Women in Science and Engineering

Moving women in science and engineering into the fast lane – that's WISE!

WOMEN IN SCIENCE AND ENGINEERING
(WISE) CONFERENCE
April 8, 2011

College of Science
Texas State University-San Marcos

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WELCOME

DR. STEPHEN SEIDMAN
Dean, College of Science

The College of Science is proud to host the second Women in Science and Engineering (WISE) conference. This conference highlights the accomplishments of Texas State University student and faculty women across all science, technology, mathematics, and engineering (STEM) disciplines. New this year is an emphasis on the commercialization of science and engineering research. We welcome students, faculty, and graduates to take advantage of this unique opportunity to talk with our researchers and learn about Texas State's STEM research and commercialization activities. I hope that the work displayed and presented here will encourage even more of our female students to pursue scientific careers.

ACKNOWLEDGMENTS

Generous support for the conference has been provided by the following companies, groups, and individuals.

The organizing committee is extremely grateful for their contributions.

Financial Support:

College of Science

Department of Biology

Department of Chemistry and Biochemistry

Department of Computer Science

Department of Engineering Technology

Department of Mathematics

Department of Physics

Ingram School of Engineering

Office of Research and Federal Relations

Samsung Austin Semiconductor

Southwest Research Institute

Women's Giving Circle

Women in Science and Engineering Initiative

Organizational Support:

Lillian Garcia

Pat Parks

University Advancement - Annual Giving

Student Tour Leaders:

Rana Dawud

Joe Alex Granado

Jerry Greene

Cody Guidry

Abdul Rahman M Abdul Kader

Amada Mendoza

Sarah Roark

Abigail M Romo

STUDENT ORGANIZATIONS

Student organizations serve a critical role within the College of Science. The organizing committee would like to acknowledge the students and the faculty advisors in the College of Science.

American Concrete Institute, Student Chapter
Faculty Sponsor: Dr. Cristian Gaedicke

American Foundry Society, Student Chapter
Faculty Sponsor: Dr. Eulogio Velasco Santes

Associated Builders & Contractors, Student Chapter
Faculty Sponsor: Dr. Vivek Sharma

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Math Honor Society (Pi Mu Epsilon
Faculty Sponsor: Dr. David Snyder

National Association of Homebuilders, Student Chapter
Faculty Sponsor: Dr. Gary Winek

Pre-Med/Pre-Dent Society, Student Chapter
Faculty Sponsors: Dr. Marilyn Banta and Dr. Carolyn Pesthy

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Faculty Sponsor: Dr. Marilyn Banta

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Faculty Sponsor: Dr. Carl Muller

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Faculty Sponsors: Dr. Farhad Ameri & Dr. Bahram Asiabanpour

Society of Physics Students
Faculty Sponsor: Dr. David Donnelly

Society of Plastics Engineers, Student Chapter
Faculty Sponsor: Dr. Luyi Sun

Society of Women Engineers, Student Chapter
Faculty Advisor: Dr. Clara Novoa

Tri Beta - Biological Honor Society
Faculty Sponsor: Dr. Paula Williamson

Wildlife Society, Student Chapter
Faculty Sponsors: Dr. John Baccus and Dr. Randy Simpson

WOMEN'S GIVING CIRCLE

Founded in 2007, the Women's Giving Circle (WGC) supports the Women in Science and Engineering 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.

Four scholarships will be awarded to Texas State University women in science and engineering during this year's conference. Two of these scholarships are given by the WGC and demonstrate the important role of women in philanthropy. As a result of this generosity, the WGC joins sister efforts across the nation that encourage women to pursue careers in science and engineering.

The Women's Giving Circle along with members of the Women in Science and Engineering Initiative invite you to join them in enhancing the success of women in science and engineering at Texas State University-San Marcos. For more information regarding donations, please see the WISE web-site at http://wise.science.txstate.edu/.

LOCAL ORGANIZING COMMITTEE

Dana García, PhD
Professor, Department of Biology - Conference Chair

Nathaniel Dean, PhD
Professor, Department of Mathematics

Debra Feakes, PhD
Associate Professor, Department of Chemistry and Biochemistry

Heather Galloway, PhD
Director, University Honors Program and Professor, Department of Physics

Terry Hazell
Entrepreneur in Residence, Office of Commercialization and Industry Relations

Anne Hee Hiong Ngu, PhD
Professor, Department of Computer Science

Clara Novoa, PhD
Assistant Professor, Ingram School of Engineering

Susan Romanella, MA
Director, H-LSAMP Scholars Program, College of Science

Stephen Seidman, PhD
Dean - College of Science

Vedaraman Sriraman, PhD
Professor - Department of Engineering Technology

PROGRAM SCHEDULE

7:30 – 8:30 am	Registration, Breakfast, Poster Set Up LBJ Student Center Ballroom
8:30 – 9:00 am	Welcome, Opening Remarks LBJ Student Center Ballroom
9:15 – 10:00 am	Session I: Science Panel LBJ Student Center Ballroom
10:00 – 10:45 am	Coffee Break/Speed Networking LBJ Student Center Ballroom
10:45 – 11:45 am	Session II: Engineering Panel LBJ Student Center Ballroom
12:00 – 1:30 pm	Luncheon and Keynote Address LBJ Student Center Ballroom
1:30 – 3:00 pm	Poster Session/Practice Interview/Campus Research Laboratory Tours
3:00 – 4:00 pm	Reception, Poster Awards, Scholarship Awards LBJ Student Center Ballroom

KEYNOTE SPEAKER

DR. MARSHA WILLS-KARP
Director, Division of Immunobiology
Cincinnati Children's Hospital Medical Center
M.S., Biology, Southwest Texas State University, 1982

Dr. Wills-Karp received her B.S. and M.S. from Texas State University in 1980 and 1982 in biology. She received her PhD from the University of California at Santa Barbara in 1987 in Environmental Health Sciences. She subsequently completed post-doctoral training in pulmonary biology at Yale University and Johns Hopkins University. She joined the faculty of the Johns Hopkins School of Public Health in 1990 and rose through the ranks to Associate Professor. During her tenure at Hopkins she published seminal studies demonstrating the importance of the IL-13 signaling pathways in the pathogenesis of asthma (Wills-Karp, *Science*, 1998). Antibodies against this cytokine are now in clinical trials for the treatment of asthma. In 2000 she was recruited to Cincinnati Children's Hospital Medical Center to build a basic immunology research division and a Ph.D. training program in Immunobiology. She is currently the Rieveschl Chair of Pediatrics and the founding director of the Division of Immunobiology. Under her leadership the Division of Immunobiology has recruited 14 faculty members. She also served for 2 years as Associate Dean for Basic Sciences at the University of Cincinnati College of Medicine. She established the

Immunobiology Graduate Program in 2004 and in this short time frame it has grown to a class size of 35 doctoral students. Her commitment to educating the next generation of PhD and physician scientists extends beyond the classroom, as evidenced by the success and contributions that her numerous trainees have made and continue to make to the field of immunology. Her trainees now serve in prominent positions within academia including an Associate Dean for Research at Michigan State University and as well as directors of government and pharmaceutical company research divisions. She has won numerous awards and served on many government, academic, and industry review and advisory committees. Dr. Wills-Karp's research is currently and has been continuously supported by several NIH-grants and industry contracts and she has published >125 research articles in top ranked journals (*Nature, Science*). She is married to a physician scientist and has a son who is a sophomore at Ohio State University.

SCIENCE PANEL

"Paths are created by walking: Women in science who are leading the way"

Moderator: Dr. Dana M. García

Susan Crumrine

Susan Crumrine joined Southwest Research Institute as a research analyst after receiving a B.S. in Computer Science from Southwest Texas State University in 1977. She is responsible for the growth of a substantial systems and software engineering program at Southwest Research Institute. As Vice President of the Automation and Data Systems Division, Susan directs a staff of approximately 150 engineers and analysts who conduct research and development projects for industry and government clients in areas including communications engineering and embedded systems, information technology and system security, intelligent transportation and vehicle systems, and manufacturing systems and process improvement.

Beverly Curtice

Beverly Curtice who received her BS and MA in chemistry from what is now Texas State University in San Marcos is a Quality Specialist/Chemist for INEOS Styrenics LLC in Pasadena, TX. She worked for Texaco Research in Bellaire, TX, where she received three patents, and a polystyrene plant in Chesapeake, VA. Beverly chairs the ASTM D16 Committee on Aromatic Hydrocarbons and is on the board for Section 1422 of the American Society for Quality.

Nikoleta Theodoropoulou

Dr. Nikoleta Theodoropoulou is an Assistant Professor in the Department of Physics at Texas State. She holds a Ph.D. in experimental physics from University Florida. She joined Texas State in 2008 after two postdoctoral appointments at MIT and Michigan State University. Her research is on materials physics and nanotechnology with an emphasis on magnetic nanostructures.

Julie Westerlund

Dr. Julie Westerlund is an Associate Professor in the Department of Biology at Texas State and the Principal Investigator for Project Flowing Waters. She holds a Ph.D. in Science Education from the University of Texas at Austin. Her primary responsibility at Texas State is to prepare future secondary science teachers and elementary teachers in their science content knowledge and in their science inquiry teaching skills, a skill that is stressed in national and state science education standards. In 2008, as part of the NSF-funded Flowing Waters project, Dr. Westerlund is responsible for training biology and geography doctoral students in inquiry science teaching as the leader on that project.

Shannon Weigum

Dr. Shannon Weigum is an Assistant Professor in the Materials Science and Engineering Program and Biology Department at Texas State University. Her academic background includes a B.A. in Biology and Science Education from Texas A&M University (1997), M.S. in Biology from Texas State University (2002), and a Ph.D. in Biochemistry from the University of Texas at Austin (2008), followed by a postdoctoral fellowship at Rice University in Bioengineering (2011). Her research is focused on the development of optical microfluidic sensors for disease diagnostics, particularly toward detection of infectious diseases at the point-of-care.

ENGINEERING PANEL

"The new girl-talk: Women leading innovation through strength and sponsorship"

Moderator: Terry Hazell

Lynn Cho

Lynn Cho is a Principal Engineer at Samsung Austin Semiconductor. Lynn holds a BS in Chemical Engineering from the University of Texas at Austin and has extensive experience in the semiconductor industry. Lynn joined Samsung Austin Semiconductor in 1997 as a Photolithography Equipment Engineer and was promoted to Principal Engineer in 2007. In this role, she serves as a team leader and mentor for the CMP Process division. Prior to joining Samsung, Lynn worked at Hitachi Semiconductor US as a member of their New College Graduate Rotation Program and held an internship position at Motorola (now Freescale) in their Environmental Department.

Marian Justiss

Marian Justiss is a seasoned Engineering Manager and a licensed Professional Engineer. She holds a BSEE from University of Texas, as well as BS Mathematics and MS Mathematics degrees. Her passion is People and Process, which she likes to apply to startup companies. Her first engineering job was at Texas Instruments, an established company, where she learned the fundamentals of analog and digital design and regulatory engineering. She then joined VTEL and worked there from 1986 to 1998, where she held various roles in Manufacturing and Engineering. She saw the company grow, thrive and then die. She managed up to 70 people on three sites. Right before the end, she left to go to work for Active Power, who had about 30 employees at the time. Active Power utilizes flywheels instead of batteries in Universal Power Supplies (UPS). She held Director-level

positions in Manufacturing and Engineering. She grew great teams, built a culture, and established many innovative and effective processes. She left in April, 2009 to join Xtreme Power Solutions where she is currently Director of Engineering. Xtreme Power uses an innovative, proprietary battery for energy storage in green applications such as Wind Farm energy storage. During the time Marian has been at XP, she has grown the Engineering Department from 3 to 30 people, deployed a 1.5MW system to a Wind Farm in Maui, and is establishing numerous processes and systems. Marian is well-known professionally as the person who can get things done.

Laura Bosowrth-Bucher

Laura Bosworth-Bucher is an experienced executive with 20 years of combined service with Dell and IBM. Laura is serving with EDCO Ventures a non-profit organization whose mission is to create diverse jobs and innovative companies in economically distressed regions in Texas. She is a venture executive mentoring nascent start-ups on all aspects of strategic planning from critical hiring, business development to capitalization. She was most recently director of Dell's WW Customer Experience effort where she worked with leaders in every function across the corporation to define Dell's strategy and execution plans for improving customer satisfaction and loyalty. During her tenure, satisfaction improved 40-50% in core support organizations. Within Dell, she led several marketing and engineering functions. In marketing, she ran strategic product planning for systems management, a Customer Advocacy Program and software alliances. Ms. Bosworth built the Solution Engineering teams that delivered custom I/T solutions and key ISV (Independent Software Vendor) certifications that enabled over $500M in sales. She was also part of launching Dell's professional services business. Prior to joining Dell in 1998, Ms. Bosworth held a variety of management positions at IBM. She has experience in both product and manufacturing process engineering.

Laura is the advisory board vice-chair for the college of engineering at the University of Texas at El Paso; leading a task force to create a culture of innovation. She is a board member with the Texas Alliance for Minority Engineering and with SafePlace, Austin's domestic and sexual violence center. Additionally, she volunteers as a Spanish interpreter at the Volunteer Healthcare Clinic and as a mentor with UT Austin's Women in Engineering Program. Ms. Bosworth holds a degree in engineering from the University of Texas at El Paso.

POSTER PROGRAM

The Ability of Native Wetland Plants to Process Grey Water during Autumn Months in Texas

Elizka McFetridge and Tina Cade
Department of Agriculture, Texas State University San Marcos

The purpose of this study is to determine which plant(s) has the greatest potential for processing gray water in an artificial wetland when exposed to the weather conditions afflicting San Marcos, Texas during the late autumn months. Four non-invasive and local wetland plant varieties were scrutinized for four weeks on their effectiveness at removing the contaminants of artificial grey water, how the plants coped with seasonal weather changes, and the practicality of using these plants in an artificial wetland. The plants were given two gallons of grey water every week with the control receiving two gallons of untreated water. The water was tested for the presence of ortho-phosphates, ammonia, pH, total chloride and nitrates weekly. The amount of water that was evapo-transpired could be determined by measuring surface water and recoding any additional water added. This study gave valuable insight on which plant(s) could offset seasonal dormancy the longest and become a valuable component in a home artificial wetland system.

Analyzing Lipocalin-2 Expression in Zebrafish Optic Nerve Following Injury

Gabriel H. Hurtado and Dana M. García
Department of Biology, Texas State University-San Marcos

The goal of this study is to analyze astrocytes in the zebrafish (Danio rerio) central nervous system in order to better characterize the reactive phenotype for these glial cells. This study seeks to analyze a protein called lipocalin-2 (Lcn2), which has been hypothesized by others to serve as an autocrine mediator of reactive astrogliosis in zebrafish. We seek to determine if this protein can serve as a marker for reactive astrogliosis. The approach to this project is to perform an optic nerve injury to an anesthetized zebrafish by severing the optic nerve. The left optic nerve was injured and the right optic nerve served as a control as it was uninjured. The eyes, brain and spinal cord will be removed intact and processed for cryosectioning. The tissue was then subjected to immunohistochemistry using an Anti-Lcn2 to detect the protein of interest. Current results show specific labeling on optic nerve 24 hr after injury in an area consistent with the location of astrocytes in the optic nerve of zebrafish based on previous studies. These results indicate that Lcn2 is present after a 24 hr injury. Uninjured controls will be examined to determine by comparison if Lcn2 is upregulated after injury.

Using Multiple Imputation to Eliminate Bias Results

Suleima Alkusari, Clara M. Novoa, and Bahram Asiabanpour
Ingram School of Engineering, Texas State University-San Marcos

Many research projects contain missing data which lead to problems and biases. Durga Vejandla's project is no exception. She had previously worked on optimizing the automated plasma cutting process by design of experiment. Her work contained missing values that might have skewed the results. There are many workable methodologies for handling missing data. One method is multiple imputation. With her collected data and results, multiple imputation was used to generate data in place of the missing values. In the conclusion of our project, the results of the original project with missing values will be compared to the results with multiple imputation.

Characterization of *pic7*, a Novel Auxin Resistant Mutant Involved in Several Plant Hormones Response Pathways

Yuting Hou, Sunethra Dharmasiri, Jessica Villareal, Nirmala Karunarathna, and Nihal Dharmasiri
Department of Biology, Texas State University-San Marcos

Among plant hormones, auxin plays a major role in plant growth and development. Indole-3- acetic acid (IAA) is the major natural auxin in plants while some synthetic chemicals with auxinic activities are widely used as herbicides. Recently we isolated a new Arabidopsis mutant named *pic7* with altered auxin response to synthetic auxin picloram. In accordance with previous studies, *pic7* plants are male sterile attributed to less number of pollens as well as defective pollens. Root growth assays indicate that the *pic7* is resistant not only to auxin but also to several other plant hormones such as abscisic acid, cytokinin, ethylene and jasmonic acid, suggesting that *PIC7* gene plays an essential role in several hormone signaling pathways. Consistent with these results, recent identification of *PIC7* reveals that it encodes an enzyme that may play a role in several plant hormone response pathways.

Improve the Efficiency of a Cashier's Workstation to Reduce Waiting Time for Customers

Joanette Aird, Don Babineaux, Miguel Huerta, Chris Trebing, and Jesus Jimenez
Ingram School of Engineering, Texas State University-San Marcos

The point of this experiment is to analyze the design of a cashier's workstation and discover which factors of the workstation greatly affect the time taken to complete one transaction. The team built an actual model of a cashier's workstation, in replication of the most common workstations used in large businesses. This model would allow us to perform multiple transactions in order to properly analyze our data collected. The data collected allowed our team to determine the best solution for reducing the service time of the cashier, by optimizing the actual setting of the workstation. Each transaction had different settings in the factors, and the response (time) was recorded in seconds. Use of Experimental Design software allowed us to analyze our data and determine how the factors interact. We analyzed our optimal results, the effects of our factors, and the major interaction with the experiment. We conclude that the position of a cashier's keyboard, and the type of scanner used highly affects the processing time of a transaction, thus reducing customer waiting time.

Improving Facility Layout

Joe Alex Granado, Jordan Gardner, Jerry Greene, and Clara Novoa
Ingram School of Engineering, Texas State University-San Marcos

ABC Corporation is a leading provider in analytical instruments, equipment, reagents, and consumables, software and services for research, analysis, discovery and diagnostic needs. Although ABC Corporation has multiple locations in 40 countries to meet its manufacturing and delivery demands, the facility being evaluated and redesigned is located in Round Rock, Texas. In the next 4 years, ABC Corporation expects to expand its production to 4 times its current rate and needs a process improvement plan to accommodate these goals. This facility houses the warehouse, assembly, testing, and shipping grounds for the company's mass spectrometers- the ISQ and the ITQ. For the purposes of this project, the layout redesign process will only be performed on the ISQ, or Single Quadrupole Mass Spectrometer. Currently, the assembly process for the ISQ is completed in four major steps, or 1.) Manifold assembly 2.) Vacuum leak testing 3.) Installation into the chassis 4.) Component installation. The current layout design does not allow for a balanced line or a continuous product flow forcing the worker to create somewhat of a "zigzag" pattern between stations. Within each station there is an unmet need for tools and parts to be at hand when needed. This will often cause delays in throughput and under-utilization of the worker. As a team, we have investigated and re-evaluated the assembly process as-is with time studies, simulations and other multiple operation analysis (lean manufacturing) analytical tools. The changes suggested will permit ABC to improve present productivity and achieve the future goals.

Pinpointing User Interface Deficiencies Using Pattern Recognition Techniques

Divya Dasari Kali Venkata and Dan Tamir
Department of Computer Science, Texas State University-San Marcos

One aspect that is commonly overlooked in software validation and verification is Usability testing as it is an expensive and time consuming activity. Often, Developers are notified of usability issues in their code through feedback from users or Human Computer Interface (HCI) experts and in many cases the feedback provided cannot be correlated with the actual user interface program code. The Texas State University, HCI Group has developed an *Effort Based Model* of usability and applies this model in evaluating user interface, development of usable software and pinpointing software usability defects. The model is based on the notion that usability is an inverse function of effort. The underlying theory and findings of the Effort Based Model along with *Pattern recognition Techniques* can be used to produce a framework to identify usability deficiencies in the software. Identifying and locating software usability issues and correlating these issues with UI software code is referred to as *Pinpoint Analysis*. This will enable UI designers to rearrange the interface at the relevant time snapshot. For example, when users are in a state of confusion or not sure how to proceed to use the software, they tend to gaze around the screen trying to find the best way to complete a task. This behavior is referred to as excessive effort. Identifying these excessive effort segments will lessen the time for software testing considerably. As a part of my master thesis work I plan to apply pattern recognition techniques to data acquired in user interface sessions using an eye tracker and keyboard / mouse key-strokes logging software, in order to pinpoint usability issues. I plan to segment the data using an event based segmentation method, locate excessive effort segments, and analyze them in order to identify usability deficiencies in the software.

Functional Relevance of Unfolded Protein: Investigating Allostery in the Tumor Suppressor Protein p53

Jessica Tracy, Leasha Schaub, and Steven Whitten
Department of Chemistry and Biochemistry, Texas State University-San Marcos

The ability to understand biological function in terms of the chemical structures adopted by protein molecules is a seminal achievement in molecular biology. Such structural descriptions of biological function are challenged, however, by recent observations that many protein molecules are unfolded and lack tertiary structure, or have large unfolded domains, under normal physiological conditions. Surprisingly, sequence-based analyses of whole genomes and computer simulations using allosteric models both suggest that a prevalence of unfolded protein in multi-cellular organisms may be attributed to functional optimization of allosteric systems. Direct tests of this correlation between functional allostery and unfolded protein have yet to be performed, but are crucially important toward gaining a physical understanding of the biochemical relevance of natively unfolded protein - a structural motif thought to be represented in ~30% of eukaryotic protein and ~70% of transcription factors.

We will test the hypothesis that the unfolded domains of a protein molecule contribute to allosteric regulation and develop a quantitative model to describe such phenomena. This will be done using the tumor suppressor protein p53, a protein that contains seven domains, only two of which fold into stable tertiary structures. A strategy of inserting amino acid substitutions into the folded and unfolded domains of p53 and measuring by quantitative methods how these substitutions perturb p53:DNA binding will be used to map the network of allosteric interactions in p53 and determine conclusively whether unfolded protein in this system offers functional properties.

Expression and Characterization of Recombinant 2-(2'-Hydroxyphenyl) Benzenesulfinate Desulfinase from *Rhodococcus* strain IGTS8

Leanne Teneyuque Harper and Linette Watkins
Department of Chemistry and Biochemistry, Texas State University-San Marcos

Sulfur is removed from aromatic organosulfur compounds like dibenzothiophene (DBT), using the dsz pathway found in the bacterium *Rhodococcus* IGTS8. The last step of this pathway was determined to be the rate-limiting step.[1] The enzyme 2-(2'-hydroxyphenyl) benzenesulfinate desulfinase (HPBS desulfinase) is responsible for cleaving the sulfur-carbon bond in DBT without damaging the aromatic carbon molecule. In this study, we have taken the IGTS8 gene that codes for the HPBS desulfinase and engineered a recombinant gene that was transformed into an *E.coli* strain- BL21(DE3). Expression of this HPBS desulfinase protein using the recombinant plasmid transformed in BL21 was successfully completed using a pTAC-MAT-Tag-2 vector[2]. The recombinant HPBS desulfinase protein was co-expressed with chaperone proteins to help the folding of the HPBS desulfinase protein in the *E.coli* strain. Previous attempts to express protein without the chaperone proteins, yield unfolded protein which could not be purified. The purification of the co-expressed protein was done successfully using the ProBond Nickel column from Invitrogen[3]. SDS page confirmed the expression of the HPBS desulfinase protein in the engineered system. Protein concentration was calculated using Bradford assays. Enzymatic assays were performed using a spectrofluorometer that could measure the fluorescence of the product of the desulfurization reaction, hydroxybiphenol (HBP). Enzymatic assays confirm the activity of the HPBS desulfinase protein from the expression system. Further characterization will be conducted on the enzyme to compare its activity with the native enzyme.

A Simulation Model for Comparing Truck Routes on a Stochastic Setting

Alexander Innes and Clara Novoa
Ingram School of Engineering, Texas State University-San Marcos

A computer simulation model is developed in C++ for comparing three different companies' delivery truck routes. Companies could be three third party logistic freight providers as Ryder, Nexus and Schneider or couriers such as DHL, FedExp, and UPS. Route comparison is based on distance traveled which translates into dollars spent. Each company has the same list of customers with their geographical locations, depot location, and estimated minimum and maximum demand at each customer. Exact demands are not known but the probability distribution they follow is known and assumed discrete uniform. Companies' delivery truck routes differ in the way they were obtained. One company solved a deterministic vehicle routing problem using average demand while the other two solved a stochastic programming model with recourse action when trucks run out of capacity (route failures). The recourse in one model was traditional; it always sends the trucks to the depot to replenish and sends them back to the customer where route failure occurred. The last model assumed trucks follow their routes and when all routes fail or end at a customer, remaining customer are known or accurately estimated so trucks with any capacity travel to serve these customers (perform completions) or new trips are scheduled. The simulation model closely resemble to real actions from a company route dispatcher. When route failure occurs, it chooses between performing the traditional recourse or scheduling a completion with a nearby truck based only on current known demand, route failure location, and location and capacities of nearby trucks.

Evidence for Multiple cAMP-Dependent Pathways for Activation of F98 Cells to the Reactive State

Sarah Kane, Joseph R. Koke, and Dana M. García
Department of Biology, Texas State University-San Marcos

Treating F98 cells *in vitro* with forskolin induces a reactive response as demonstrated by increased anti-glial fibrillary acidic protein (GFAP) and monoclonal antibody (mAB) J1-31 immunostaining. mAB J1-31 may recognize a phosphoserine-containing epitope on lamins and GFAP. Intracellular cAMP pathways include cAMP-dependent protein kinase A (PKA), exchange protein activated by cAMP (Epac), and cyclic nucleotide-gated channels. Using H89 and PKI to inhibit PKA, we observe decreased labeling of cytoplasmic IFs by mAB J1-31 in forskolin-treated F98 cells. Conversely, the same treatment appears to increase both the intensity and number of nuclear epitopes. In F98 cells stimulated with the PKA-specific analog of cAMP, 6-Bnz-cAMP, we find no increase in nuclear labeling by mAB J1-31, but a striking increase in mAB J1-31-labeling of cytoplasmic structures. Using anti-phosphoserine to probe extracts of forskolin-stimulated F98 cells separated by SDS-PAGE, we show PKI was effective in reducing phosphorylation of multiple proteins, including bands at the positions expected for lamins and GFAP which are also labeled by mAB J1-31. Thus it appears that cAMP acts on nuclear lamins via an Epac (GEF) pathway and on cytoplasmic IFs (GFAP) via a PKA mediated pathway. This work is supported by the Biology Department at Texas State University-San Marcos and NSF DBI-0821252 to JRK and DMG.

Expression of Duplicated Pigment Transport Genes in Zebrafish

Richard J. Nuckels and Dana M. García
Department of Biology, Texas State University-San Marcos

Genome duplications have occurred in vertebrate species an estimated three times with one of these duplications occurring only in the fish lineage. A group of duplicated genes of interest are the genes involved in melanosome movement. Melanosomes are the pigment containing organelles in pigmented cells. There are several genes or proteins involved in the attachment of the melanosome to the cytoskeleton and the shuttling of melanosomes along the actin and microtubule networks of the cell. Melanosome movement takes place in different types of pigment cells, including dermal melanophores and retinal pigmented epithelial cells. Genes were selected for analysis because of their involvement in melanosome movement and because duplicated versions of these genes have been identified in fish. Whether both gene duplicates are involved in the pigment moving process is not known. It is possible that some of these duplicated pigment genes which are found only in fish may have an altered function or spatial or temporal pattern of expression. By examining the expression of these pigmentation gene duplicates it may be possible to decipher which parts of a pigmentation gene are important for the normal operation and function of that pigmentation gene. Duplicated genes involved in pigmentation processes along with other physiological processes may show a split in functionality with one duplicate being involved in a certain pigment cell type and the other duplicate playing a role in a non-pigment related function. Preliminary results show the expression of these gene duplicates at several points of development.

Potential Climate Change Induced Shifts in Autumnal Streamflows of the Rio Grande Headwater Streams

Anne Ruthstrom and Kenneth Mix
Department of Agriculture, Texas State University-San Marcos

Previous studies have determined climate change induced increases in mountain temperature, raising the number of days when the freeze-thaw threshold is surpassed, are the cause of changes in timing of spring streamflows. However, few studies have been conducted illustrating the effects of increased melting on autumnal flows. The purpose of this study was to determine the presence and extent of increases in autumnal flows related to climate change in the Lower and Eastern Rocky Mountain headwater streams of the San Luis Valley. To determine climate change influences on timing changes of autumnal flows, change point analyses of temperature data from mountain climate stations since 1895 indicated a climate shift occurred in 1994. Further, change point analyses of the number of 24 hour periods exceeding 0^{o}C identified 1984 as the change point. Subsequent change point analyses identified correlated changes in autumnal flows. Julian days 200 to 365 were identified as the typical range for changes in timing of these flows, however dates vary specifically with each gauge station. The cycle of precipitation and timely snowmelt through the seasons provides the valley with much needed irrigation for its agricultural industry, among other users. Irrigated agriculture is the dominant economic generator for the San Luis Valley; therefore increases in autumnal streamflows reduce agricultural opportunities for utilization and revenue.

Rydberg Matter Synthesis with Na/K Intercalated Iron Oxide and MoS_2 Catalysts

Linda L. Akinkunmi, Karl Stephan[†], and Benjamin R. Martin*
*Department of Chemistry and Biochemistry, [†]Ingram School of Engineering, Texas State University-San Marcos

Rydberg Matter (RM) are unusual high energy species (composed of Cs, K, or H atoms) that are believed to be composed of highly excited atoms that are condensed into clusters. RM is known to emit radio frequency radiation caused by rotation of clusters. It is not clear whether all alkali metals can produce RM. Known catalysts for RM generation is graphite or iron oxides under high vacuum. The chemical structure for these catalysts may help assist in the formation of RM. Yet what is not known is what specific features do these catalysts need to have to generate RM? We have been experimenting with Fe/O and MoS_2 catalysts intercalated with Na and K. K intercalated Fe/O species were synthesized using measured ratios of potassium carbonate with iron oxide, ground and heated to 900 degrees Celsius for 48 hours or longer. Intercalated MoS_2 was made by layering K metal with MoS_2 in a crucible, which was then heated in a quartz tube under vacuum at 500 degrees Celsius for a period of a week. X-ray diffraction measurements were used for structural analysis. In preliminary studies, our synthesized $KFe_{11}O_{17}$ catalyst emitted radio frequency radiation (indicating the presence of RM) when heated under vacuum, similar to the mineral used by Holmlid, et al, in their original studies. Work is underway to examine whether Na (in compounds such as $NaFeO_2$) may generate RM, and whether $KMoS_2$ acts as a more efficient catalyst.

Aptamer-mediated Complement System Killing of MCF-7 and MEAR Cancer Cells

John R. Stecker, John G. Bruno*, and Joseph R Koke
Department of Biology, Texas State University-San Marcos; *OTC Biotechnologies, LLC., San Antonio, TX

The first aptamer used, designated MUSC1-5TR-1, has a high binding affinity for Mucin 1 (MUC1), which is over expressed in the adenocarcinoma cell line MCF-7 derived from human breast cancer. The second aptamer, TLS-11a, was developed for the BNL 1ME A.7R.1 (MEAR) mouse liver cancer cell line (Shangguan, D, et al., *Anal Chem* 80, no. 3: 721-728). Biotinylation of the 5' end of the aptamers allowed them to be conjugated to the protein streptavidin that was in turn conjugated to C1q, the first protein in the classical complement immune response pathway. Killing of MCF-7 and MEAR cells *in vitro* by complement-mediated lysis resulting from exposure to the biotinylated aptamers-streptavidin-C1q, in the presence of human complement protein serum, was visualized using SYTOX Green nucleic acid stain. SYTOX Green (Invitrogen) brightly labels nucleic acid in cells with compromised membrane integrity. MCF-7 and MEAR cells exposed to the full treatment both showed increased nuclear staining within a few hours, whereas cells not exposed to the aptamer, streptavidin-C1q conjugate, or complement protein serum showed little to no nuclear staining. Future experiments will incorporate FRET detection of membrane potential changes resulting from MAC formation, and will utilize immuno-fluorescence and immuno-gold to localize components of the MAC by laser scanning confocal and electron microscopy. This work supported by funding from OTC Biotechnologies, LLC and NSF DBI-0821252 to Joseph Koke.

The Mathematics of Katherine Okikiolu

R. Wade Bradfute
Department of Mathematics, Texas State University-San Marcos

This poster presentation highlights the contributions of award winning Katherine Okikiolu. She is an approximately 45 year old Black woman who made and is making significant contributions in the mathematics area of Spatial Geometry. She is noted for her work with differential operators, making contributions in the mathematics field which have gone beyond what was thought to be mathematically possible.

Register Pressure Guided Code Transformations for the GPU

Swapneela Unkule and Apan Qasem
Department of Computer Science, Texas State University-San Marcos

Increased programmability and inclusion of higher precision arithmetic hardware has opened the doors for general-purpose computing on the GPU. With hundreds of cores and extremely fine-grain multithreading, GPUs offer massive amounts of on-chip parallelism. GPU's *FLOPS-per-watt* ratio is much superior to conventional CPUs. Moreover, the cost per GFLOP for GPUs is an order of magnitude less than that of mainstream supercomputers. These features have made GPUs a highly attractive platform for the HPC community.

Although GPUs have dramatically increased the performance potential of computing systems, achieving a high fraction of peak still remains a major challenge. Implementation of algorithm other than regular streaming applications requires significant programming effort and careful orchestration of thread granularity parameters to extract a sufficient amount of parallelism. Another challenge in achieving high performance on GPUs is managing and effectively exploiting the GPUs' complex memory hierarchy. This is because of the division of memory into various subspaces including global, local, constant, shared and texture memory. Improved memory performance depends not only on exploiting locality at higher levels of memory but also the placement of data in the different subspaces.

This research aims to understand the impact of register pressure on performance of GPU applications. We evaluate the impact of increased register pressure on GPU performance and provide a strategy for controlling loop transformation based on register pressure. We also develop a framework to estimate the amount of register pressure and implement a pragma for autotuning loop transformations.

The Role of Physical Environment in Stress Reactivity

Wendy Brooks and Alexander Nagurney
Department of Psychology, Texas State University-San Marcos

This study examined the role of physical environment (restorative v. non-restorative) in physiological and psychological reactivity to a cognitive stressor and investigated the potential for hostile personality to moderate this process. Globally, cardiovascular disease and affective disorders such as anxiety are enormous health burdens; stress and hostility are leading psychosocial contributors to these conditions. The physical environment, consisting of architectural, ambient, and design features, is one critical albeit often overlooked factor in stress reactivity. Restorative environmental characteristics are thought to influence emotional and physiological states through psycho-evolutionary mechanisms of attention restoration and stress reduction. Fifty-nine participants were randomly assigned to condition in this experimental design. It was hypothesized that participants in the restorative environment would show less stress reactivity and greater recovery than those in the non-restorative environment; changes were measured at baseline, reactivity, and recovery. Repeated measures ANOVAs/ANCOVAs revealed that changes in systolic blood pressure and heart rate, but not diastolic blood pressure, significantly interacted by condition, indicating that the restorative environment suppressed reactivity and promoted recovery. Although not statistically significant, patterns emerged suggesting that positive and negative affect are influenced by the physical environment. A pattern emerged which, if significant, would suggest that hostility moderates environmental effects on anxiety. An ancillary meditational regression analysis suggested that effects of hostility on anxiety may be mediated by sensitivity to the environment. Findings offer partial support for the insight that the environment meaningfully affects stress reactivity, meriting future research. Implications for the design of healthcare and other environments are discussed.

IAA28 May have Multiple Functions in Plant Growth and Development

Nirmala Karunarathna, Sunethra Dharmasiri, Thilanka Jayaweera, Praveen Kathare, Joseph R. Koke and Nihal Dharmasiri.
Department of Biology, Texas State University-San Marcos

The phyto-hormone auxin plays a vital role in regulating plant growth and development throughout the plant's lifecycle. Using a chemical genetic approach we recently identified several *Arabidopsis* mutants that are resistant to the auxinic herbicide picloram. One of the mutants, *pic11* that showed severe growth and developmental defects was identified as an allele of *IAA28.* It encodes an Aux/IAA (IAA28) protein. Since another allele was previously isolated as *iaa28-1* in Arabidopsis (Rogg et al 2000), *pic11* was re-named as *iaa28-2*. Like many other Aux/IAA proteins, IAA28 interacts with auxin receptor proteins TIR1 and AFB1 in an auxin dependent manner. However, *iaa28-2* mutation disrupts this interaction suggesting that the mutant protein is stabilized. All Aux/IAA proteins, including IAA28, contain bipartite-like and SV40-type nuclear localization sequences, and many known Aux/IAA proteins are localized to the nucleus. However, localization results with $IAA28_{Pro}$*::IAA28*-GUS shows that, IAA28 protein is localized to both nucleus and cytoplasm. This cytoplasmic localization of IAA28 protein indicates the possibility of multiple functions for IAA28 in plant growth and development. In addition, both mutant alleles of IAA28 show severe defects in lateral root formation, however, higher concentrations of IBA and 2, 4-D treatments were able to rescue the defective lateral root phenotype in *iaa28-2*. The mutant seedlings produce adventitious roots with picloram treatment while Col-0 (WT) produces many lateral roots along the primary root. These results show that, IAA28 play a major role in secondary root formation in Arabidopsis.

The Impact of Turbidity and Visual Versus Chemical Cues on Predator Avoidance by Fountain Darters, *Etheostoma fonticola*

Lily Swanbrow and Caitlin Gabor
Department of Biology, Texas State University-San Marcos

The San Marcos and Comal Rivers are unique aquatic ecosystems to the southwestern United States and are home to many endemic flora and fauna, including seven threatened and endangered species. However, these ecosystems are currently facing many anthropogenic threats and are at risk of losing biodiversity. This project will examine the effect of one anthropogenic threat, increased turbidity, on one federally endangered species endemic to the San Marcos and Comal Rivers, the fountain darter (*Etheostoma fonticola).* Rising turbidity can result in serious consequences for aquatic ecosystems including behavioral affects on fishes. This study tests the impact of turbidity on predator recognition and response in *E. fonticola*. I will measure the response of *E. fonticola* to chemical and or visual cues of a native predator, the green sunfish (*Lepomis cyanellus)* in four predator cue treatments (chemical, visual, combination, and no predator cues) across two vision levels (clear and impaired due to turbidity). I expect that turbidity will significantly decrease *E. fonticola's* response to visual cues of a predator. However, preliminary results indicate that turbidity may have little effect. Pollution, recreational, and industrial activities can all lead to rising turbidity in *E. fonticola* habitat. From a conservation standpoint, the results of this study can be applied to help managers make decisions regarding restoration practices that will best benefit this species as well as other benthic stenothermic fishes.

Identification of a Rab27 Guanine Nucleotide Exchange Factor Homologue in Zebrafish

Matthew Davidson and Dana M. García
Department of Biology, Texas State University-San Marcos

Melanophores are pigmented cells found in the skin of zebrafish. The pigment granules inside of these cells disperse towards the periphery of the cell in response to extracellular cues. Three of the proteins required for granule transport are: Rab27a, melanophilin and myosin5a. Rab27a must be bound with GTP before it can attach to a pigment granule. The guanine nucleotide exchange factor responsible for providing GTP to Rab27a in zebrafish is unknown. Here we identify an uncharacterized protein through *in silico* research, Madd, that shows 74.0% amino acid sequence identity with Rab3 GEP, a known Rab27a GEF found in mouse melanocytes.

Secreted Bioactive Factors from *Bifidobacterium longum* Increase the Levels of Intestinal Fasting Induced Adipocyte Factor (FIAF) *in Vitro*

Priscilla Pham, Reese Cotton, Shaniece Parker, Dhiraj A Vattem, B. J. Friedman and Vatsala Maitin
Department of Family and Consumer Sciences, Texas State University-San Marcos

Gut bacteria are now recognized as a factor in diet-related obesity; partly due to their ability to regulate triglyceride storage in the adipose tissue. A specific target mediating the effects of gut bacteria on triglyceride-storage is intestinal FIAF, a circulating lipoprotein lipase (LPL)-inhibitor. Stimulation of intestinal FIAF levels by probiotic bacteria may thus serve as a promising strategy to impact obesity. The objective of this study was to evaluate the influence of secreted bioactive compounds from representative probiotic strains from two different bacterial phyla: (a) *Lactobacillus casei* (Phylum: Firmicutes) and (b) *Bifidobacterium longum* (Phylum: Actinobacter) on intestinal FIAF levels and downstream effects on LPL-activity and triglyceride storage. FIAF-levels were measured by western blot in HT-29 cells. LPL activity and triglyceride accumulation were measured in 3T3-L1 cells. Secreted bioactives from *L. casei* had no significant influence on FIAF levels, LPL activity or triglyceride levels whereas those from *Bifidobacterium longum* demonstrated potential in suppressing adiposity by significantly increasing intracellular and secreted intestinal FIAF levels (by 47.16±20.23 and 83.15±17.51% respectively), decreasing LPL-activity (by 30.68±9.80%) and triglyceride levels (by 10.01±5.14%) *in vitro*.

On the Depths of Powers of an Ideal

Heather Bruch and Susan Morey
Department of Mathematics, Texas State University-San Marcos

The paper "The depth of powers of an ideal," by Herzog and Hibi is expanded to include background information and proof details. The numerical function f(k)= depthS/I^k is discussed where S is Noetherian local or standard graded and I is a proper ideal of S. A combinatorial example where the depth is known for each power is included.

AUTHOR INDEX

CONFERENCE PARTICIPANTS

Ahmad, Mariam
Aird, Joanette
Akinkunmi, Linda
Alkusari, Suleima
Allen, Phylicia
Arriaga, Alejandra
Basurto Vazquez, Selene
Berthelot, Carolyn
Bradfute, Wade
Brittain, Courtney
Brooks, Wendy
Bruch, Heather
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Chen, Maggie
Cherry, Elyssa
Cho, Lynn
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Galloway, Heather
García, Dana
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Granado, Joe Alex
Greene, Jerry
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Hernandez Jaramillo, Maria
Hernandez, Ana
Hosein, Venitra
Hou, Yuting
Hu, Hang
Innes, Alexander
Jones, Melissa
Kane, Sarah
Karunarathna, Nirmala
Klimicek, Sylvia
Klussmann, Kaitlyn
Kuykendall, Cassandra
Kuykendall, David
Lucas, Amber
Lucas, Amber
Mali, Ivana
Mauldin, Tiffany
McFetridge, Elizka
Mejia Colindres, Carlos
Minter, Lauren

Miranda, Mark
Moore, Geoffrey
Mount, Jennifer
Moyer, Chris
Murray, Mindy
Myers, Odille
Namakshi, Namakshi
Ngu, Anne
Novoa, Clara
Nuckels, Richard
O'Neil, Molly
Oakley, Jennifer
Oktavia, Rini
Ortega, Erica
Pandey, R. Kumar
Parker, Shaniece
Parks, Ashley
Pham, Priscilla
Piehl, Shannon
Plaxico-Chandler, Emmie
Pompa, Rose
Popkes, Bradley
Reiter, Karissa
Roark, Sarah
Rodriguez, Kelley
Romanella, Susan
Ruggiere, Holly
Rull, Elaine
Ruthstrom, Anne
Sampath, Veeraraghavan
Schaub, Leasha
Schneider, Joni
Schreiber, Kyna
Scolfaro, Luisa
Sha, Qiong
Stecker, John
Swanbrow, Lily
Theodoropoulou, Nikoleta
Tiemann, Ashley
Tongate, Rachel
Torres, Phylicia
Tracy, Jessica
Unkule, Swapneela
Urday, Giselle
Van Tine, Justin
Venkata, Divya Dasari Kali
Weaver, Sara
Williamson, Paula
Wills-Karp, Marsha

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