Women in Science and Engineering (WISE) Conference

November 21-22, 2013

Program and Abstracts

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ORGANIZING COMMITTEE

Women's Giving Circle

Founded in 2007, the Women's Giving Circle (WGC) supports the Women in Science Initiative, and their confluent efforts seek to strengthen the opportunities and enhance the experiences of women in the sciences and engineering. The founding members of the WGC are SWT alumnae Beverly Curtice, Ann Muir and Suzanne Patenaude. The vision of the WGC is to bring women together whose gifts, when combined, will make a dramatic difference for women and women's leadership in the College. The goal is to make it possible for women to become philanthropists in a way that makes sense for them both personally and financially. For more information on the Women's Giving Circle, please see: http://wise.cose.txstate.edu/givingcircle/membership.html.

Organizing Committee

The Organizing Committee would like to welcome you to the fourth annual Women in Science and Engineering Conference and look forward to an outstanding conference.

Dr. Dana M. García, Conference Chair

Professor and Associate Chair
Department of Biology
Texas State University

Dr. Debra A. Feakes

Professor and Associate Chair
Department of Chemistry and Biochemistry
Texas State University

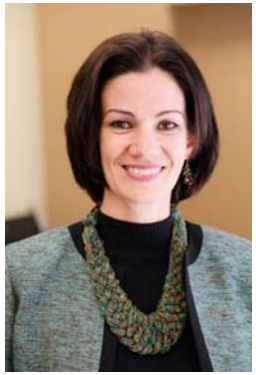
Dr. Heather Galloway

Professor and Dean of the Honors College
Department of Physics
Texas State University

Mr. Miguel Guerrero

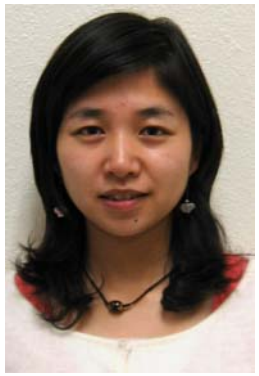
Career Advisor
Texas State University

Ms. Terry Chase Hazell



Director, Emerging Technology Fund
Office of the Governor
State of Texas

Dr. Yijuan (Lucy) Lu



Assistant Professor
Department of Computer Science
Texas State University

Ms. Lauren Minter

Graduate Student
Department of Biology
Texas State University

Dr. Clara Novoa

Associate Professor
Ingram School of Engineering
Texas State University

Dr. Harold Stern

Professor
Ingram School of Engineering
Texas State University

Dr. Vedaraman Sriraman

University Distinguished Professor
Department of Engineering Technology
Texas State University

Mr. Jesse Torres

Director of Corporate Relations
University Advancement
Texas State University

SCHEDULE OF EVENTS

Schedule	Thursday, November 21, 2013 Embassy Suites
4:00 – 4:50	Mocktail Hour
5:00 – 5:50	Concurrent Workshops • "You are in Charge of Your Career!- Keys for Success" SPEAKER: Dr. Araceli Ortiz • "Conference Commandos" SPEAKER: Mr. Ross Wood • "Sustaining Impact Through Entrepreneurship" SPEAKER: Ms. Terry Chase Hazell • "Polishing Your Professional Image" SPEAKER: Ms. Norma Gaier
6:00 – 6:50	Business Etiquette Dinner SPEAKER: Ms. Summer Salazar
7:00 – 7:50	Dessert and Keynote Address “Sustainability, Competitiveness and the Women in Science and Engineering Relay Race” SPEAKER: Ms. Terry Chase Hazell

Schedule	Friday, November 22, 2013 Texas State University
8:00 – 8:30 LBJ Ballroom	Registration, Continental breakfast
8:45 LBJ Ballroom	Welcome and Opening Remarks
9:00 – 9:45 LBJ Ballroom	Plenary Address "What Science Has Done for Me” SPEAKER: Dr. Misty Rowe
10:00 – 10:45	Concurrent Workshops • "Micromessaging to Reach and Teach Every Student" SPEAKER: Ms. Tegwin Pulley LBJ 3-10.1 • "Your Future with the CIA" LBJ 5-7.1 • Career Panel LBJ Ballroom Dr. Jennifer Irvin, Assistant Professor, Department of Chemistry and Biochemistry Dr. Araceli Ortiz, Assistant Professor, Department of Curriculum and Instruction Ms. Valerie Little, Engineering Manager, Applied Materials
11:00 – 11:45 LBJ 3-14.1	Faculty Research Presentations • A Hidden Markov Model-Based Method for Identifying Differential Methylation SPEAKER: Dr. Shuying Sun

	• Exploring the Promise of Nanomedicine: Nano-Scaled Biomaterials for Detection and Treatment of Disease SPEAKER: Dr. Tania Betancourt • Climate-Vegetation Interactions- A Texas Perspective SPEAKER: Dr. Susan Schwinning
12:00 – 12:50 LBJ Ballroom	Networking Lunch
1:00 – 2:45 LBJ 3-9.1	Research Poster Sessions I&II
3:00 – 3:50 LBJ Ballroom	Keynote Address "Healthy Networks and Thriving Careers" SPEAKER: Ms. Karen Siles
4:00 – 5:00 LBJ Ballroom	Reception and awards ceremony
5:00 – 6:00 LBJ 3-12.1	Business Meeting: Post-conference WISE Planning Committee

WELCOME

Welcome to the 2013 Women in Science and Engineering (WISE) Conference at Texas State University. WISE focuses on women's accomplishments in science and engineering and seeks to narrow the gender gap in participation in those fields. WISE is a worthwhile forum not only for sharing research and education in the Science, Technology, Engineering, and Math (or STEM) fields at our university, but for developing friendships and mentorships to draw more women into these critical fields of study.

Women scientists at Texas State are engaged in an array of cutting-edge research and investigative activities. These include traumatic brain injury and post-stroke research, developing methods for identifying human remains found along the U.S.-Mexico border, determining how dietary vitamin A prevents colorectal cancer metastasis, and the investigation of structure-function relationships in proteins, just to name a few.

We at Texas State recognize the importance of inspiring women to pursue careers in science and engineering, not only from the perspective of global problem solving and scientific progress, but for satisfying the needs of an evolving workforce that increasingly relies on technology and innovation. This conference provides an opportunity for students, faculty, and alumni to experience Texas State's robust science and engineering resources, and can be particularly helpful for students exploring which discipline may be

right for them. Judging by the growing corporate support and rising participation from recruiters and presenters, this conference is certain to inspire everyone.

Texas State is proud to be educating future scientists and engineers. Best wishes for a highly rewarding and successful conference.

Dr. Denise M. Trauth
President, Texas State University

The College of Science and Engineering is proud to host the fourth annual Women in Science and Engineering (WISE) conference. This conference highlights the research accomplishments of Texas State students and faculty from five different colleges and also brings to campus highly accomplished engineers from across the state. The theme this year is “Sustainability – Preparing for the Long Haul,” and the conference is sponsored by Halliburton Foundation. We welcome visitors from Halliburton, ExxonMobil, IBM, and other universities to talk with Texas State students, faculty, and graduates, taking advantage of this unique opportunity to learn about the range and depth of Texas State STEM research. I hope that the work displayed and presented here, along with the inspirational models of professional women, will encourage even more of our female students to pursue careers in STEM disciplines.

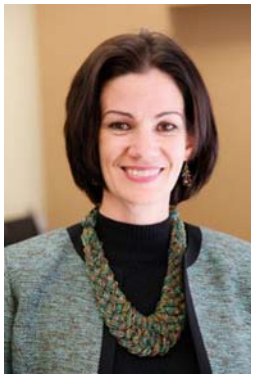
Dr. Stephen Seidman
Dean, College of Science and Engineering

Welcome to Texas State University's Fourth Annual Women in Science and Engineering Conference! This year we are privileged to enjoy the generous support of Halliburton Foundation and ExxonMobil Foundation, who provided major funding for the conference and pre-conference event, respectively. Halliburton and ExxonMobil Foundations stepped forward because they both have a long-standing commitment to supporting education and more particularly to supporting the advancement of women in fields that have traditionally restricted their access. Dr. Misty Rowe, the plenary speaker for this year's conference, is an example of the success of their endeavors. Joining them in the effort to increase the representation of women in STEM fields is the National Alliance for Partnerships in Education, who are also co-sponsors of this event. Finally, we remain indebted to the Women's Giving Circle and Samsung without whose support we would be unable to award scholarships. I hope that all our participants see the important contributions that Texas State's women scientists are making to their respective fields and take advantage of the opportunity to see how they can get involved and stay involved *for the long haul*!

Dr. Dana García
WISE Conference Chair

INVITED SPEAKERS' BIOGRAPHIES

Ms. Terry Chase Hazell



Terry Chase Hazell has more than 20 years of experience leading university programs, launching companies and advising funding agencies. Hazell is Director of the $400 million Texas Emerging Technology Fund. Previously, she served as Advisory Committee Chair and led the investment review and recommendation of over $50M. She has led multiple reforms that have shortened the review process, streamlined compliance, and dramatically improved transparency. Hazell testified at and authored briefings for the 83rd legislative session resulting in $50M appropriation. Hazell launched or grew several University programs, including the University of Maryland's Biotechnology Program, professor venture fair, entrepreneur office hours and Texas State University's Women's Entrepreneurship Program. She is co-founder and Chair of AVINDE a nonprofit women's business accelerator. Though these programs she has launched or helped founders launch over 40 start-up companies—many of them led by women. She serves on the national advisory committee for Springboard Enterprises. Hazell was an entrepreneur spinning out university technologies into successful companies. She founded the award-winning startup Chesapeake PERL, which was named one of Fortune Magazine's Coolest Companies and recognized not only as the best Maryland Incubator company but also as the best technology transfer company by the Federal laboratories. Hazell began her career in contract biologics manufacturing, where she managed large teams, product development and CGMP

manufacturing through Phase III clinical trials. Hazell speaks and writes for nationally-recognized conferences and was a commencement speaker at her alma mater, the University of Maryland. She was named one of Austin's most social citizens and one of the top 20 politically-minded Austinites to know.

Dr. Misty Rowe

Misty Rowe is an employee of Halliburton Energy Services in Houston, Texas. She grew up in the Midwest and is a Hoosier at heart. Misty got interested in the sciences early on in here childhood when she won the Invention Convention in her elementary science fair. She completed her BS in Chemistry at the University of Southern Indiana. After undergraduate research and a COOP position at a small coatings company, she started here PhD in the Polymer Science and Engineering program at University of Southern Mississippi and completed her doctorate in Applied Chemistry at Colorado School of Mines. She next started a small startup company called TheragNos which developed nanoparticles for the imaging and targeted treatment of cancer. An opportunity arose to join the Cementing Applied Sciences and Processes group at Halliburton, where she's currently employed and has been lucky enough to be a part of the cementing chemical development group, along with doing global training, and most recently is enjoying being challenged with leading the Engineering development group. Misty is passionate about STEM outreach programs, is involved in WSE at Halliburton, the Women's Committee for the ACS, SWE, and SPE and was awarded the Halliburton Cementing PSL MVP Award for 2012.

Ms. Karen Siles

Karen Mariela Siles is a Software Engineer at IBM Corporation in Austin, Texas. She graduated from George Mason University with a Bachelor in Science Electrical Engineering in 2007. Her current role involves supporting global clients with Middleware Software Product -WebSphere Application Server. Karen was born and raised in Cochabamba, Bolivia; her family migrated to the United States in 1998 and moved to Northern Virginia. Karen enjoys giving back to the community through various organizations that focus on education and self improvement primarily in STEM education.

Currently Karen serves as the Region V Professional Representative for the Society of Hispanic Professional Engineers (SHPE) Inc. as well as the SHPE Jr. Outreach Director for the local Austin SHPE Professional Chapter. As a director she assists High School students develop their skills. Recently Karen finished her term as Regional Vice President for SHPE Inc. on the Board of Directors from 2011-2013. Furthermore, she has participated in leadership programs such as Hispanic Austin Leadership where her team developed a community program called “Ready 2 Talk/Listos Para Hablar.” Her passion for education has driven her to participate in this year’s Up Close Program for the Austin Independent School District.

Ms. Summer Salazar

Summer Salazar is a speaker and presenter who is passionate about developing leaders and assisting them with their transition from student to professional. She is a Career Advisor at Texas State Career Services, and a Certified Business and Social Etiquette Trainer. Previously, Summer worked for Junior Achievement of South Texas, the Alamo Area Council of the Boy Scouts of America, and Delta Zeta National Sorority. Her experience working with collegiate students began when she was chosen to travel the nation as an Educational Leadership Consultant for Delta Zeta. Summer received her degree in English/Communication Arts from St. Mary’s University in San Antonio, Texas, and she is currently pursuing her Master’s Degree from Texas State University with a focus in Leadership Studies. One of Summer’s favorite quotes for success is, “Believe in yourself so strongly that the world can’t help but believe in you, too.” -Anonymous

Dr. Araceli Ortiz

Dr. Araceli Martinez Ortiz is an Assistant Professor of Engineering Education in the College of Education at Texas State University. She teachers graduate courses in the Department of Curriculum and Instruction and collaborates on various state and national Science, Technology, Engineering and Mathematics education (STEM) teacher

professional development programs and pre-engineering student outreach programs. Araceli is also Director of the LBJ Institute for STEM Education and Research at Texas State University. Through the Institute, Araceli brings educators, students, and families together in research-based educational STEM experiences.

Araceli holds a B.S. in Industrial Engineering from the University of Michigan in Ann Arbor, a M.S. degree in Manufacturing Management from Kettering University, a M.A degree in Education from Michigan State University and a PhD in Engineering Education from Tufts University. For 15 years, she pursued a career as an engineer and manager with General Motors, the Ford Motor Company and Microsoft with experiences in the areas of manufacturing, quality improvement, product design and marketing. Her background as an educator includes leadership experiences in curriculum development, teaching, and policy development in public education and teacher education. While at the Museum of Science in Boston, she co-developed the Engineering is Elementary curriculum that integrates science, engineering and literacy for elementary students. Her research interests include studying the role of engineering as a curricular context and problem-based learning as an instructional strategy to facilitate teachers' and students' STEM learning.

Mr. Ross Wood

Ross Wood is currently a Career Advisor and Liaison to the McCoy College of Business. He assists the McCoy business students in their transition from "student to professional" through resume review, job search strategy discussions, mock interview prep, and any additional needed support. As a Marine Corps veteran, Ross also serves as a contact

point within Career Services for any veteran Texas State student needing assistance.

Ross has had diversified employment experience in fast-paced business, education, and military environments, which have included work as a Winery Marketing Director, Corporate Communications Manager in a non-profit small business finance company, a Certified Economic Developer, a Chamber of Commerce Executive Director, an Assistant Director of Admissions/Coordinator of New Student Orientation for what was then Southwest Texas State University, and as a Combat Correspondent for the United States Marine Corps.

Ms. Norma Gaier

Norma Guerra Gaier has worked in the career development field at both private and public institutions for more than 22 years, with her most recent experience as the Director of Career Services at Texas State University. Currently, she serves on the Board of Directors for the National Association of Colleges and Employers and is the Board Advisor to the First Destination Task Force. She has held various leadership positions in her field, including serving as the president of the Southern Association of Colleges and Employers, the Texas Association of Employment in Education and the San Antonio Colleges and Universities Career Centers Association. She has also served as an Expert Reviewer for the CAS Standards for Career Services and as a NACE Ethics presenter. She holds a Bachelor's degree in English-Communication Arts and a Master's degree in Communication Studies from St. Mary's University in San Antonio, Texas. Norma's teaching experience includes Rhetoric and Composition;

Communication Studies Capstone Courses; Freshmen Seminar; and guest lecturer at the Oblate School of Theology. Her interests include communication analysis and interpretation involved in the career development process, life transitional issues, ethics in our profession, and the integration of social media in the career search process.

Ms. Tegwin Pulley

Ms. Tegwin Pulley is a well-known advocate for STEM education. Ms. Pulley is the recipient of 10 awards including the Athena Award from the Regional Dallas Chamber of Commerce and the TechTitan Community Hero Award from the Metroplex Technology Business Council. Tegwin recently retired from Texas Instruments where she was Vice President for Workforce Development, Diversity and Work-Life Strategies. She is now consulting for both business and education, including serving as Executive Director of High-Tech High Heels (programs to prepare and encourage girls to pursue technology-related degrees) and DFW Director of the STEM Equity Pipeline of the National Alliance for Partnerships in Equity.

Dr. Jennifer Irvin

Dr. Jennifer Irvin is an Assistant Professor in the Department of Chemistry & Biochemistry at Texas State University. Her research focuses on electroactive polymers, that is, polymers that change their properties in the presence of an electric field. Projects include synthesis of novel n-doping polymers with enhanced stability, improving understanding of ion movement into and out of electroactive polymers in an electric field, using electroactive polymers to develop energy storage devices as alternatives to traditional batteries and capacitors, using electroactive polymers to detect and treat cancer, and using templating approaches to enhance electroactivity. Funding sources include the National Science Foundation, the US Army, the US Air Force, the Research Corporation for Scientific Advancement, the Petroleum Research Fund, and the Norman Hackerman Advanced Research Program. Dr. Irvin received a Ph.D. in Organic Chemistry from the University of Florida under the guidance of John R. Reynolds prior to spending two years as a post-doctoral fellow at Sandia National Laboratories. Dr. Irvin then spent eight years as a Research Chemist and Head of Analytical Chemistry in the Chemistry and Materials Division of the Naval Air Warfare Center Weapons Division (NAWCWD) in China Lake, CA. In 2008 Dr. Irvin joined the faculty at Texas State University. Dr. Irvin has more than 30 publications, 12 patents issued, and over 70 technical presentations. She is a member of the American Chemical Society.

Ms. Valerie Little

Ms. Little completed a Bachelor of Science degree in Chemistry and a Bachelor of Science degree in Engineering at the University of Texas – Permian Basin. She has over 25 years of experience in the high tech industry in a variety of Engineering, Management and Project Management positions. Currently, Ms. Little holds the position of Industrial Engineering Manager for Applied Materials with responsibility for manufacturing and logistics space planning, tooling development and factory layout and design.

Dr. Shuying Sun

Dr. Shuying Sun is an assistant professor at the Department of Mathematics, Texas State University. She received her Ph.D. in statistics from the University of Toronto and conducted postdoctoral research at the Mathematical Biosciences Institute, the Ohio State University. Currently, Dr. Sun teaches both undergraduate and graduate statistics courses at Texas State University. Dr. Sun's research focuses on addressing challenging genetic and epigenetic questions using statistical and computational methods. In particular, Dr. Sun has been working on statistical genetics and bioinformatics with a focus on methylation microarray and sequencing data analysis, haplotype inference, mutation age estimation, and genetic variant identification. Dr. Sun has collaborated with biomedical researchers from different research groups in Canada and the United States on projects related to complex diseases (e.g., cancer and arthritis). She has also been developing statistical methodologies and software packages for genomic and epigenomic problems using Bayesian methods, Hidden Markov Models, Markov Chain Monte Carlo algorithms, and linear models.

Dr. Tania Betancourt

Dr. Betancourt is an Assistant Professor in the Department of Chemistry and Biochemistry and a faculty member in the Materials Science, Engineering, and Commercialization Program at Texas State University. Dr. Betancourt leads the research of the Biomaterials and Nanomedicine Laboratory at Texas State University, where research focuses on the development of functional nanostructures that can act as highly specific contrast agents for bioimaging, targeted and intracellular drug delivery systems, photoablation agents, and stimuli controlled delivery systems.

Dr. Betancourt obtained her B.S. degree in chemical engineering from Texas A&M University, College Station, in 2002, followed by her M.S. and Ph.D. degrees in biomedical engineering from The University of Texas at Austin in 2005 and 2007, respectively. She worked as a Postdoctoral Research Fellow at The University of Texas at Austin in the laboratory of Dr. Nicholas Peppas. Prior to joining Texas State University in 2011, Dr. Betancourt worked at InnoSense LLC, a technology company serving the aerospace, energy, defense, and health care market. During her three-year tenure at InnoSense, Dr. Betancourt held the positions of Research Scientist, Team Leader, and Deputy Director-R&D. At InnoSense, Dr. Betancourt was responsible for developing novel technologies in the areas of biosensors, biomaterials, therapeutics, theranostics, contrast agent, drug delivery, and specialty materials.

Dr. Susan Schwinning

Susan Schwinning is an Associate Professor in Biology at Texas State University, where she conducts research in Ecohydrology and plant responses to drought. Prior to Texas State, Dr. Schwinning has served as a professor at the University of Arizona as well as a postdoctoral scholar for Columbia University's Biosphere 2 project. Dr. Schwinning received her B.S. in Biology from the University of Göttingen in Germany, her M.S. In Plant Physiology at the University of California, Davis, and her Ph.D. in Ecology from the University of Arizona. In addition to teaching and conducting research, Dr. Schwinning also serves as an Associate Editor for *Oecologia* and the *Journal of Ecology*. Dr. Scwinning has over 45 publications including ones in *Nature*, *Functional Ecology*, and *Bioscience.* She is the recipient of the John L. Harper Young Investigator Prize for a paper published in the *Journal of Ecology*, British Ecological Society.

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POSTER PROGRAM

Identification of Critical Residues in the Spliceosomal Protein Dib1

Amber Lucas, Steven T. Whitten, and Corina Maeder
Department of Chemistry and Biochemistry, Texas State University

Pre-messenger RNA in eukaryotic cells must have its introns removed in order to be able to produce functional proteins. This removal of introns is facilitated by a macromolecule known as the spliceosome. The spliceosome is a large complex of five snRNA and ~80 protein that orients the pre-mRNA such that two transesterification reactions are catalyzed resulting in the removal of introns from pre-mRNA. This produces a mature mRNA that can then be translated in to a functional protein. Mutations in the spliceosome and the proteins that regulate the spliceosome can have drastic effects on protein production and lead to diseases such as Retinitis Pigmentosa. Dib1 is an evolutionarily conserved protein in the spliceosome associated with the U5 snRNP in the spliceosome and is required for cell viability. Although the human homolog, Dim1, has been crystalized and its association with the spliceosome is known, its function still remains unknown. In order to identify Dib1's function, we have created point mutations in the protein and analyzed their effects on cell viability. We identified four Dib1 mutants that are temperature sensitive at 37 °C. We are characterizing these mutants by using circular dichroism spectroscopy and in vitro splicing assays to determine the effect these mutations have on Dib1 secondary structure and their overall impact on splicing. This study will identify the role of critical residues in Dib1 in pre-mRNA splicing.

Prevalence of Staphylococci, Including Methicillin Resistant *Staphylococcus aureus*, in a Physical Therapy Education Facility

Priya Dhagat, BSCLS, MLS (ASCP), Karen Gibbs, PT, PhD, DPT, CWS and Rodney E. Rohde, PhD, MS, SV, SM(ASCP)^{CM} MB ^{CM}
Clinical Laboratory Science Program and Department of Physical Therapy, Texas State University

The purpose of this study was to assess the prevalence of *Staphylcocci* species, including Methicillin Resistant *Staphylococcus aureus* (MRSA), in a physical therapy education facility. The lab classrooms are utilized by graduate physical therapist students and faculty, undergraduate anatomy students, and occasionally by licensed practitioners for training courses. Due to high facility use in this setting, we expect to see *Staphylococci* environmental prevalence. In this study, 42 treatment tables, two blood pressure cuffs, one bed, and one microwave were swabbed and plated onto Mannitol Salt Agar and Chromagar®. A total of 88 samples (two per treatment table) were placed in a non-CO_2 incubator at 37°C for 72 hours. Forty seven isolates were identified (47/88, 53%). Of those 47 samples, seven tested positive for *Staphylococcus aureus* (7/47, 15%), including one MRSA isolate (1/7, 2%). The remaining 40 samples grew other species of *Staphylococcus*, including *S. hominis*, and *S. epidermidis*, as well as *Micrococcus luteus*, *Kocuria kristinae*, and various gram positive bacilli. All *Staphylococcus* isolates underwent antibiotic susceptibility testing using a Vitek2 to confirm the presence of MRSA.

Our results demonstrate the potential for easily transmissible and potentially harmful organisms to be present in multi-use classrooms utilized by health professions students. Further studies should be conducted in order to better assess the prevalence of potentially harmful bacteria in health professions educational classrooms where frequent skin-to-skin contact between students and equipment is part of the mandatory curriculum. The presence of MRSA in physical therapy classrooms further acknowledges the emergence of MRSA into the community and emphasizes the need for diligent routine cleaning in educational facilities.

Swallow Feces Accumulation Pattern During Nesting Phenology Phases at a Central Texas Site

Candice Rodriguez[1,2], Ivan Castro-Arellano[1], Dittmar Hahn[1], Michael Forstner[1], Clay Green[1], and Kimberly G. Talley[3]
[1]Department of Biology, Texas State University, [2]United States Department of Agriculture-FATE Program, [3]Department of Engineering Technology, Texas State University

Identification of point sources of contamination is crucial for management of water resources for irrigation, human consumption, or recreation. Avian feces, including that of Cliff (*Petrochelidon pyrrhonota*) and Cave Swallows *(P. fulva*) have been suggested to increase amounts of *Escherichia coli* present in waterways located under bridges with nesting colonies, but no assessments have tied feces accumulation to water bacterial levels. Quantifying feces accumulation patterns at bridges is beset by logistical limitations but this quantification can be attained at other places where swallows nest. We quantified feces accumulation per nest during different nesting phenology phases by using wooden boards wrapped in cellophane placed directly under a sample of nests from a swallow colony at a campus parking garage. Every week, cellophane was removed and weighed to produce an accurate feces accumulation quantification. Feces accumulation was directly tied to nesting phenology, with largest amounts related to nests containing stationary chicks and limited to a very narrow time frame. Results from this project will be tied with nest surveys and bacterial quantifications to ascertain the potential of swallow nests to contaminate water sources.

Learning Assistants' Development of Physics (Teacher) Identity

Jessica Conn, Eleanor W. Close, and Hunter G. Close
Department of Physics, Texas State University

The physics department at Texas State University is developing a Learning Assistant (LA) program with reform-based instructional changes in our introductory course sequences. We are interested in how participation in the LA program influences LAs' identity both as physics students and as physics teachers; in particular, how being part of the LA community changes participants' self-concepts and their day-to-day practice. We analyze written artifacts from program applications, reflections, and evaluations; our analysis of self-concepts is informed by the identity framework developed by Hazari and colleagues, and our analysis of practice is informed by Lave and Wenger's theory of Communities of Practice. Preliminary experience suggests that engagement in the *collaborative physics education community* elements of the LA program blurs the distinction between learner and teacher practice and increases LAs' engagement in negotiation of meaning in both contexts.

Seasonal Diets of Sable Antelope at Mason Mountain Wildlife Management Area Using DNA Analysis

Amanda Winn and Thomas R. Simpson
Department of Biology, Texas State University

Sable antelope have been stocked on several ranches in Texas but basic ecological information for this exotic ungulate is lacking for Texas. Such knowledge is necessary to appropriately manage exotic populations and to assess the potential for competition with native wildlife. Our study determines the seasonal food habits of a captive herd of 15 sable antelope at Mason Mountain Wildlife Management Area. Plant species in fecal pellets are being identified using traditional microhistological methods and an emerging technique of DNA analysis using the trnL approach. Seasonal vegetation surveys are being conducted to determine the availability of plant species to sable antelope. Selectivity will be established to compare the proportion of each plant species in the fecal material to its availability in the habitat. This basic ecological information can be used to compare diets and address competition between sable antelope and native wildlife. In addition this study will assess the use of DNA analysis on fecal material as a technique for determining seasonal diets of large herbivores.

Synbiotic-induced Alterations in Fecal Microbiota are Associated with Increased Levels of Plasma ANGPTL4 in Healthy Overweight Adults

Priscilla Pham[1, 2], Qing Shen[1], Samantha Newton[1], Dhiraj Vattem[1] and Vatsala Maitin[1]
[1]Nutrition and Foods Program, School of Family and Consumer Sciences and [2]Department of Biology, Texas State University

Gut bacteria have been shown to influence diet-related obesity, mediated in part via ANGPTL4, a circulating lipoprotein lipase inhibitor that modulates fat-storage in the adipose tissue. Modulating the gut flora to exert stimulatory activity towards ANGPTL4 may thus serve a protective function against diet-related obesity. We have previously shown that secreted factors from *Bifidobacterium sp.* significantly increased the levels of ANGPTL4 secreted from enterocytes *in vitro*. The objective of this study was to investigate whether a synbiotic formulation containing probiotic Bifidobacterium sp. and prebiotics inulin and galactooligosacharides is capable of enhancing ANGPTL4 levels in human subjects, via potentially enriching Bifidobacterium numbers in their gut. In a parallel, double-blind, placebo-controlled pilot study conducted with 56 healthy overweight adults, we found that a 12-week long synbiotic intervention was able to promote a significant increase in fecal Bifidobacterium numbers and enhance the levels of ANGPTL4 detectable in the plasma of the study subjects. Moreover, there was a significant positive correlation between the increase in Bifidobacterium numbers and the levels of ANGPTL4 at 12-weeks when compared to baseline.

Use of Plant Species as Predictors of Insect Community Composition

Virginia Brown and Michael Huston
Department of Biology, Texas State University

Food availability is one of the factors that determines the abundance and types of animals found in a given habitat. A literature review is being conducted to determine what moth species are known to consume plant species that inhabit the Christmas Mountains, located in the Chihuahuan Desert. We expect that this review will help predict what species of moths occur in the Christmas Mountains. Two locations have been chosen in the Christmas Mountains to serve as sampling sites for nocturnal Lepidoptera. Using a UV light trap, moths and other nocturnal insects have been sampled from these two sites bi-monthly for an hour and a half between the full moon and the new moon lunar phases. Samples are sorted to morphospecies to be cross-referenced with the list of potential moth species. Species that have been identified include the Yucca Moth and the Mesquite Looper which are thought to be representatives of the immediate habitat around the UV traps. We also captured numerous White-Lined Sphinx Moths which are long distant flyers and might be representative of the productivity of the habitat along the Rio Grande. Other than these few species that have been identified there has been little overlap between the physical surveys and the species list compiled from the literature review. This indicates that there is a strong need for further research on the food habits and the host plants of the nocturnal Lepidoptera in this region of the Chihuahuan desert.

Women's Health, Religious Belief, and Prayer

Graciela Sandoval
Department of Geography, Texas State University

This exploratory study examines Latinas' perceptions about health status, health access, religious belief, and prayer at three community health centers in San Marcos and Lockhart in Hays County, Texas. Through quantitative and open-ended questions, Latinas, 17 to 54 years of age, explained their perception of health and healing. The majority of the Latinas are low income, low education attainment, working class, and bilingual. Access to health care includes monetary and transportation barriers to health insurance and the health care facility, as well as, physician or nurse practitioner trust, caring for patients, and knowledge about health, disease, and prescription medicine. Religious belief and prayer were found to be of great importance in Latinas' perception of good health. The majority of women believe transportation is not a barrier to health access, but income and health care costs are a barrier. The participants seek health care in Mexico and travel long distances for various reasons, including lower cost of medicine and surgical procedures. Another important factor is familiarity and historical sense of place due to family, place of origin, or having lived there for five years of more as an adult. This study may help health professionals guide community organizing and interventions to focus on Latina patients by targeting access to low cost preventative health services. More research should focus on a larger geographic scale along the American Southwest with a greater diversity of women to further explain and compare their perception of access to the United States health care system.

Memory and Metacognitive Accuracy Following Moderate and Heavy Bouts of Aerobic Exercise

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Problem

Previous studies have demonstrated cognitive benefits following brief bouts of exercise. For example, Salas, Minakata, and Kelemen (2011) tested the effects of walking outdoors for 10 minutes and found that memory performance increased by approximately 25%. However, the rate of walking was uncontrolled in that study. The present study was designed to compare memory and metacognitive accuracy in three separate conditions: moderate exercise (55% maximum heart rate), heavy exercise (75% maximum heart rate), and a control (sedentary) condition. One main hypothesis was that memory scores would be higher following exercise compared with the sedentary condition.

Methodology

Data were analyzed from 27 college students (mean age = 20.4, SD = 1.9) at Texas State University. Each participant was tested in 3 sessions separated by at least 24 hours, and participants were paid $10 per session plus a bonus $10 for completing all sessions as scheduled. Type of activity (sedentary, moderate exercise, or heavy exercise) was counterbalanced across sessions. Participants completed the experimental manipulation at the start of the session: heart rate was maintained in the exercise conditions using a chest-strap heart rate monitor attached to a treadmill. The experimental manipulation was followed by a 30-item study session during which participants provided judgments of learning (JOLs). A free recall test was administered at the end of each session.

Results

As predicted, participants' levels of recall were significantly lower in the sedentary condition (M = 35.8%) compared with the moderate exercise (M = 44.0%) and the heavy exercise (M = 42.1%) conditions, $t(26) = 2.79$, $p < .05$ and $t(26) = 3.02$, $p < .05$, respectively. Similarly, participants' JOLs were lower in the sedentary condition (M = 35.8%) compared with the moderate exercise (M = 44.0%) and the heavy exercise (M = 42.1%) conditions, but lacked significant changes. Participants walked at a significantly higher speed in the heavy exercise condition (M = 3.9 MPH) compared with the light exercise condition (M = 2.1 MPH), $t(26) = 9.96$, $p < .05$, and mean heart rates were higher in the heavy exercise condition (M = 137.5 bpm) compared with the light exercise condition (M = 106.0 bpm), $t(26) = 28.62$, $p < .05$.

These results replicate and extend the main findings of Salas et al. (2011): namely, that 10 minutes of walking can significantly improve memory in the absence of metacognitive changes. In this experiment, participants' level of physical fitness was controlled by maintaining a specific percentage of max heart rates within a programmed treadmill. Thus, it appears that both moderate and heavy exercise can improve memory compared with a sedentary condition, though participants do not appear to expect this benefit. Future studies should examine biological markers associated with this memory increase.

Ion Mobility-Mass Spectrometry of a Widely Used Photochromic System: Experimental Support for the *Cisoid* form of Spiropyran

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Photochromism is the transformation of a molecule from one structural state to another where at least one of the states must be light-induced. Because of its unique properties, spiropyran is enjoying widespread use in many applications and particularly in light-responsive materials research, namely hybrid materials that utilize spiropyran to induce material changes or provide colormetric sensing of changes in the microenvironment. In our studies of spiropyran solution kinetics, we have observed deviations in expected behavior that argues that spiropyran photoisomerization is not a simple first-order process involving two equilibrating structures. These results motivated us to examine details of this interconversion using ion mobility- mass spectrometry (IM-MS) which can separate the spiropyran isomers based on molecular cross-sectional area (CCS). Quantum chemical modeling based on Density Functional Theory (DFT) was used to identify theoretical ground-state all possible isomers of merocyanine. Collision cross-section calculations from the program MOBCAL were employed to aid conformer assignment to specific isomers. IM-MS experiments reveal the presence of three distinct conformers. CCS values and theoretical structures will be presented. The results indicate that the three conformers are comprised of one single structure and two groups of isomers; the ring-closed isomer, the *cis*-MC group; CCX, and the *trans*-MC group; XTX. The designations; *cis* (C) and *trans* (T), refer to configuration of the three methylene bonds linking the *p*-

nitrophenolate and indoline moieties of MC. This work represents the first observation of a second isomer group on timescales greater than nanoseconds. A mechanism for the thermal reaction is postulated to occur via the formation of a stable *cis* intermediate, CCX, which has not been previously identified as a stable isomer in other work.

Female Preference or Familiarity vs. LPA by Gynogens in a Unisexual-bisexual Mating Complex

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Gynogenetic species rely on sperm for reproduction and may exhibit mating preferences, yet they do not receive genetic benefits from mating. We examined the mate preferences of the gynogenetic Amazon molly (*Poecilia formosa*) that are sympatric with one of their two parent host species: the sailfin molly (*P. latipinna*) or the Atlantic molly (*P. mexicana*). We tested whether Amazon mollies prefer their sympatric male (familiar) host or the male with the greatest lateral projection area (LPA). We tested the association preferences of Amazon mollies sympatric with either *P. mexicana* or *P. latipinna.* They were given a choice between four animated male model types (unmodified *P. latipinna*, unmodified *P. mexicana*, *P. mexicana* with a large dorsal fin, and *P. latipinna* with a small dorsal fin). Amazon mollies from a population sympatric with *P. mexicana* spent more time associating with the modified *P. latipinna* and *P. mexicana* (small LPA stimuli) and the least time associating with the most unfamiliar models of male *P. latipinna*. In contrast, Amazon mollies from a population sympatric with *P. latipinna*, showed no variation in their association preference across the different models. Familiarity due to sexual imprinting may explain preferences of Amazon mollies from the population sympatric with *P. mexicana*.

Characterization of IBR5 Interacting Protein1 (IIP1) in Arabidopsis

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Auxin is a vital plant hormone that regulates growth and development throughout the life cycle. Recently, IBR5, a gene that encodes a dual specificity phosphatase, was identified as a negative regulator of plant auxin signaling. However, the exact molecular mechanism of IBR5's function in plant auxin response is unknown. One approach to understand the molecular mechanism is to identify IBR5 interacting proteins. To this end we performed a yeast two hybrid screening using an Arabidopsis cDNA library. Among several IBR5 interacting proteins (IIPs), IIP1was selected for further studies. While yeast two hybrid screening is a powerful technique to identify new interacting proteins, results of this assay have to be validated by other biochemical and/or genetic techniques. We hypothesized that IIP1 is a true IBR5 interacting protein and used other molecular techniques to validate IBR5-IIP1 interaction. First, *in vitro* pull-down assay was used to confirm the interaction. IBR5 was expressed in Arabidopsis plants as a myc-tagged fusion protein (IBR5-myc), and IIP1 was expressed in *E. coli* as GST-tagged recombinant protein (GST-IIP1). GST-IIP1 protein was purified from *E. coli* and added to Arabidopsis crude protein extract isolated from *35S::IBR5-myc* seedlings. Proteins interacted with GST-IIP1 were recovered and separated by SDS-PAGE. Interacting proteins were detected by western blot using anti-myc antibody. Results indicate that IIP1 is a true IBR5 interacting protein. Experiments are in progress to confirm this interaction *in vivo* using co-immunoprecipitation (Co-IP) assay.

To understand the genetic interaction between IBR5 and IIP1, Arabidopsis T-DNA insertion mutant of *iip1* was obtained from Arabidopsis biological resource center (ABRC). PCR analysis was performed to identify *iip1* homozygous mutant. Work is in progress to assess the auxin response defects in this mutant line. Future molecular and genetic characterization of IBR5-IIP1 interaction will unveil the function of IBR5 in auxin signaling.

Suggested Revisions to ACI 440.2R-08 for the Safe Design of GFRP Repairs

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Strengthening concrete structures with fiber reinforced polymers (FRP) is becoming increasingly common in construction practice. The currently available design recommendations is the ACI 440.2R-08 model for predicting the maximum confined compressive strength. These formulas are based on a small test dataset of glass fiber reinforced polymers (GFRP) and carbon fiber reinforced polymers (CFRP) wrapped specimens. This investigation reviews available testing data from GFRP-wrapped plain concrete specimens to evaluate the performance of the design guidelines. The results from 204 compression tests are compared to the predicted maximum confined compressive strength following the ACI 440.2R-08 design formulas. As one third of the tested specimens had capacities that were less than the design guidelines' prediction, it was found that the current design formula is unconservative for the design of GFRP-wrapped specimens. Finally, in order to suggest a conservative design formula, a variation of the existing formula for calculating the confined compressive strength of a GFRP-wrapped specimen is presented.

Investigating the Evolution of Students' Conceptions About the Scientific Method

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A study is presented that explores how students' knowledge structures, as related to the scientific method, evolve over time. A word association test is used to probe the knowledge structure, using ten total stimulus words, amongst them *experiment*, *science fair*, and *hypothesis*. Students from grades four, five, and eight, as well as first-year college students were tested to measure their knowledge structure. Students' conceptions about the scientific method begin focused around *science fair* and *data collection*, but eventually focus around experimentation. The evolution of more complex knowledge structures is also observed.

Behavioral and Stress Response to Predators in a Unisexual-bisexual Mating System

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Asexually reproducing species are less likely to respond to selective pressures as fast as sexual species because they lack genetic recombination. Predation is a strong and important selective pressure that can modify the behavior of prey and affect their stress levels. Here we examined whether the unisexual sperm-dependent fish species *Poecilia formosa* differs in its predator recognition and stress response compared to its sexual parental species, *P. latipinna*. *Poecilia latipinna* is sympatric with the predatory green sunfish (*Lepomis cyanellus*) for an extensive part of its range, whereas *P. formosa* is sympatric with the predator only in a small part of its range. We tested the antipredator and stress response (cortisol) of juvenile *P. formosa* and *P. latipinna* to the visual and chemical cues of the predator and a non-predator (*P. reticulata)*. Fish of both species did not show a change in activity in response to any treatment or a cortisol response to the predator. *Poecilia latipinna* showed an increase in cortisol with *P. reticulata*. Juvenile *P. latipinna* may perceive these similar size fish as competitors. Further studies are needed to fully understand antipredator response in these species.

Powering High-Tech Manufacturing Facilities using Renewable Electricity

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In this research, simulation and optimization models are applied for designing distributed and renewable energy systems, the paradigm for producing electricity through solar photovoltaics and wind turbines. Distributed generation (DG) can be integrated into high technology manufacturing facility, particularly in semiconductor wafer fabs, seeking to reduce electricity bills and carbon footprints. The simulation and optimization model presented represents the DG power generation, taking into consideration weather uncertainty, the day of the year, and the hour of the day, and also simulates the hourly load of the wafer fab. The simulation model then determines if it has to either compute the cost of hauling energy from the utility grid, due to the deficiency of power from the DG system, or compute revenue for selling renewable energy to the utility company, due to surplus power from DG systems. Finally the simulation model computes and outputs the total cost and the loss-of-load probability of the DG system. To facilitate the input of parameters into the simulation model, we developed a user interface using Microsoft Excel, R statistical software, and RExcel. The purpose of RExcel is to transfer the input parameters from Excel to R, run the simulation code, and return the output data to Excel. A case study will be presented to demonstrate the effects of carbon credits, capital investment, and the utility rate on the net present value and payback period of the DG system.

A Parallel Random Search for the Quadratic Assignment Problem Exploiting the Graphical Processing Unit Capabilities

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In the Quadratic Assignment Problem (QAP), N units (usually departments or machines) must be assigned to N locations given the distance between them and the flow between the units. The goal is to find the assignment that minimizes the sum-product of distance times flow. The QAP is a combinatorial problem difficult to solve to optimality even for small size problems. In this poster, we solve the QAP by implementing a random search algorithm serially (CPU version) and in a parallel (GPU version). The execution time for the GPU version in a problem with N=60 units is 89.13% lower than the one in in the CPU (9.2 speedup). The gap between cost for the GPU solution vs. the known optimal solution for a problem with N= 60 units is very low (0.85%). The instances used in the tests come from the well-known operations research library QAPLIB. Furthermore, this poster presents the impact of varying threads per block and total threads for problem sizes ranging from 20-90 units.

Examination of Mouse Retina by Electron Microscopy

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Our current research has been focused on the light adaptive and dark adaptive pigment granule movement in the retinal pigment epithelium (RPE) of mouse eyes. To study our specimens we have been preparing them for the viewing via transmission electron microscopy (TEM). In order to view the samples they must be cut into sections 70 nm thick using an ultramicrotome. One of our many challenges is orchestrating the orientation of the eye after it has been osmicated, a process which enhances the visibility of cellular membranes once the tissue has been sectioned but also turns the organ black. Since the orientation of the sections of the eye are so important for our research, we have come up with several approaches to help us get better sections for viewing without wasting material or samples. When first cutting the sections we have tried cutting thicker section of 1.5 µm to view under the phase-contrast microscope to make sure we are cutting tissue at the level of RPE. Once we know we are cutting tissue at the level we want, we begin cutting sections to view under the TEM. Further research is still in progress using these techniques, which we expect will enable us to detect changes in pigment position that occur in response to changing light conditions.

Examining Developmental Mathematics Students' Proficiency with Operations on Irrational Numbers

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Fluency with our number system is a critical part of mathematics. Understanding how rational and irrational numbers work and fit in to the number system as a whole is at the foundation of a good understanding of mathematics (Fischbein, Jahiam, & Cohen, 1995). In this study, we present developmental mathematics students with a task which tests understanding of the closure of irrational numbers under addition and multiplication. We analyze the data with the strands of proficiency framework from *Adding It Up* (Kilpatrick, Swafford, & Findell, 2001), searching for evidence of each strand. The results show varied levels of proficiency within each strand and overall.

Impacts of Bridge Design and Land Cover Characteristics on Cliff Swallow Nesting

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As infrastructure has expanded, so have the nesting sites for animals roosting underneath bridges, in particular, the Cliff Swallow. With over fifty thousand bridges in Texas, the possibility of water contamination, due to the abundance of fecal matter left behind from these roosting cliff swallows, has become an environmental concern. An assessment of sixty-six bridges will be made to develop a model for determining the relationship between bridge characteristics, the surrounding environments, and the likelihood of cliff swallows nesting. With the understanding of the birds' behavior, a reduction or promotion of cliff swallow nesting can be achieved through design choices. Data will be collected on the bridges as well as their surrounding environments in comparison with the number of cliff swallows nests and nest scars to determine what makes a bridge site attractive to a cliff swallow. The original bridge data will be obtained through the National Bridge Inventory Database. From there, detailed information will be obtained through bridge inspection reports from the Texas Department of Transportation. Additional data such as number of nests and the level of openness will be collected on site. The level of openness of a bridges site will range on a scale of zero to three, with zero pertaining to areas that are completely open and three for areas that have abundant levels of brush or trees. Along with the physical aspects of a bridge site, GIS data will be obtained and observed using ArcGIS to determine the impact of surrounding land usage and soil types. With a preliminary graphical analysis, criteria for correlation will be determined for further statistical analysis using SPSS Statistics, statistical analysis software. A

statistical model will be created by correlating the observed number of nests and nest scars, with the structural characteristics, bridge orientation, land use, and soil types around the studied bridges. The objective of this project is to use this model to identify the attractive qualities of a nesting site for a cliff swallow, and in turn use this information for future bridge designs. This will enable bridges to be designed with an increase of decrease in cliff swallow activity in mind.

Developmental Expression of GFAP in Zebrafish

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The increase of age accounts for numerous changes throughout an organism that can impact everything from physical appearance, metabolic pathways, to tissue function, and can be determined based on how long the organism has been alive. Glial fibrillary acidic protein (GFAP) is an intermediate filament protein that is found in astroglial cells, which are cells that support brain and spinal cord activity. When the brain or spinal cord is injured through trauma or disease, astroglial cells respond by rapidly producing more GFAP. Trauma or diseases, however, are not the only factors that can inflict damage. As aging continues, tissue degradation starts to occur as natural repair mechanisms slow down and the body's machinery deteriorates. GFAP is used as a marker for both retinal and optic nerve astrocytes in mammals. In zebrafish, on the other hand, GFAP is not commonly found in the optic nerve; rather it is observed in the retinal astrocytes. Unexpectedly, in examining older fish, we found evidence of GFAP expression. Therefore, we hypothesize that as fish age, the amount of GFAP expression increases in the optic nerve. Using zebrafish ranging in age from three months (young adult) to three years of age (very old adult), the amount of GFAP expression was tracked in order to determine whether GFAP expression increased with age. We anticipate that the older the zebrafish are, the more GFAP expression will be observed when looking at the optic nerve, giving insight to GFAP's importance as organisms age.

Experiencing Mathematics: A Pilot Study Describing the Beliefs of Three Minority Girls about their Experience of Mathematics at the Middle School Level

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The aim of this poster is to present the findings of a qualitative single-site pilot study conducted in 2011 at a middle school in central Texas involving 3 minority female middle school students, describing their experience of school mathematics by exploring their beliefs. The study was conducted as a class assignment (ED 7352) designed to understand Qualitative research methods. Studies and news media reports on female experience with mathematics, the practice of educational deficit thinking, minority students' beliefs about mathematics, learning of mathematics, and mathematical learner identity (Valencia, 1997; Drummond & Stipek, 2004; Johnson & Kritsonis, 2006; Lim, 2008; Women's Bureau, 2010; Robinson & Lubienski, 2011; Pálsdóttir, 2007; Pinar, 2011) provide a rationale for and guide the conceptual framework of this study.

Antipredator Response of the San Marcos Salamander to a Nocturnal and a Diurnal Predator

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The San Marcos Salamander (*Eurycea nana)* is a federally threatened, fully aquatic, nocturnal salamander endemic to the San Marcos River, and faces threats from decreased water flow, pollution, and the introduction of non-native predators. In this experiment, we wanted to determine whether *E. nana* exhibits a differential anti-predator response to kairomones of a diurnal predator(*Lepomis cyanellus*) and a nocturnal predator (*Procambarus clarkii*). It is an important conservation initiative to study the effect of diel cycles on antipredator behavior for potential reintroduction purposes and to better understand the intricacies behavior that can potentially increase the vulnerability of a species. In concordance with the threat sensitivity hypothesis, we predicted that *E. nana* would match their level of antipredator behavior with the perceived threat level. We predicted that *E. nana* would show increased antipredator behavior (reduced activity) to the diurnal predator during the day, and increased antipredator behavior to the nocturnal predator at night. We found that although there was a significant difference in antipredator behavior of *E. nana* between *L. cyanellus* and *P. clarkii*, there was no significant effect of time of day.

Contribution of Cliff Swallow Feces to Surface Water Contamination

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The contamination of surface waters by potential pathogens is important to human health due to the recreational uses these waters provide. This study focused on the impact Cliff swallows (Petrochelidon pyrrhonota) may have on surface water quality, and if contamination of these waters may be caused by these birds. The study used the comparative analyses of *Escherichia coli* (E. coli) as an indicator organism for fecal contamination, contrasting a most-probable-number (MPN) based enumeration to a colony forming unit (CFU) based enumeration. The impacts of season (absence and presence of Cliff swallows) and potential run-off (large precipitation events) were also evaluated across five different bridges located in central Texas. The comparison between the MPN based enumeration and the CFU based enumeration showed that the former was more accurate but the latter allows for further assessments such as source tracking analysis. Statistical analysis was done using ANOVA. For both methods, there were no significant differences ($p>0.05$) between the numbers of *E. coli* present in up and down stream samples. However, run-off events did have an impact on the abundance of *E. coli* present in the water regardless of the method used ($p<0.05$). These results, so far show that the presence of Cliff swallows is not a major contributing factor to the contamination present in the waters sampled.

Pre-calculus Students' Difficulty with Modeling Rates of Change

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In 2004, the Mathematics Association of America published a report providing recommendations to undergraduate mathematics programs, stating that all mathematics courses should help students develop "analytical, critical reasoning, problem-solving, and communication skills". This study investigated pre-calculus students' ability to reason given a mathematical modeling task. Five students were asked to graphically represent the height of water in a bottle as a function of the amount of water in the bottle without numerical values, units, and rates given. All five students recognized the increasing relationship between height and amount of water, and that the shape of the bottle would result in a non-constant rate of change in height. However, students struggled to correctly model the non-constant rate of change. Only one student produced a correct graph, two drew concave up or exponential graphs, and two drew piece-wise linear graphs. In-depth interviews revealed that students had difficulty understanding how the shape of the bottle would affect the rate of change. This could suggest a lack of conceptual understanding, which could hinder the students' success in the calculus sequence and other STEM courses.

Recognition and Response to Native and Novel Predators in the Largespring Mosquitofish, *Gambusia geiseri*

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The introduction of predator species into new habitats is an increasingly common consequence of human activities, and the persistence of native prey species depends upon their response to these novel predators. In the present study we examined whether prey species exhibited anitpredator behavior and/or hormonal stress responses to visual and chemical cues from a native predator, a novel predator, or a non-predatory control fish. As we predicted prey showed the most pronounced response to the native predator treatment, by moving away from the stimulus, while the prey showed no significant changes in their vertical or horizontal position in response to the novel or non-predator treatments. We also found no significant difference in stress hormone levels following any of the treatments. Our results suggest the prey did not recognize and exhibit antipredator behavior to this novel predator. We conclude that the expansion of this introduced predator species could be detrimental to native populations of *G.geiseri.*

Quantification of *Frankia* in Soils Using SYBR Green Based *q*PCR

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A SYBR Green based *q*PCR method was developed for the quantification of clusters 1 and 3 of the actinomycete *Frankia* in soils. Primer *nifH*r158 was designed to be used as reverse primer in combination with forward primer *nifH*f1 specifically amplifying a 191-bp fragment of the *nif*H gene of these *Frankia*. The primer combination was tested for specificity on selected pure cultures, and by comparative sequence analyses of randomly selected clones of a clone library generated with these primers from soil DNA extracts. After adjustments of DNA extraction conditions, and the determination of extraction efficiencies used for sample normalization, copy numbers of *nif*H genes representing *Frankia* of clusters 1 and 3 were quantified in different mineral soils, resulting in cell density estimates for these *Frankia* of up to 10^6 cells [g soil {dry weight}]$^{-1}$ depending on the soil. Despite indications that the *nif*H gene is not a perfect target for the quantification of *Frankia*, the *q*PCR method described here provides a new tool for the quantification and thus a more complete examination of the ecology of *Frankia* in soils.

Structural and Magnetotransport Study of $SrTiO_3$/Si Structures Grown by Molecular Beam Epitaxy

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$SrTiO_3$ (STO) films were grown on p-Si (001) and STO (001) bulk substrates using molecular beam epitaxy (MBE). Oxygen vacancies were introduced by controlling the oxygen pressure during growth. The single phase STO/Si films were of high crystalline quality as verified by transmission electron microscopy (TEM), performed at UT-San Antonio, and by x-ray diffraction (XRD), and atomically flat as verified by atomic force microscopy (AFM). The thickness of the STO films was measured by x-ray reflectivity. Transport measurements were performed on the STO/Si structures in a Van der Pauw configuration. We measured the resistance of all the films as a function of temperature for T = 3K to 300K, as well as a function of an applied magnetic field, H = 0 to ±9T. Unexpected thickness dependence was observed in the resistivity of the STO films seemingly not obeying Ohm's Law. The resistance was increasing as a function of the magnetic field as expected but at certain temperature regimes, a decrease in the resistance with the magnetic field was observed. To identify the origin of the thickness dependence of the resistivity, we considered several competing effects in STO/Si such as compressive strain induced by lattice mismatch with Si, strain due to oxygen vacancies, interface states, and structural dislocations. The observed effect can be attributed to space charge effect at the interface of STO with Si, similar to what happens at a p-n junction and at a Si-based transistor.

The Contributions of Sleep to Implicit Memory

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Implicit memories are expressions of knowledge that occur outside of our conscious awareness. One form of implicit memory, perceptual priming, refers to the benefit in processing we experience when viewing and naming an object, due to prior exposure to that same object (we are faster and more accurate at naming the object). Simultaneously, a phenomenon known as anti-priming also occurs, wherein there is a marked decrement at naming an object, due to prior exposure to a visually similar but different object (viewing a desk prior to viewing a table). Priming occurs because each time we view an object, connections between groups of neurons that represent different features of the object become strengthened. One hypothesis is that this also necessarily weakens connections between those specific features and other features that are present in visually similar objects, resulting in anti-priming. Recent research suggests that one important function of sleep may be to stabilize memories, by strengthening connections between different brain cells that represent information involved in the memory. Therefore, neural processing that underlies anti-priming may also take place during sleep. To test this possibility, participants named objects presented one at a time on a computer screen. Half of the participants then took a 90-min nap (nap group) while the other half remained awake (wake group). Electroencephalography (EEG) was used to monitor brain activity during the naps. After 90 min, all participants named objects presented on the screen, including some that had been previously named and some that were similar but not identical to

the previously named objects. Significant anti-priming was observed in the nap group as evidenced by naming times, and the extent of anti-priming that was present correlated with multiple aspects of sleep physiology. These results indicate that sleep is an important mediator of anti-priming effects in implicit memory.

Regional Comparison of Moths in Central Texas

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The variation in rainfall across Texas creates an ideal study area to compare the effects of rainfall on populations of plants and animals. While primary production in terrestrial habitats is expected to respond to differences in rainfall, the biomass of the populations that feed on plant tissues could also be a useful tool in comparing regions. In this study, the biomass of moths (and other night flying insects) is being compared in two different regions of Texas. The locations sampled were Freeman Ranch, Hays County, Texas (average annual rainfall 37.2 inches) and the Christmas Mountains, Brewster County, Texas (average annual rainfall 17.2 inches). The Chihuahuan Desert habitat (Christmas Mountains) would generally be expected to have lower primary production, and therefore less moth biomass than the Central Texas habitat (Freeman Ranch). UV light traps were used to determine the overall biomass of moths in two different habitats at each of the two sites. Insects were collected beginning 30 minutes after sunset during the new moon for 1.5 hours at both locations. The Freeman location was sampled at least monthly, and the Christmas Mountains location was sampled approximately every 2 months. Total biomass was recorded and compared at each site. Weather data were obtained from Weather Underground and the National Oceanic and Atmospheric Administration. Preliminary results indicate that biomass was higher at the Christmas Mountains than at Freeman Ranch for most months in which simultaneous sampling occurred. Unusual weather patterns in both areas may have affected the results. More research and sampling is needed to determine if moths can be an indicator of the overall primary production in these Texas regions.

Correlation of Performance Properties to the Cementitious Paste Thickness of Pervious Concrete

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Pervious concrete has been sought out for its sustainability impact on conserving water recourses by effectively recharging groundwater and managing storm water runoff managing. The performance of pervious concrete is dictated by the pore structure features such as the size of coarse aggregate, pore volume, pore size, pore distribution, and the amount of cement used. Pervious concrete consists of coarse aggregate surrounded by a thin layer of Portland cement paste. The amount of cement used effects the aggregate coating thickness, which has an effect on the porosity and other mechanical properties of the concrete. A higher porosity of the material doesn’t ensure a higher permeability, as the permeability is a function of the pore surface area and pore size. The pore size is not purely governed by the size of coarse aggregate, but both the aggregate size and the thickness of cement paste. In this study a correlation will be made between the porosity versus the cement paste thickness. A thicker cement coating will lead to a lower percolation rate by reducing the porosity, however, this could have an effect on other desirable mechanical properties (strength, absorption, freeze/thaw capabilities, and durability).

This research focus on proportioning the coarse aggregate, cement content, and other admixtures in order to correlate the cement past thickness to the desired properties of pervious concrete. This will be completed through concrete mix-design, laboratory preparation and hardened concrete cross-sectional analysis. The processing techniques utilized will be microscope analysis, Scanning Electron

Microscope (SEM), and other imaging processing that captures and measures the cement paste distribution and thickness surrounding each aggregate. The data obtained from this study will benefit future pervious concrete design considerations for industrial practices. Further benefit to industry includes a feasibility study on limiting the amount of constituents but still maintaining the desired properties of the material.

Cervical Cancer Disparities: Where are Underserved Minorities?

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Cervical cancer is the third most common cancer among females in the United States. Racial disparities exist between ethnic minority groups and whites in cervical cancer diagnosis, incidence, screening, and mortality. Hispanics experienced the highest incidence rate, and African Americans have the second highest incidence rate of cervical cancer. However, African Americans have steadily experienced the highest mortality rate documented. This study aims to identify geographic areas where underserved minority groups including African Americans and Hispanics are at higher risks of late-stage cervical cancer. Using the population-weighted risk difference, this study investigated geographic patterns of racial/ethnic disparities of cervical cancer late-stage diagnosis in Texas based on data from 1995 to 2008 geo-referenced at the census tract level. In addition, this study considered the impact of five factors on racial/ethnic disparities in the analysis using multivariate logistic regression. These five factors are: spatial access to health care, socioeconomic status (SES), the socio-cultural factor, the percentage of African Americans, and the health insurance factor. The study identified 431 out of 4,388 census tracts experienced significantly higher late-stage diagnosis rates in African Americans than non-Hispanic whites. These census tracts were observed in the metropolitan areas of Houston, Austin-San Antonio, and Dallas-Fort Worth, as well as eastern Texas. African women within these census tracts have an elevated risk of late-stage diagnosis after adjusting for covariates compared with the rest of areas (OR, 2.28; 95% CI,

1.84–2.83). These census tracts are characterized by lower SES and insurance expenditures, as well as higher percentage of African Americans. The study also identified 481 census tracts with significantly higher late-stage diagnosis rates in Hispanics than non-Hispanic whites. These census tracts were observed in the metropolitan areas of Houston, Austin-San Antonio, and Dallas-Fort Worth, as well as southwest Texas-Mexico border areas. Hispanic women within these census tracts have an elevated risk of late-stage diagnosis after adjusting for covariates compared with the rest of the state (OR, 1.26; 95% CI, 1.09–1.46). These census tracts are areas with lower SES and higher percentage of foreign-born and linguistic isolated population. Findings from this study could allow cervical cancer intervention programs to more clearly identify areas in efforts to reduce disparity of cervical cancer outcomes.

Microbial Conversion of Humic Acid to Graphene: A Green Chemistry Approach

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Graphene is a two-dimensional sp^2-hybridized carbon-based material possessing extraordinary properties including, excellent electrical conductivity, ballistic thermal conductivity, tensile strength exceeding that of steel, high flexural strength, optical transparency, and the ability to adsorb and desorb atoms and molecules. Because of these characteristics, graphene is a candidate for applications in integrated circuits, electrochromic devices, transparent conducting electrodes, desalination, solar cells, thermal management materials, polymer nanocomposites, and biosensors. Despite the above mentioned properties and possible applications, very few technologies have been commercialized with graphene. This is due to the high cost associated with the raw materials and complicated processes required in graphene's fabrication. In an effort to contribute to the commercialization of graphene on a large scale, the dissertation research proposed here will include a low-cost synthetic process of graphene from humic acid which is obtained from an inexpensive source of carbon. It has been suggested in current literature that graphene can be derived from functionalized graphene via microbial reduction of graphene oxide. This process utilizes specific bacteria which have the ability to use both organic and inorganic compounds as terminal electron acceptors in their respiratory pathway. Due to the data found within the literature, it is hypothesized that these bacteria may also reduce humic acid to graphene using low-cost and non-toxic starting materials and energy efficient processes. The dissertation work will include the

validation and characterization of the physical and electrical properties of the humic acid starting material versus graphene oxide and the identification of the facultative aerobic/anaerobic bacteria that are capable of reduction to graphene.

Mechanistic Basis for Ligand-regulated Control of Protein Self-assembly into Fibril Nanostructures

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Self-assembly of the prion protein into ordered nanofibrils can be triggered by interactions with small cyclic peptides that have the sequence cyclo-CGGKFAKFGGC. A similar peptide with the sequence of cyclo-CGKFAKFGC, however, has been observed to block fibril conversion of monomeric prion protein. To better understand these opposite results, for almost identical peptides, molecular dynamic simulations will be performed to investigate the structural origins to ligand-regulated control of the self-assembly process. Initial simulations will focus on the solution character of cyclo-CGGKFAKFGGC and cyclo-CGKFAKFGC in the absence of binding interactions with the prion protein. Subsequent studies will focus on simulations of binding between the prion protein and both peptides. The proposed simulations will be carried out at both the Texas State PREM and the MRSEC partner NCSU.

Heteromyidae Species Assemblage Data from Jim Hogg County, Texas

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Phylogenetic work and species distribution accounts comprise the majority of the research to date for Heteromyidae in south Texas and Mexico. Habitat and soil associations for heteromyids in south Texas has not been described in depth. Species assemblage data was obtained for Heteromyidae from a 3,294 ha site, located approximately 27.7 kilometers south of Hebbronville, in Jim Hogg County, Texas. Sherman live traps were placed within each unique soil and land use combination for three consecutive nights to determine presence and abundance. Trapping results within each unique combination of soil/land use were compared to determine if variation exists among treatments. Three species of heteromyids, including the hispid pocket mouse, *Chaetodipus hispidus*, Merriam's pocket mouse, *Perognathus merriami*, and the Gulf Coast kangaroo rat, *Dipodomys compactus*, were captured during the effort. *Perognathus merriami* was the most abundant species in each soil/land use combination, followed by *C. hispidus*, and *D. compactus*, respectively. The results of the analysis indicate that there are significant differences in capture rates among the soil/land use combinations. The shrub/scrub-Delmita association, distinguished as shrubland with well drained soils, had the highest capture rate. The shrub/scrub-Nueces-Sarita combination, distinguished as shrubland with moderately well drained soils, had the lowest capture rate. The results of the study might aid in the identification of other heteromyid species assemblages on similar soil/land use combinations. In addition, these data could be beneficial in the development of management strategies for these species, especially for *D. compactus*, a heteromyid with restricted range.

Can the Blind See? A Histological Comparison of Three South Central Texas Eurycea Species

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In 1900, Carl Eigenmann described the ocular structure of *Eurycea rathbuni*, the Texas blind salamander, a subterranean, cave dwelling species of salamander discovered in the 1890s. Eigenmann's morphological description reflected a species adapted to the dark, karst, and aqueous environment of the underground caves of San Marcos, where *E. rathbuni* can be found. An investigation, using confocal microscopy, confirmed the unique ocular morphology of *E. rathbuni*, which is reduced in comparison to two related sister species. The eye includes a single retinal layer, a rudimentary lens, optic nerve and what is suspected to be a hyaloid canal. In contrast, images obtained from members of sister species, *Eurycea nana* and *Eurycea sosorum*, which spend at least part of their life above ground, display fully developed retinal layers, lens, and optic nerve as is expected from amphibians known to utilize visual cues when navigating their environment.
It is unknown whether the optic nerve and rudimentary retina, observed in images taken of *E. rathbuni*, reflect a connection in neural activity between the brain and retina. Neurofilament, a cytoskeletal element present in nerve cells, can be used as a marker to indicate the presence of nerve cell axons. The presence of neurofilament is being tested by conducting immunohistochemistry using eye sections obtained from the three salamander species, mouse anti-neurofilament antibody, an anti-mouse antibody conjugated with a fluorescent dye, and confocal microscopy. The presence or absence of neurofilament throughout the optic nerve and retina will further elucidate the morphological characteristics of these salamanders and also lay a foundation for understanding the nature of the physiological role of the retina and optic nerve in *E. rathbuni*.

Pattern Nanoparticle Growth using Spyropiran and UV light

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Patterned and controlled growth has been extensively studied in an effort to manipulate matter at the nano scale. As Moore's Law continues determine the fate of modern electronics, new technologies will be needed to keep pace with the decreasing device size. Our research focuses on the growth of nanoparticles on a glass substrate coated with spyropiran, a molecule whose properties change reversibly with exposure UV light. Spyropiran has been synthesized and characterized in lab and will be attached to our substrates using various methods. A charged pattern will be created on the substrate using UV light and masking on which the nanoparticles will be grown. We will then grow various metal nanoparticles using a UV stimulated solution growth. We have already experimented with the convective assembly of spyropiran coated nanoparticles and will use the knowledge gained to compare with the patterned growth experiments. The results of this research have the potential to create a multitude of nanoscale electronic devices.

Characterization of a Critical Domain in the Splicing Protein Brr2

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Splicing is an essential component of eukaryotic mRNA processing. Mistakes in splicing cause several diseases such as cancer and retinitis pigmentosa. Splicing must occur between transcription and translation for the cell to produce functional protein. This process is catalyzed by the spliceosome, which is composed of 5 small nuclear ribonucleic acids (snRNAs U1, U2, U4, U5, and U6) and over 100 different proteins. The spliceosome facilitates the removal of non-essential components from the pre-mRNA. An important protein in the spliceosome is Brr2, which is associated with U5 snRNA[2]. Brr2 possesses helicase activity which is responsible for the unwinding of two snRNAs required for activation of the spliceosome[1]. Brr2 is composed of a N-terminal domain (N) and two tandem helicase domains. The first helicase domain has ATPase activity while the second helicase domain does not[2]. Even with its apparent lack of activity, the second helicase domain is highly conserved[2]. Previous studies suggest that the second helicase domain is required for interactions with other splicing factors such as Prp8. It is the aim of this investigation to further characterize the second helicase domain and understand its interactions with other splicing factors. Mutations in the second helicase domain of the protein have been created and will be used to examine these interactions. In particular, these mutants will be assayed to determine if the mutations disrupt protein-protein interactions between Brr2 and Prp8. Additionally, ATP binding assays will be used to determine

if disruption of critical residues in the putative binding pocket will have an effect on protein function.

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The Dielectric Properties of Permalloy-Oxide

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It was recently shown that the partial oxidation of a permalloy thin film in magnetic hard disk reading heads can drastically increase the performance of such device and enable the development of larger hard disks [1]. In order to apply Permalloy oxide (PyO) in magnetic reading heads effectively, the electric properties must be known. Therefore we investigated the dielectric properties of PyO.

The samples were made by reactive dual ion beam sputtering using a silicon wafer covered with an aluminum film as a template. We sputtered off a Nickel Iron target and during deposition the substrate, which was kept at room temperature, was exposed to an atomic oxygen beam. Because of this, the PyO we made is expected to be amorphous similar to the PyO in the hard disk reading heads.

We measured the dielectric properties between 5Hz and 13MHz using an HP impedance analyzer. A mercury probe was used to make the contacts to the sample. The real and imaginary parts of the impedance were used to calculate the dielectric constant of the material.

[1] Goran Mihajlovic, et al., Applied Physics Letters, 97, 112502, 2010

Development and Staging of Two Phenotypically Divergent South Central Texas *Eurycea* Species: *Eurycea rathbuni* and *Eurycea sosorum*

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The south central Texas Eurycea clade represents a unique continuum of karst phenotypes not exhibited by any other vertebrate tetrapod. Together, *E. rathbuni* and *E. sosorum* represent two extremes of this karst continuum of phenotypes. The Texas blind salamander (*Eurycea rathbuni*) completes its lifecycle in a subterranean habitat where it lives in perpetual darkness. Consequently, *E. rathbuni* exemplifies subterranean features including a broad head, gracile limbs, and reduced eyes and pigmentation. Reciprocally, the Barton Springs salamander (*E. sosorum*) is endemic to above ground habitats and exhibits small robust limbs, pigmentation, and well developed eyes. Based on phylogenetic studies the species of the south central Texas *Eurycea* clade share close relationships. The two species (*E. rathbuni* and *E. sosprum*) provide a platform for comparing the sequence of events during development which lead to such disparate phenotypic outcomes. These differences are expected to be subtle since the two species are so closely related.

Herein, a description of the development and staging is accomplished using specimens provided by the U.S. Fish and Wildlife Service, Aquatic Resource Center. The ontogeny of both species is relatively similar including migration of pigmented cells, cranial development, and limb bud development. Interestingly, the tempo of *E. rathbuni* development seems to be slower than *E. sosorum*. The slower development of *E. rathbuni* may be due to the constant environmental conditions which they inhabit, and specifically the relatively consistent low temperature. Investigations of histology and gene expression are underway to further explore the mechanisms responsible for the ultimate phenotype.

Optical Properties of Thin Films of Oxidized Ni-Fe

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Nickel Iron, commonly referred to as permalloy, is a magnetic material that is used in the reading heads of magnetic hard disks. Goran et al recently showed that the performance of reading heads employing permalloy can be significantly enhanced up to a factor of 10 if the permalloy layer is partially oxidized. In order to apply oxidized permalloy (PyO) in the production line of hard disk reading heads, one would need a technique to monitor the thickness of a thin PyO layer. Film thicknesses of transparent layers are normally measured by optical spectroscopy. One would measure the reflection spectrum and determine the film thickness from the observed interference maxima and minima in the spectra and the optical properties of the thin film material. The optical properties of PyO, however, have yet to be determined. Therefore PyO cannot be used in electronic devices at this moment.

Measurements were made on samples made by reactive dual ion beam sputtering on glass substrates. The samples were deposited at room temperature on cleaned glass microscope slides mounted to a water cooled substrate. Samples were rotated during deposition in order to ensure a uniform film. The optical properties of the substrates and the samples were measured using a Woollam M2000 variable angle spectroscopic ellipsometer. The transmission spectra shows that PyO is transparent above 600 nm and strongly absorbs below 300 nm indicating a band gap between 2 and 4 eV. The optical properties above 600 nm are well described by a Cauchy dispersion and can be used to determine the film thickness. Optical properties over the measured spectral range

(200nm – 1000 nm) are well described by a Gaussian, a Lorentz, or a Tauc-Lorentz dispersion.

[1] Goran Mihajlovic et al., Appl. Phys. Lett. 97, pp. 112502 (2010).

Facility Layout for Micropower New Location

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MicroPower manufactures chips for thermoelectric devices. They needed a new facility layout that optimizes the total flow-distance traveled per unit of time. The manufacturing process includes five departments. Managers suggested a layout but they were unsure if it was optimal. The project modeled the problem as a Quadratic Assignment Problem. Constraints to require two specific departments to be in the same location were added. The model was solved using Xpress-MP. The optimal solution reduced the total distance traveled by near 400 feet/day if compared to the layout managers suggested. Other layouts were evaluated. Management favored a massaged solution derived from the one in Xpress. It considers the need for low travel distances between the offices and the manufacturing area. In on-going research, authors extended the model to solve a dynamic QAP considering a horizon of 3 years and relocation costs. Experimentation with the new model and larger problems is in progress.

Effectiveness of a Workshop Intervention in Improving Child-Care Center Lunch Menus in the Central Texas Area

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New strategies are needed to help decrease the high prevalence of childhood obesity. For children ages 2 – 19, the incidence of overweight or obesity is approximately 32%. Child-care centers (CCC) are an optimum location for obesity prevention because of the number of meals and first experiences with food that children receive while in care. Previous research has shown that CCC meals are often of poor quality. Following IRB protocols, one month of menus were collected at 27 CCC in central Texas before a workshop intervention and again for post analysis after 4 months of telephone follow-up support. Following an intervention workshop including a lecture on obesity, an interactive activity with MyPlate analysis of menus, and training on policy changes, 21 CCC staff were motivated to improve their menus. Pre/post SPSS analysis of 8 CCC's lunch menus revealed a significant decrease in serving starchy vegetables ($P<0.05$) and a trend in increased in serving red/orange vegetables served ($P=0.073$). Results suggest the efficacy of the workshop and MyPlate activities.

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Thank you for participating in the
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