and Management****Volatilization of bornyl acetate, camphor, and bornyl acetate from *Juniperus ashei***

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The most abundant volatile organic compounds (VOC's) emitted from the leaves of Ashe juniper (*Juniperus ashei*) have been identified as bornyl acetate, camphor, and limonene. In order to further investigate the potential role of the VOC's as allelopathic compounds, these VOC's were collected using a Dynamic Headspace System in order to establish an adequate sampling time for future research. Sampling times of 0, 5, 10, 20, 30, and 40 minutes were conducted using 20-30 mg of HayeSep® Q80/100 adsorbent. The samples were eluted with 150 µl of hexane and analyzed using gas chromatography coupled with mass spectrometry. Retention times were established using commercially purchased standards. The peak intensities of the VOC's for both replicates generally increased as the sampling time increased, with the exception of the 20 min. sample in replicate 1. Some of the sample may have been lost during transport to the lab. It was determined that 30 minutes was an acceptable sampling time, and the adsorbing capacity of the glass traps would not be exceeded. In order to establish an approximate rate of volatilization, the above method will be duplicated and the internal standard method will be employed, using linalyl acetate as the internal standard, during GC-MS analysis to obtain quantitative data from field samples and laboratory samples. The laboratory data will provide information about how the rate of volatilization changes in a detached branch and will allow for a better simulation of field conditions for the investigation of the potential allelopathic role of the VOC's.

P684 **Terrestrial Ecology and Management****Longevity, philopatry and tests of oviposition preferences in *Exoprosopa albicollaris* (Diptera: bombyliidae), a parasite of *Bembecinus neglectus* (Hymenoptera: Crabronidae: Bembecinae)**

Rachael Amador* and Allan Hook, St. Edwards University

Exoprosopa albicollaris, a parasitic bee fly of the sand wasp *Bembecinus neglectus*, was studied 11 May-4 June, 2010, at Pedernales Falls State Park in Blanco Co., Texas. Emerging flies (n=68) were diagnostically marked to obtain information on longevity and site philopatry. The average number of days a fly was observed was only 2 days (range 1-5 days) while the average time span a fly was observed was 5.8 days (range 1-22) in the study site. Flies were occasionally seen up to 100m distant. Results were obtained on time/date of adult eclosion and daily activity patterns (feeding, oviposition). Additional results were obtained on oviposition rates, or the number of eggs thrown between bouts of landing to fill a sand chamber; flies coat an egg with sand from their abdominal sand chamber before tossing it down a wasp burrow. Variables influencing choice of oviposition sites were tested through paired tests of artificial nest entrances of various sizes and shapes. Generally the larger the entrance the more attractive it was to ovipositing flies.

694 **Terrestrial Ecology and Management****Differences in structure of the bat community in managed and unmanaged Southeastern pine-hardwood forests and the role of ecomorphology**

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Prescribed burn management improves habitat conditions for certain forest-dwelling species (red-cockaded woodpecker). However, the effect of such management practices on the forest-dwelling bat community is not well understood. We conducted our study in Sam Houston National Forest, Texas, a mixed pine-hardwood forest characterizing much of the southeastern United States. This forest comprises two districts: heavily managed (by prescribed burns) and unmanaged (unburned). We predicted the bat community of managed areas would have predominantly open-adapted, or clutter-intolerant species (large body size, high aspect ratio, high wing loading, and relatively constant frequency of echolocation calls). We expected the bat community in unmanaged areas to contain more clutter-adapted bat species (small body size, low aspect ratio, low wing loading, and frequency modulated calls). The study was conducted during summers in managed (2009 and 2010) and unmanaged areas (2010). We netted overall 151 bats in managed and 102 bats in unmanaged area. Bats were identified to species, and their age, sex, and reproductive status recorded. We took digital pictures of wings and recorded echolocation calls. We found that Seminole bats (high characteristic frequency, Fc; low wing loading) dominated at both sites. Big brown bats occurred in higher numbers in the unmanaged site despite their high wing loading. Evening bats (high call duration but low Fc) occurred in highest numbers in managed areas. Finally, we found a statistically significant difference in structures of the communities at the two sites (d.f. = 4, P < 0.0001), thus rejecting the null hypothesis of no difference.

P696 **Terrestrial Ecology and Management****Effect of land use of playa invertebrate richness and abundance**

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The purpose of this study was to determine landscape level patterns of invertebrate richness and abundance in 8 playas of the Southern High Plains in Floyd and Hale Counties, Texas. Invertebrates were collected from 20 July 2010-21 July 2010 from 8 playas surrounded by landscapes with different land uses. Land uses included urban (2 playas), grazed pasture (2 playas) and Conservation Reserve Program grasslands (CRP, 4 playas). Invertebrates were collected using dip net (30.5cm diameter, 800x900 micron) sweeps and a hand-tossed plankton tow net (25.4cm diameter, 400 micron) towed for 8 meters, and identified to family. Water chemistry was measured in the field (temperature, secchi transparency, pH) and samples were collected and measured in the lab (dissolved oxygen, hardness). Water chemistry in playas ranged as follows: temperature 23-29°C, pH 7.0-9.0, dissolved oxygen 5-10 mg/L, hardness 51.369-102.739 mg/L. Urban playas had the lowest total invertebrate richness (13 species), followed by grazed playas (16 species), with CRP playas having the highest richness (25 species). Richness was also lower in playas with obvious sources of pollution (urban and agricultural runoff). Grazed and CRP playas had multiple families of aquatic Coleoptera, but urban playas had only one family represented. Taxonomic diversity was also high for Odonata and Hemiptera in CRP playas compared to grazed and urban playas. Our results suggest that land use may be a determining factor in patterns of playa invertebrate diversity in the Southern High Plains.

717 Terrestrial Ecology and Management

Establishment of Clay-colored Thrush (*Turdus grayi*) in the Lower Rio Grande Valley of Texas

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Clay-colored Thrush (*Turdus grayi*) was first seen in the USA in 1940 and first nested in the USA in 1999 (Hidalgo Co.). A rare bird in the Lower Rio Grande Valley in 1990s, the species has become fairly common since 2000, in urban and riparian forests from Brownsville upriver to Laredo. Individuals have been banded in Harlingen (1), Weslaco (1), McAllen (15), and Santa Ana National Wildlife Refuge (17). 12 of 34 banded birds were juveniles (hatch year), indicating continued breeding in at least 2 locations. Given recent nesting in Laredo, and recent sightings in the Coastal Bend area, Clay-colored Thrushes may continue to expand northward in Texas.

724 Terrestrial Ecology and Management

The prevalence and abundance of endoparasites and ectoparasites in domesticated cattle: A study of parasitism on the Eastern Edwards Plateau

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The effects that parasites can have on cattle vary from unperceivable drains on energy to the untimely death of the host. Within this range, parasites have caused significant economic losses in cattle production in the United States. To better understand parasitism of cattle (*Bos taurus* and *Bos indicus*) cattle in central Texas on the Eastern Edwards Plateau, 240 cattle from two habitat groups, feedlot and range environments, were sampled for ectoparasites and endoparasites over the course of one year. Ten cattle from each habitat type were sampled each month over the year to account for any seasonal variability that might exist. Parasites were collected by direct fecal collection for endoparasites and external body examination for the recovery of ectoparasites. Ectoparasites reported include lice (Mallophaga and Anoplura), ticks (Argasidae and Ixodidae) and mites (Acari). Endoparasitic ova reported include Strongyloides and Coccidia type parasites. Prevalence, mean intensity, and abundance of endoparasites and ectoparasites found on cattle will be reported for each sample group. A comparison of parasites per group will also be reported in order to determine if habitat type and rearing technique has an effect on parasite type and load.

725 Terrestrial Ecology and Management

The impact of saltcedar biological control on a non-target species, *Tamarisk aphylla*

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The control of the exotic saltcedar (*Tamarix chinensis* and *T. ramosissima*) throughout the southwest has become an area of concern by conservationists. In an attempt to control this plant by biological means, several species of tamarisk leaf beetle (*Diorhabda* spp.) have been approved for release in the United States by the USDA. Along the Rio Grande River in Texas, two of these beetles have become established, with one (*D. sublineata*, the tropical tamarisk beetle) dominating the biocontrol efforts in the region. While studies prior to release indicated that the saltcedar was the primary preferred host for forage and reproduction, it was observed that leaf beetles were capable of reduced feeding and egg-laying on a sister taxa, the athel (*Tamarix aphylla*). Although athels are also exotic, they have been more widely accepted, being grown for shade and windbreaks. When the populations of *D. sublineata* encountered athel under field conditions, light to moderate damage was initially anticipated. This prediction proved false in August 2010, when numerous athels in the vicinity of Presidio, TX were completely defoliated as the wave of beetles passed through the area. Continued monitoring of both the saltcedar and athel is underway to assess the long-term impacts of the subtropical leaf beetle on both the saltcedar and the non-target athel trees of the region.

768 Terrestrial Ecology and Management

Artificial lighting and nocturnal anuran calling behavior in Michigan and Central Texas

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Artificial lighting affects the physiology of nocturnal anurans (i.e., frogs and toads); however, its effects on their behavior are still largely unknown. This study repeats and expands upon an earlier study I conducted in northern Michigan to determine if artificial lighting significantly affects male anuran calling behavior. Using the North American Amphibian Monitoring Program (NAAMP) protocol, I surveyed six anuran breeding sites in central Texas under an artificially illuminated (lit) condition using a high intensity floodlight and a naturally illuminated (unlit) condition. Seven anuran species were detected during these surveys. Across all species, significantly fewer anurans called and called less intensely during lit surveys than unlit surveys. Each individual species followed these trends and many did so with statistical significance. Abiotic weather variables also accounted for some of the calling variance. These results are consistent with the previous study analyzing a different frog community in northern Michigan. Together, these studies suggest that artificial night lighting is a form of ecological pollution that could potentially contribute to amphibian declines by reducing vocal advertisements by male anurans for mating opportunities.

P769 Terrestrial Ecology and Management

Call latency in anuran breeding call surveys in Central Texas

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Concern over global amphibian declines has increased the use of amphibian monitoring programs such as the North American Amphibian Monitoring Program (NAAMP). The NAAMP protocol has been widely used to determine anuran (i.e., frog and toad) species distribution and relative abundance using volunteer-based auditory surveys of male breeding calls. The goals of this study were to monitor anuran breeding habitats in central Texas using the NAAMP protocol and to investigate the utility of a new measure of anuran calling behavior, call latency, the latency of a species to call after the beginning of a call survey. Four routes with ten listening sites per route were surveyed once a month between February and July from 2007 to 2010. Nine species of anurans were heard across all surveys and for six species, annual percent site occupancy changed significantly between years. Call latency and call index (a measure of calling intensity) varied significantly across species. For seven of the nine species, higher call index was associated with shorter call latency. Neither call latency nor call index differed significantly between surveys with low road noise and surveys with high road noise. Call index was not associated with wind velocity, but for two species, call latency was longer in surveys conducted under high-wind conditions than surveys conducted under low-wind conditions. Call latency is more reliably quantified than call index and is a simple measure that can be incorporated into the NAAMP call survey protocol.

774 Terrestrial Ecology and Management**The efficacy of different herbicides with varying doses on the weed flora associated in direct seeded rice under puddle condition**

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The present investigation was conducted at Instructional Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) India during the kharif season (June-October) 2006. The experiment was laid out in randomized block design comprised of eight treatments of various combinations of different herbicides viz. T₁: PIH 2023 10% SC 15 g a.i./ha at 18 DAS; T₂: PIH 2023 10% SC 20 g a.i./ha at 18 DAS; T₃: PIH 2023 10% SC 25 g a.i./ha at 18 DAS; T₄: PIH 2023 10% SC 30 g a.i./ha at 18 DAS; T₅: PIH 2023 10% SC 60 g a.i./ha at 18 DAS; T₆: Almix 20% WP 4 g a.i./ha 18 DAS; T₇: Control (unweeded check) and T₈: Hand weeding at 30 DAS with three replications. Rice cultivar "IR-64" was grown as a test crop. Rice was manually sown with a seed rate of 60 kg ha⁻¹ on 25th July, 2006 and harvested on 15th and 16th November, 2006. The crop was fertilized with 100:60:40 kg NPK ha⁻¹, respectively. Results revealed that almost all growth parameters, yield attributes and grain yield were significantly higher under post-emergence application of PIH 2023 10% SC @ 25 g a.i. ha⁻¹ at 18 DAS after sowing (T₃) over other treatments. *Echinochloa colona*, *Cyperus* spp., *F. miaceae*, *L. hyssopifolia* were the pre-dominant weeds in experimental plot. Minimum weed density was noted under post emergence application of Almix 4 g ha⁻¹ and PIH 2023 25 g ha⁻¹ at 20, 40, 70 and 90 DAS. Whereas, at harvest lower dry matter of weeds and highest weed control efficiency was recorded under Almix 4 g ha⁻¹ (T₆), PIH 2023 25 g ha⁻¹ and PIH 2023 60 g ha⁻¹, respectively. It was found effective to control broad spectrum of weeds viz., grasses, sedges and forbs.

775 Terrestrial Ecology and Management**An ecological study of the Southern Plains woodrat (*Neotoma micropus*) on the Bar SR Bar Ranch in Alpine, Texas**

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From October 2008 to October 2009 a study was completed on the Southern Plains woodrat (*Neotoma micropus*) in Alpine, Texas. Based on the available literature, this type of study had never been performed in Trans-Pecos region of Texas. During the study, woodrats were trapped using Havahart traps. The coordinates of each den were recorded. Once captured, woodrats were ear tagged and the sex was determined with the following morphometrics recorded: body length, tail length, ear length, hindfoot length, and mass. The primary plant composition of the occupied den was also recorded. Using the coordinates, a nearest neighbor test was performed comparing all dens trapped, occupied dens, dens occupied by males, and dens occupied by females. A chi-square test was performed to determine if the primary plant composition of occupied dens differed significantly from parity. A Student's t test was performed to determine if the morphometrics of males and females differed significantly.

P816 Terrestrial Ecology and Management**Brood care and transport behaviors in *S. invicta***

Rachel Grotte*, Robert Renthal, University of Texas at San Antonio

Solenopsis invicta has been extensively studied in North America as an invasive species that costs the U.S. over 5 billion each year in agricultural damage, medical damage and management costs. Much is known about its preferred habitat, morphology, and physiology, however its behavior, especially regarding brood care and transport within the nest has room for study. This study was performed in a laboratory constructed colony made of hydrostone plaster. The colony was made with all subterranean tunnels and chambers directly against the clear plastic side of the container to allow for viewing. A surface area for free foraging is also present. Ants were fed on a diet consisting of sucrose solution and *Acheta domestica* as a protein source. Behavioral observations were centered upon brood chambers, adjacent tunnels, main vertical tunnels leaving the surface using video recorded with a Sony Handy-cam DCR-HC96 with a wide conversion lens. Population determined by mark and recapture Lincoln-Peterson method. The purpose initially was to determine the best methods for keeping the colony in an environment that was natural and comfortable, as well as keep viewing and filming of all subterranean area's possible. Ultimately the experiment attempts to determine a basis for the decision making process in brood transport and assess the factors that affect brood care behavior inconsistencies. Also examined was a summary of discrete behaviors observed in *S. invicta*. Insight into caretaking behavior of such a cooperative animal community could reveal implications for the evolution of many social and eusocial species.

P817 Terrestrial Ecology and Management**Competition and Light Exposure as Possible Factors in the Distribution of *Verbesina virginica***

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Verbesina virginica (Frost Weed) is a perennial herbaceous plant that occurs in areas across the eastern and central United States, including Bexar County, Texas. In central Texas, *V. virginica* is found almost exclusively in the understory of woodland habitats. Competition with grasses and susceptibility to water loss with increased solar radiation are possible factors affecting its distribution. Density gradient experiments and a DeWitt replacement series experiment were performed to evaluate the effect of competition on *V. virginica* and a perennial grass, *Bothriochloa ischaemum* (K.R. Bluestem). Light gradient experiments were performed in which each species is grown in a monoculture at a constant population density and in a mixture at a constant ratio to evaluate their growth and ability to compete at specific light levels. *Verbesina virginica* biomass, stem length, and leaves per plant decreased significantly with increased density and with increased frequency in the replacement series. *Bothriochloa ischaemum* biomass, leaf length, and leaves per plant decreased significantly with increased density but displayed no significant differences between species frequencies. In both monoculture and mixture, *Verbesina virginica* biomass, stem length, and leaves per plant were highest at intermediate light levels ranging from 33% to 66% ambient light levels and *Bothriochloa ischaemum* biomass, leaf length, and leaves per plant were highest at 100% ambient light levels. The results show that growth of both species is inhibited by intraspecific competition. The results for *V. virginica* are consistent with an understory shade plant, while the results for *B. ischaemum* are consistent with a grassland species.

859 Terrestrial Ecology and Management

Diversity, abundance, and associated habitat use of coastal marsh avian communities following the storm surge of Hurricane Ike

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Avian species diversity and abundance in marsh ecosystems may be determined by the size and quality of the marsh, which can be altered by tropical storms and hurricanes. The marshes in southern Jefferson County were negatively affected as a result of Hurricane Ike striking the upper Texas Gulf Coast on 13 September 2008. I am conducting year-round monthly point count surveys in order to estimate species diversity and abundance of migratory and non-migratory birds following the storm surge of Hurricane Ike. Marsh birds have documented habitat associations based upon the dominant vegetation type and the percentages of water cover, bare substrate, and emergent vegetation; therefore, I will also be conducting habitat analyses in order to correlated species diversity and individual abundances with these variables. Preliminary results are revealing that water and mud coverage, habitat diversity, and the level of human disturbance are important factors contributing to marsh avian species diversity and abundance.

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Nestling growth and mortality of urban great-tailed grackles (*Quiscalus mexicanus*)

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Conflicts can occur when wildlife populations increase in urban areas. One species currently causing concern in urban areas is the great-tailed grackle (*Quiscalus mexicanus*). Great-tailed grackles form large roosts and breeding colonies in urban parks, shopping centers, and parking lots. Many cities in Texas are therefore faced with the perennial issue of managing these flocks. Most cities have not been successful, possibly due to a considerable lack of information on this species in urban areas. In particular, there is little information on the reproductive success of urban great-tailed grackles. Therefore, in 2009 and 2010 data were collected from 724 chicks at 655 nests at an urban breeding colony in northeast Texas. These chicks were weighed, measured, and banded. A subset of 37 focal nests was also studied to create growth curves for male and female nestlings. Finally, 90 nests were studied to establish terminal egg neglect, if any. Here we present data on nest success and sources of mortality, sex ratio biases and the sources of these biases, hatch failure, and nestling growth relative to egg sequence. These data are then compared to published studies on populations in more non-urban settings.

898 Terrestrial Ecology and Management

Use of urban bird feeders by white-winged doves (*Zenaida asiatica*) in Texas

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Over the last 60 years, white-winged doves (*Zenaida asiatica*) in Texas have expanded their range northward from the southern portion of the state, taking advantage of resources in urban areas. This expansion increased potential interactions between white-winged doves and already-established urban species at bird feeders. To understand the extent of these interactions, we documented and quantified bird usage at 30 feeders in two central Texas cities. Trays of seed were placed in urban yards, parks, and greenspaces and video recorded for five half-hour sessions during summer 2009 and winter 2010. During observation sessions, numbers of individuals present, total time present, and numbers of displacement interactions performed were recorded for each species. White-winged doves used feeders more than other species. During displacements, a size-based hierarchy was found with larger species more likely to be the displacer, with a large portions of aggressive interactions being intraspecific. As white-winged doves spread into new areas, they could potentially reduce feeder usage of more established urban species, possibly on par with the effect of great-tailed grackles in time spent at feeders, numbers present, and aggressive behavior.

900 Terrestrial Ecology and Management

Problematic predator: Coyote (*Canis latrans*) predation, competition, and dispersal

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Abstract: With the eradication of many top tier carnivores over the centuries throughout the lower 48 states, the expansion of the coyote (*Canis latrans*) population has been an ever increasing wildlife management issue. Multiple studies have been conducted illustrating that coyotes, during pup rearing months, increase predation on livestock. However, very little is known about dispersing coyote pups and their impact on seasonal predation due to competition with other carnivores. We propose that in looking at predation rates of both mating coyotes pairs and their dispersing pups, and how these rates compare to rates of competition between other carnivores in the study areas, that we will have a greater understanding of coyote predation, dispersal, and competition to aid in the development of new management tools that would assist in the reduction of livestock predation.

P905 Terrestrial Ecology and Management

A survey of ectoparasites from small mammals from Honduras

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The ectoparasites of small mammals are commonly overlooked by many in field collections. The knowledge about their host-parasite associations is still not well understood in areas with histories of intensive vertebrate sampling, and is even less so in the more remote parts of the world. Toward rectifying this issue, an investigation into the ectoparasitic acari associated with small mammals from Honduras was initiated. Three genera of rodents (*Peromyscus*, *Oryzomys*, and *Heteromys*) were collected in the Cusuco National park and La Tigra National Park in 1994 and 1995. Hosts were brushed for ectoparasites, and collected arthropods were stored in 70% EtOH until they could be processed and identified. These specimens were donated to the Jim V. Richerson Invertebrate Collection in 2008, and work began on mounting and identifying the acari. Ectoparasites recovered included *Eubrachylaelps circularis*, *Steptolaelps heteromys*, *Glycyphagus hypudei*, and several *Androlaelaps* and Trombiculid species. Prevalence and mean intensity for each parasite by host will be presented.

906 Terrestrial Ecology and Management**A preliminary survey of reptiles, amphibians, and small mammals in invasive saltcedar (*Tamarix* spp.) monocultures in Presidio County, Texas**

Karin L. Nilsen, Steven G. Platt, and Christopher M. Ritzi, Sul Ross State University

Saltcedar (*Tamarix* spp.) are small trees or shrubs which evolved in the saline, arid riparian habitat, of Central Asia and the eastern Mediterranean. Since 1823, two highly invasive species and their hybrids (*Tamarix ramosissima* and *T. chinensis*) had been introduced into the western United States, primarily as ornamentals and control of stream bank erosion. These species have displaced native plant communities in riparian zones, contributing to the decline of biodiversity found along West Texas water ways. Previous studies throughout the western United States show mixed responses of mammalian wildlife to the presence of saltcedar. This study aims to examine the mammalian and herpetological biodiversity in various levels of *Tamarix* populations. Sampling occurred from March through October 2010 at nine sites. The sites were categorized as either: Dominant Native (ie. 75% of native, Non- *Tamarix* flora), Dominant Non-Native (ie. *Tamarix* Monocultures) and Mixed Vegetation. Three trap line types were used at each site in each vegetation type. Mammalian trap lines consisted of a 15 m line transect of alternating Sherman live traps and snap traps. Reptile trap lines consisted of three drift fences at 0, 120 and 240 degrees armed with terminal pitfalls. Amphibian trap lines consisted of a single drift fence with terminal pitfalls. Survey results for the 2010 field season include the following species; Mammals- *Chaetodipus intermedius*, *Dipodomys ordii* *Peromyscus maniculatus*, *Peromyscus leucopus*; Reptiles- *Cnemidophorus tesselatus*, *Uta stansburiana stejnegeri*, *Lampropeltis triangulum*; Amphibians- *Scaphiopus couchii* and *Bufo speciosus*. Information concerning species presence and abundance per habitat type will be discussed.

910 Terrestrial Ecology and Management**Introduction of the tamarisk leaf beetle (*Diorhabda* spp.) as a saltcedar (*Tamarix*) biocontrol agent along the Rio Grande in Presidio County, Texas**

Christopher M. Ritzi*, Anne Marie Hilscher, Sul Ross State University, Alpine, TX and Andrew Berezin, Wharton County Community College, Sugar land, TX

Saltcedar (*Tamarix* spp.) is a deciduous shrub or small tree that was introduced into the United States from Eurasia in the early 1800's to stabilize riverbank erosion and to serve as a windbreak and ornamental. However, due to a high reproductive potential and the absence of natural predators, saltcedar has become invasive on many river systems in the Western United States, such as the Colorado and Rio Grande rivers. In 2006, attempts to establish the Tamarisk leaf beetle (*Diorhabda* spp.) at three locations along the Rio Grande was conducted in an attempt to control the spread of saltcedar and restore the riparian corridor which has become dominated by a monoculture of this invasive exotic plant. Currently, 14 release sites along the Rio Grande from Candelaria to Lajitas have achieved varying levels of establishment. A comparison of the establishment and efficiency of two species of Tamarisk leaf beetle, the Subtropical Tamarisk Beetle (*Diorhabda sublineata*) and the Mediterranean Leaf Beetle (*Diorhabda elongate*), has been conducted. Current results favor *D. sublineata*, as it has defoliated over twenty hectares of Tamarisk within the study area.

915 Terrestrial Ecology and Management**A Long-term and landscape view of tropical and imported fire ants in the South Texas brush country**

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Competition among *Solenopsis* fire ants is thought to strongly influence the relative abundances of respective species in a community. We examined changes over a 12 year period in relative densities of two species, the Tropical and the Red Imported fire ant at 10 sites on a 'large' private ranch in the South Texas Brush country near the Texas-Mexican border. Presence-absence and relative abundances of ants were documented by mound counts and baiting procedures. Rainfall and temperatures had strong influences on population counts of both species. Direct competition between these species was observed at five sites with Tropical fire ants being locally or temporally exterminated in each case. Imported fire ants were observed to found and spread in five additional sites. Tropical fire ants declined or died out at all but one site. The decline and following absence of Tropical fire ants at four sites before the establishment of Imported Fire ants was also documented. We suggest that the internal population dynamics of tropical fire ants (and perhaps other taxa) may be an important factor in the ability of native ants to act as community resistance to the invasive imported fire ant.

P961 Terrestrial Ecology and Management**A comparative analysis of small mammals from barn owl pellets and live trapping from the Koanaka Hills, Northwestern Botswana**

Richard S. Tutalo*, Patrick J. Lewis, Monte L. Thies, Sam Houston State University

Recent excavations at the Koanaka Hills locality of northwestern Botswana have yielded a diverse small mammal fossil assemblage dating from ca. 2 million to 100,000 years old. Based on element preservation and etching from digestion, barn owls (*Tyto alba*) are the most likely accumulating agent for this assemblage. There are two active barn owl roosts in the cave system and collection of modern owl pellets yielded 95 pellets in 2008-2009. Small mammal trapping was conducted during these field seasons to determine modern taxa at the Koanaka Hills and to build a comparative skeletal collection. Here we compare species representation in the trapping record and barn owl pellets. This comparison should reveal aspects of owl behavior and other sources of potential bias in the fossil record. For example, comparing taxa recovered from pellets with those recorded through trapping, barn owl hunting range and prey preference can be estimated. All pellets collected were dissected producing more than 1000 skeletal elements, primarily attributed to mammals. Identifications were made from tooth cusp patterns and alveoli patterns when the former was not available. Preliminary analysis of pellet remains yielded possible identifications of thirteen rodent genera and one genus of shrew, while our trapping records indicated eleven genera of rodents, one genus of shrew, and one genus of elephant shrew. Together, these two methods will provide an accurate representation of the small mammal fauna of this locality, while also identifying potential areas of taphonomic bias, thereby allowing greater confidence in the interpretation of the fossil material.

966 Terrestrial Ecology and Management

Denning ecology of the American hog-nosed skunk, *Conepatus leuconotus*

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We studied den site selection by 29 radio-collared American hog-nosed skunks (*Conepatus leuconotus*) in west-central Texas. Between July 2008 and December 2010, skunks were tracked to den sites 996 times, yielding 611 unique den sites. These den sites were categorized into five types: 1) under large rocks or rock outcroppings, 2) burrows, 3) in prickly pear (*Opuntia* spp.), 4) brushpiles, and 5) other. Den type selection differed between sexes ($n=996$, $\chi^2=51.2$, $d.f.=4$), and seasonally for males ($n=386$, $\chi^2=51.6$, $d.f.=12$, and females ($n=610$, $\chi^2=98.1$, $d.f.=12$). A random subset ($n=120$) of the located den sites were further analyzed, as well as an equal number of duplicate random plots. A principal component analysis (PCA) was conducted on 18 habitat variables used to assess den sites and random plots. The first six factors of the PCA explained over 70% of the variance, and were used to conduct multivariate analysis of variance tests and discriminant function analyses. These analyses showed that den sites differed significantly from random sites ($F=7.801$, Wilk's lambda=0.833, $d.f.=223$, $P=0.000$), and revealed that *C. leuconotus* favored den sites that afforded some degree of cover, typically choosing sites thick with trees and shrubs. Den site selection differed between males and females ($F=8.125$, Wilk's lambda=0.681, $d.f.=6,104$, $P=0.000$); and a jackknifed classification analysis correctly assigned den sites to gender 73% of the time.

P969 Terrestrial Ecology and Management

The molecular identification of North Central Texas urban coyotes (*Canis latrans*) using a species-specific primer pair

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Surveying large urban mammals is problematic since populations are low in density, occupy fragmented habitats, and as secretive species are difficult to detect. As such, traditional mark-recapture methods may not be appropriate or adequate. Non-invasive genetic sampling is an effective ecological tool for studying populations under these conditions. Such sampling typically involves the extraction of mtDNA from hair or scat, PCR amplification, and enzymatic digestion of the product. Species identification is made from the resulting restriction profiles. This study presents an alternative method that uses computer generated species-specific primer pairs for identification, eliminating the cost and time of using restriction endonucleases. With this method, we successfully distinguished coyote scat from that of other common North Central Texas urban predators.

971 Terrestrial Ecology and Management

Multiple captures of *Reithrodontomys fulvescens* and *Baiomys taylori* may indicate short-term, not long-term pair-bonding

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Multiple captures (finding >1 animal in a single trap) of small mammals are often used to infer pair-bonding activity in arvicoline and cricetine rodents. We analyzed captures of fulvous harvest mice (*Reithrodontomys fulvescens*) and northern pygmy mice (*Baiomys taylori*) from a 2 year trapping study in native tallgrass prairie at Clymer Meadow, a Nature Conservancy property in Central Texas, to test the hypothesis that these species form heterosexual, long-term pair bonds. A significant majority of multiple captures in both species were heterosexual, which is consistent with reproductive co-traveling. However, there was little evidence of long-term pair-bonding. Only 1 co-captured heterosexual pair was recaptured as a pair (in *R. fulvescens*) and several animals of both sexes in both species were co-captured with multiple individuals. We measured our findings against published criteria for inference of social traveling and interpret our data to mean that *R. fulvescens* and *B. taylori* co-travel with mates for short periods of time but that the lengths of such associations are highly plastic.

982 Terrestrial Ecology and Management

Creating a successful citizen science program to detect and report invasive species

Travis Gallo* & Damon Waitt, the Lady Bird Johnson Wildflower Center at the University of Texas at Austin

Invasive plants are being introduced at alarming rates and our limited knowledge about their actual distribution is becoming increasingly worrisome. The *Invaders of Texas* program is a successful citizen science program using volunteers to survey and monitor invasive plants throughout Texas. The program trains citizen scientists to detect the arrival and dispersal of invasive plants in their local areas and report them into an online, statewide mapping database. To test the value of citizen scientists' data we compared *Invaders of Texas* citizen scientists' observations of *Arundo donax* (giant reed) to previously recorded *A. donax* in Texas, finding an increase in its overall distribution. By using an online data submission tool and a web-based mapping system we have engaged a cadre of citizen scientists to identify and report invasive plants throughout Texas, contributing valuable information about the distribution of invasive plants in Texas.

P1025 **Terrestrial Ecology and Management****Female mortality rate, age at maturity, and annual reproductive output predict species status in turtles**

James Cureton, Jeff Goessling*, and Raelynn Deaton, Department of Biological Sciences, Sam Houston State University

Road mortality is a major concern for all conservation biologists, especially those studying declining species. Several models have been developed to better understand road mortality; however, none of these models have directly incorporated life-history theory. Here, we developed a model which predicts the relative sustainability of a species in the presence of increasing urbanization; we assessed the role of female age at maturity and annual reproductive output in population sustainability of ten turtle species commonly killed on roads. In general, with increasing female mortality, the probability of extinction increased, and population growth rate and the number of alleles decreased. Male mortality has less of an impact than female mortality on the probability of extinction, population growth rate, and the number of alleles. We observed a similar pattern when we reduced the original population size by half to simulate habitat fragmentation. Further, with reduced population size and increased female mortality, the gopher tortoise (*Gopherus polyphemus*), Texas tortoise (*G. berlandieri*), Blanding's turtle (*Emydoidea blandingii*), and western box turtle (*Terrapene ornata*) were most susceptible to decline. Using simulated data from our ten species, we developed a predictive model that incorporates a sensitivity factor (female age at maturity / annual reproductive output) to predict the relative viability of a species for which only limited data exist. Almost all species with high sensitivity factors are currently recognized as declining species. Our simulations and predictive model demonstrate that female age at maturity and annual reproductive output play an important role in population viability, especially in organisms susceptible to high mortality, and should be an important factor in proactive conservation.

P1026 **Terrestrial Ecology and Management****Hot moments and hot spots: Identifying spatial and temporal predictors of road mortality of turtles in Texas**

Raelynn Deaton and James C. Cureton II, Department of Biological Sciences, Sam Houston State University

For vulnerable wildlife, reduced gene flow and road mortality are major consequences of urban development. Turtles are one of the most highly susceptible vertebrate groups to road mortality, which is believed to be a major cause of recent population declines. Certain life history traits (e.g. long life span, low reproductive output) also make turtles vulnerable to population declines, especially when female mortality is high. Thus, life history coupled with high susceptibility to road mortality, calls for a proactive way to identify species or groups most vulnerable. One approach is identifying hot moments (temporal) and hot spots (spatial) of road mortality. Temporal factors, including temperature and precipitation, are important predictors of turtle activity, while spatial factors, such as habitat type and traffic volume, may indicate where road mortality is most likely; thus, identifying the main factors associated with road mortality will help predict areas where turtles are most likely to be struck. In this study, we used Akaike's Information Criterion to (1) evaluate several explanatory temporal models testing the observed road mortality patterns of turtles for 2009 and 2010 in an urban-prone population in Texas; and (2) to identify temporal and spatial predictors of turtle road mortality in this urban area. As expected, our temporal models showed average daily temperature and/or precipitation as the most important predictors of road mortality for all five turtle species collected (aquatic and terrestrial). For terrestrial turtles, the most explanatory spatial model included the distance to the nearest water. For aquatic and all species combined, the best explanatory spatial model included distance to the nearest forest. These results verify important temporal and spatial factors driving turtle mortality in an urban prone area, and will aid in our understanding of turtle ecology and mortality. This information will be useful in implementing proactive conservation plans for this group.

P1030 **Terrestrial Ecology and Management****Landscape effects on seedbank and seedling density, cover, growth and seed production of *Centaurea stoebe* in Boulder County, Colorado**

Stefano Pineda*, Dr. Osvaldo Hernandez, Benjamin Itz, St. Edwards University Austin, Tx, Dr. David G. Knochel, University of Colorado at Boulder.

As an invasive, *Centaurea stoebe*'s (spotted knapweed) success may be attributed to the plant's ability to outcompete native plants for resources in environments. It is logical to assume that some landscapes offer a more favorable environment for *C. stoebe* populations to flourish. This study included an analysis of the landscape variable aspect, which has been suggested to enhance the abundance of invasives such as *C. stoebe*. Transects were established on three aspects (north facing slope, south facing slope, and bottom meadow/riparian zone) along which seed bank, seedling density, growth and production of mature knapweed were sampled. Cover of native competitors and *Centaurea stoebe* were also sampled. Knapweed seed bank and seed density were compared to the population of mature knapweed and knapweed seedlings. In all three aspects, knapweed negatively correlated with both native forbs and grasses. Additionally, native grasses were more prominent in bottomlands and native forbs were more prominent on north aspects. Although knapweed cover did not statistically differ by aspect, it appears there is more knapweed on the bottomlands than on the north slope. North facing slopes and bottomlands have about twice as many seeds per seed head than south-facing slopes. *C. stoebe* seed bank density was also significantly correlated to seedling density, and marginally with respect to percent total knapweed cover. Knapweed seedling density did not differ by aspect and there was a positive correlation between knapweed seedling density and knapweed percent cover.

1032 **Terrestrial Ecology and Management****Cow fecal arthropod community succession in pasture and forest habitats**

Ian Wright*, University of Texas at Austin, Austin, TX

Arthropods colonize fresh cow feces and utilize this resource for both larval rearing and as hunting grounds. In this study, I sampled the arthropod taxa within and among cow patties placed in both a pasture and a forest site in Monteverde, Costa Rica. The number and complexity of taxa found here and the interactions among them increased with time of exposure of the fecal resource for the first 72 to 96 hours. After this time, the resource senesced and trophic complexity decreased. Putative food webs (Appendix 1) constructed for pasture and forest sites showed higher trophic complexity in the forest site than in the pasture site. The forest was also more diverse and species even than was the pasture, the latter having been dominated by fly larvae. These results indicate that forests are more diverse and complex than are pastures. These results also have importance for human health as disease-transmitting Muscid flies seem to have higher

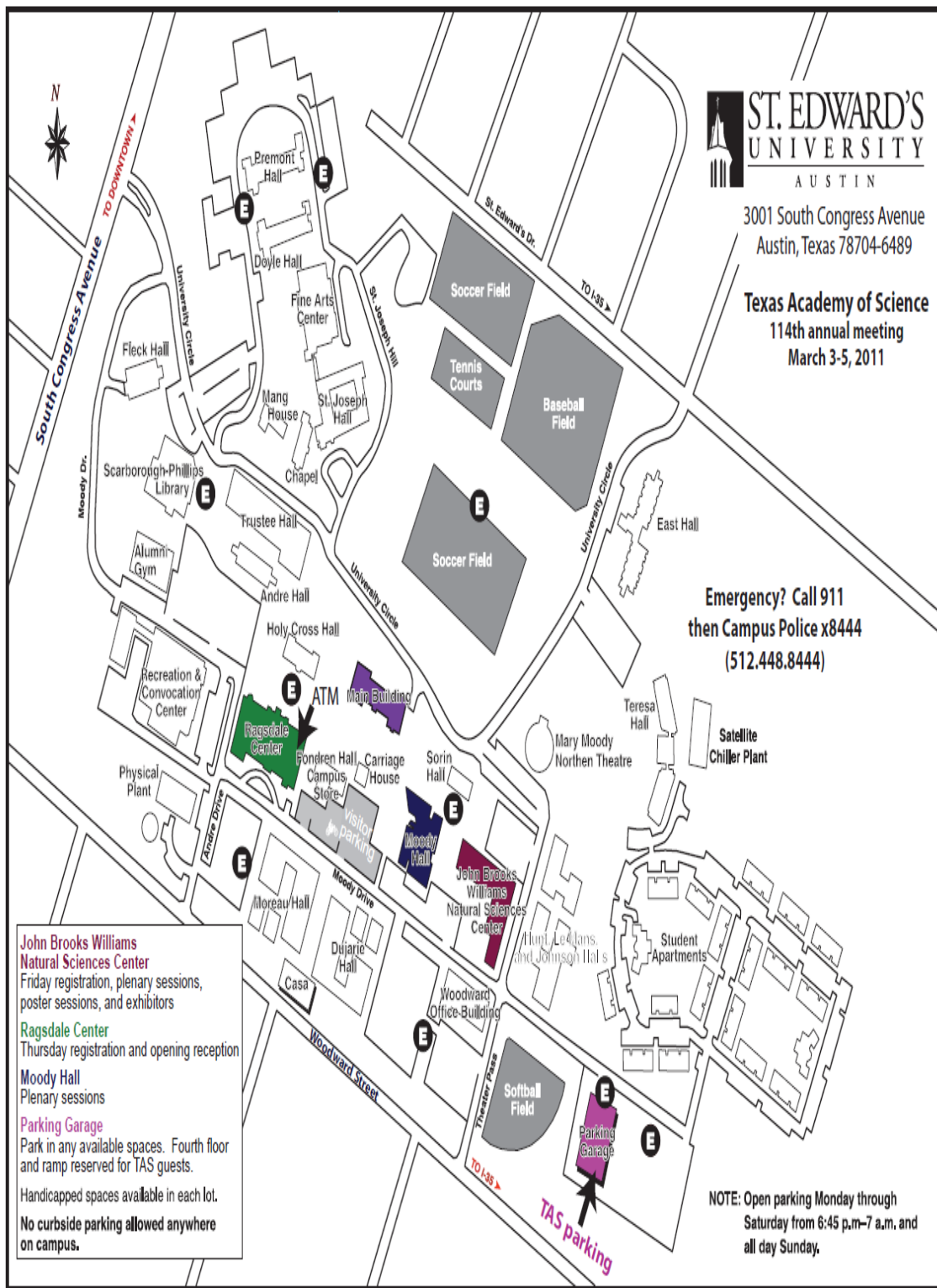
survivorship in pastures where their Staphylinid predators are less abundant and food webs are less complex.

P1045 **Terrestrial Ecology and Management**

Effects of gopher mounds on a spotted knapweed (*Centaurea stoebe*) population

Benjamin Itz*, Stefano Pineda, William Quinn, Osvaldo Hernandez, St. Edward's University, Austin, TX and David Knochel, Timothy Seastedt, University of Colorado, Boulder, CO

Disturbance is an important factor in ecosystem stability, strongly influencing the composition of plant communities. High levels of disturbance increase the availability of exposed soil, which favors fast growing generalists and pioneer species. Most invasive plant species fall into these categories, and are favored by disturbance. Our research focused on the interactions between an invasive forb, spotted knapweed (*Centaurea stoebe*), and gopher mounds in a valley near Left Hand Canyon, in Boulder County, Colorado. Gopher mounds have been shown to be important sources of micro-disturbance in some other grass communities, aiding the migration of invasive pioneer species. We hypothesized that the gopher mounds in the valley correlated positively with knapweed cover, seed production, and/or seedling success. We established plots with and without gopher disturbance and compared plant cover, as well as spotted knapweed seed production, seedbank richness, and seedling density. Additionally, we analyzed the abundance and activity of several biological control insects that had been released to target spotted knapweed, including *Cyphocleonus achates*, *Larinus minutus*, *Sphenoptera jugoslavica*, and two species of Urophora gall fly. We found no significant evidence that gopher mounds had affected spotted knapweed distribution in the valley.



John Brooks Williams Natural Sciences Center
Friday registration, plenary sessions, poster sessions, and exhibitors

Ragsdale Center
Thursday registration and opening reception

Moody Hall
Plenary sessions

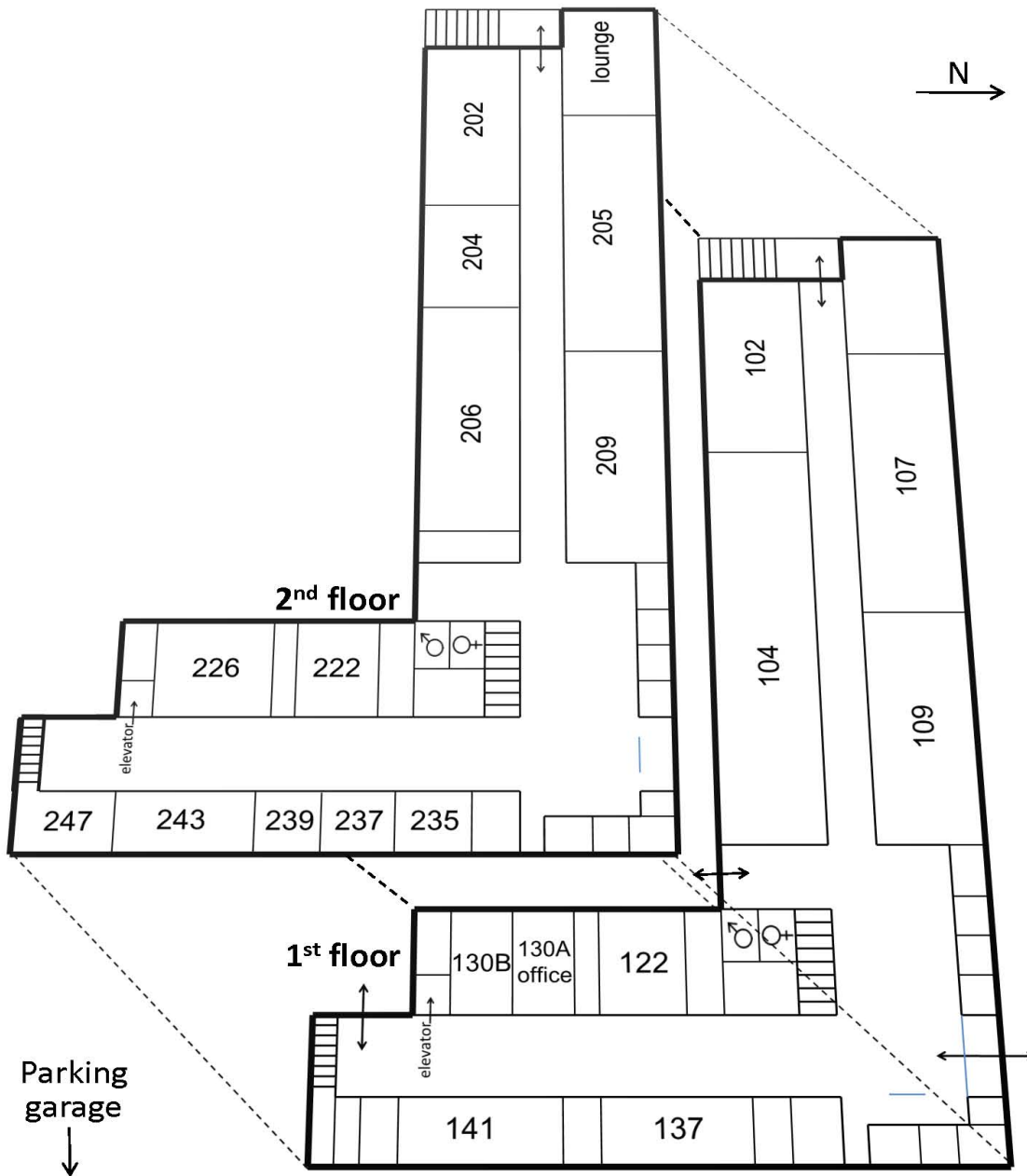
Parking Garage
Park in any available spaces. Fourth floor and ramp reserved for TAS guests.

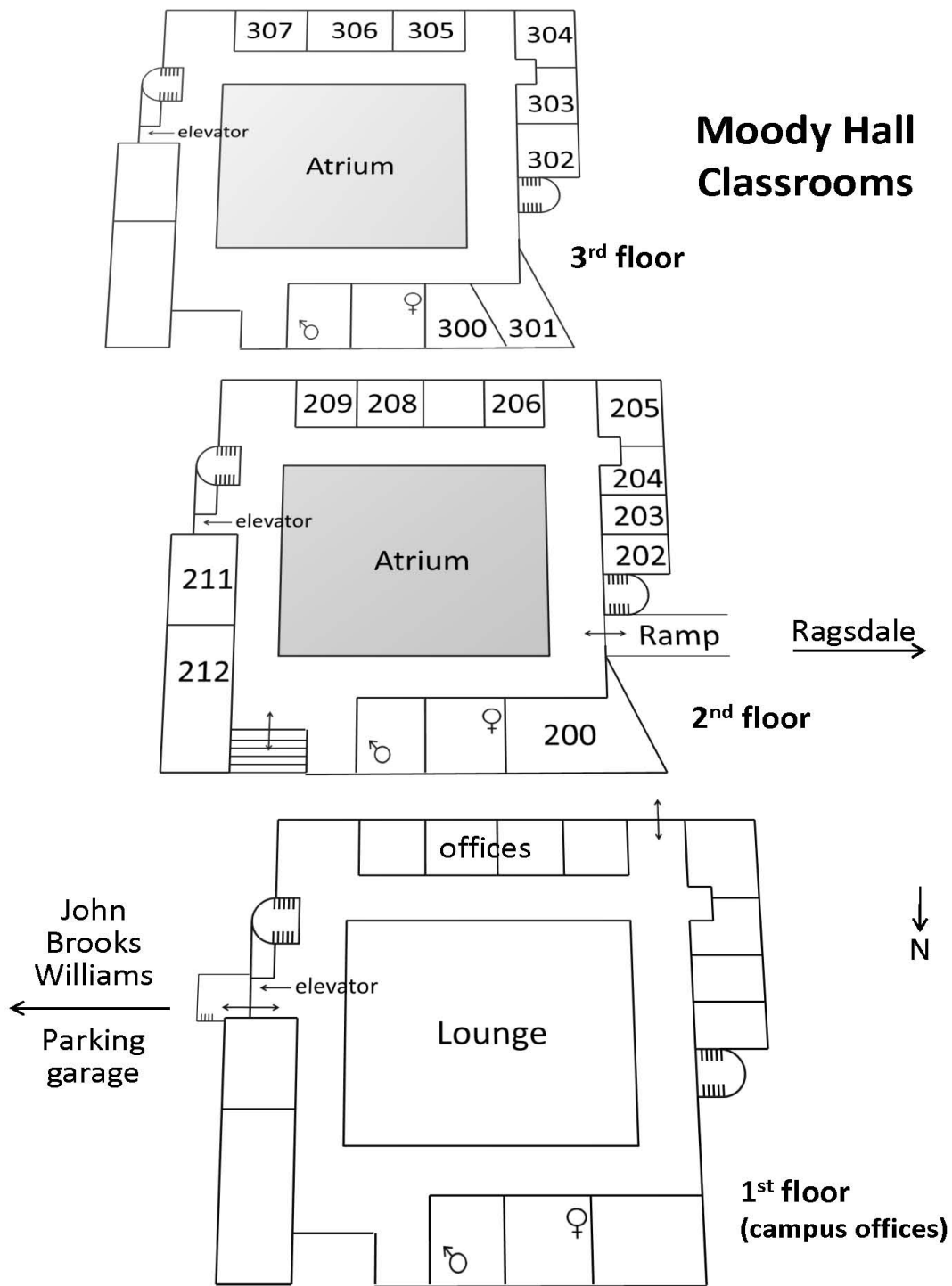
Handicapped spaces available in each lot.

No curbside parking allowed anywhere on campus.

John Brooks Williams Natural Sciences Center

↑
Moody
Hall





The Bob Bullock Texas State History Museum approximately 4 miles north of the St. Edward's University Campus

Both are on Congress Avenue, but drive around the state capitol to get there. DO NOT TAKE 1-35. Park under the museum via an entrance off of 18th street or in the open lot across Congress Avenue.

OPTION 1: From St. Ed's, drive North on Congress. Cross Lady Bird Lake. Turn left off of Congress onto 6th St. Quickly, after Colorado St., turn right on Lavaca St. Turn right off of Lavaca onto 17^h St. After Colorado St., turn left onto N. Congress.

OPTION 2 (Google): Go northwest on University toward Moody. Turn right at S Congress Ave (2.3 miles). Turn left at W Cesar Chavez St (0.2 mi). Turn right at Lavaca St (1.3 mi) Turn right at W Martin Luther King Jr Blvd (0.1 mi). Take the 2nd right onto N Congress Ave Destination will be on right 272 ft.

