THE UNIVERSITY OF TEXAS AT ARLINGTON

Annual Celebration of Excellence by Students in Graduate & Undergraduate Scholarly Activities

ACES 2010

MARCH 25, 2010

Coordinated by the:

ACES Steering Committee
Office of Graduate Studies
Acknowledgments

Generous financial support for ACES 2010 was provided by the Office of the President.

Additional financial support was provided by the Offices of the Provost, Vice President for Research, Graduate Studies, Office of Development and by all the University’s Colleges and Schools.

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DR. PHILIP COHEN,
VICE PROVOST FOR ACADEMIC AFFAIRS AND DEAN OF GRADUATE STUDIES

CORDIALLY INVITES

ACES PRESENTERS, THEIR FRIENDS AND FACULTY MENTORS
TO
THE ANNUAL CELEBRATION OF EXCELLENCE BY STUDENTS (ACES)
IN THE E.E. HEREFORD UNIVERSITY CENTER
MARCH 24-25, 2010

WELCOME!

On behalf of President Jim Spaniolo, Provost Don Bobbitt, and Vice President for Research and Federal Relations Ron Elsenbaumer, I am delighted to welcome you to UT Arlington’s seventh Annual Celebration of Excellence by Students (ACES). Research and creative activity are matters of the highest importance to all of us here at the university, in part because education is such a strenuously interactive enterprise. ACES highlights some of the many research and creative projects that our undergraduate and graduate students are involved in across the entire campus. Students in the undergraduate and graduate competitions prepare original research and creative activity in the form of oral or poster presentations. Students work with faculty mentors in their disciplines, and faculty members and graduate alumni judge all the submissions. I trust you will enjoy the day and learn much about the interesting and exciting work going on in UT Arlington’s many undergraduate and graduate programs. I also hope you will agree with me that our students are some of today’s best young scholars.

This year’s ACES keynote speaker is Jeffery Toobin. Toobin has been a staff writer at The New Yorker since 1993 and is the senior legal analyst for CNN. His most recent book, The Nine: Inside the Secret World of the Supreme Court, spent more than four months on The New York Times bestseller list and was named one of the 10 best books of the year by The New York Times Book Review, Time, Newsweek, Fortune, Entertainment Weekly, and the Economist. The Nine also received the J. Anthony Lukas Book Prize for Non-fiction and the Silver Gavel Award of the American Bar Association. Toobin joined CNN in 2002 after six years with ABC News. In 2000, he received an Emmy Award for his coverage of the Elian Gonzalez case.

I want to express my gratitude to the faculty mentors, both on and off campus, who have enriched the educational experiences of our students and have helped prepare the ACES participants for today’s symposium. The time and attention that you have devoted to involve students in your research programs and creative endeavors have shaped the scholars of tomorrow. I also want to thank Dr. David Silva, Vice Provost for Academic Affairs and Professor of Linguistics, and Dr. Raymond Jackson, Associate Dean of Graduate Studies, for the workshops on enhancing poster and presentation effectiveness that they presented for ACES participants.

Finally, I gratefully acknowledge the many efforts of the members of the ACES Steering Committee, the Office of Graduate Studies staff, our faculty and alumni judges, and our student moderators from Graduate Student Senate, Phi Kappa Phi and Alpha Phi Sigma. I know that all of them have worked hard to make the seventh Annual Celebration of Excellence by Students a memorable one.

For more information about this year’s ACES event or to read about past ACES events and winners, please visit our website at www.uta.edu/aces.
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<td>Crystal Red Eagle PHYS</td>
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# POSTER NUMBERS

## GRADUATE POSTERS

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ACES Symposium
March 25, 2010

Addendum

Cancellations:

Oral presentations
Donna Wylie
Thomas Pickering
Andres Lopez

Poster presentations
Roja Haritha M Gangupomu
Collins Watson
Natchanok Pala-en

Schedule Changes:

Joshua Jenson – moved to 1:40pm in the Palo Pinto Room
Poster #37 – Qingjiang Guo

Additions:

Jenna N. Pieczonka
Poster No. 63

The Synergistic Effect of Elevated Temperature and the Presence of Caribbean Yellow Band Disease Pathogens on Symbiotic Algae Growth

Missing from Table of Contents

Emily Farris (Psychology) – Abstract on page 34.
“Relationship of Reading Networks in the Brain to Reading Skills”
Congratulations to all of the award recipients and thank you to all of the presenters.

**Graduate Dean's Excellence in Doctoral Student Mentoring Award**

Dr. Frank Lewis, Department of Electrical Engineering

**Sigma Xi Faculty Award**

Dr. Kevin Schug, Department of Chemistry and Biochemistry

**Graduate Morning Oral Presentation**

**Honorable Mention ($50)** - Praveen Gulaka (Biomedical Engineering)
**Title:** Monitoring tissue response to hyperbaric oxygen intervention using 1H MRI
**Faculty Mentor(s):** Vikram D. Kodibagkar

**Honorable Mention ($50)** - Aniket Wadajkar (Biomedical Engineering)
**Title:** Theranostic nanoparticles for cancer diagnosis and treatment
**Faculty Mentor(s):** Kytai Nguyen

**Graduate Dean's Award ($100)** - Aruna B. Wijeratne (Chemistry)
**Title:** "Tartar Emetic": Chemically Known as Potassium Antimony Tartrate: The Best Kept Secret for Centuries.
**Faculty Mentor(s):** Kevin A. Schug

**Provost's Award ($200)** - Giacomo Ghidini (Computer Engineering)
**Title:** A Novel Framework for Data Dissemination in Wireless Sensor Networks
**Faculty Mentor(s):** Dr. Sajal K. Das

**President's Award ($300)** - Sanchali Deb (Electrical Engineering)
**Title:** Wireless Micro Gastro-Stimulator for the treatment of Gastroparesis
**Faculty Mentor(s):** Jung Chih Chiao
Graduate Afternoon Oral Presentation

Honorable Mention ($50) - Jonathan Armstrong (Electrical Engineering)
Title: Human Steadiness/Tremor Measurement Using General Systems Performance Theory
Faculty Mentor(s): George Kondraske

Honorable Mention ($50) - Sairam Geethanath (Biomedical Engineering)
Title: Rapid metabolic imaging of brain cancer
Faculty Mentor(s): Vikram D. Kodibagkar

Graduate Dean's Award ($100) - Aydin Farajidavar (Biomedical Engineering)
Title: Treating Neural Disorders: A Smart Brain-Machine-Brain Interface (BMBI)
Faculty Mentor(s): Dr. J. C. Chiao, Dr. Yuan B. Peng

Provost's Award ($200) - Joshua Jensen (Linguistics)
Title: Curious Couplets in Jarai Poems
Faculty Mentor(s): Colleen Fitzgerald

President's Award ($300) - Kallie Kosc (History)
Title: "Friends of Our Fathers": Praying Indian Patriots and American-Native Relations in Revolutionary-Era New England
Faculty Mentor(s): Dr. David Narrett

Graduate Poster Presentation

Graduate Dean's Poster Award ($50) - Richa Karanjekar (Civil Engineering)
Title: An Improved Model to Predict Gas Generation from Bioreactor Landfills
Faculty Mentor(s): Melanie Sattler, Sahadat Hossain

Provost's Poster Award ($100) - Ashwin Nair (Biomedical Engineering)
Title: Biomaterial Implant Mediated Autologous Stem Cell Recruitment and Differentiation
Faculty Mentor(s): Dr. Liping Tang

President's Poster Award ($200) - Vitaly Voinov (Linguistics)
Title: WORDS SHOULD BE FUN: USING SCRABBLE AS A TOOL FOR LANGUAGE PRESERVATION
Faculty Mentor(s): Cynthia Kilpatrick
Undergraduate Afternoon Oral Presentation

**Honorable Mention ($50)** - Jaundell Parker (Interdisciplinary Studies)
*Title*: Environmental temperature and virulence in marine bacteria  
*Faculty Mentor(s)*: Laura Mydlarz

**Honorable Mention ($50)** - Keduse Agonafer (Mechanical Engineering)
*Title*: Solar Shroud Design Using Computational Fluid Dynamics  
*Faculty Mentor(s)*: Dereje Agonafer

**Graduate Dean's Award ($100)** - Nathan Dunn (Aerospace Engineering)
*Title*: Development and Testing of a Continuous Detonation Wave Engine  
*Faculty Mentor(s)*: Dr. Frank K. Lu

**Provost's Award ($200)** - Chelsea Roff (Psychology)
*Title*: How Affective Dissonance Impacts Self-Reported Emotional Experience  
*Faculty Mentor(s)*: Dr. Andrew Baum, Dr. Daniel Levine

**President's Award ($300)** - Brian Stamos (Biochemistry)
*Title*: Protein Biochip Technology for Medicinal Drug Discovery  
*Faculty Mentor(s)*: Roshan Perera

Undergraduate Poster Presentation

**Graduate Dean's Poster Award ($50)** - Ezgihan Baydar (Aerospace Engineering)
*Title*: Analysis of frequency spectrum of a two-layer photonic crystal  
*Faculty Mentor(s)*: Tuncay Aktosun

**Provost's Poster Award ($100)** - W Clemons (Chemistry)
*Title*: Determining Sickle Cell Anemia and Beta-Thalassemia Carriers Rapidly, Accurately, and Inexpensively with a Dual Wavelength Light Source Light Scattering Analytical Instrument  
*Faculty Mentor(s)*: Dr. Purnendu Dasgupta

**President's Poster Award ($200)** - Paul Pasichnyk (Biology)
*Title*: In field conditions, avian predators attack blue sections of a potential prey item at a higher frequency than black sections: Empirical evidence of an underlying premise of the decoy hypothesis.  
*Faculty Mentor(s)*: Charles M. Watson
**Graduate Sustainability Award**

**Graduate Sustainability Award ($200)** - Moustafa R Abou Shabana (Chemistry)

**Title:** Photoassisted Coal Electrolysis

**Faculty Mentor(s):** Prof. K. Rajeshwar

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**Undergraduate Sustainability Award**

**Undergraduate Sustainability Award ($200)** - Ashley Johnson (Interior Design)

**Title:** Sustainability With a Shipping Container

**Faculty Mentor(s):** Rebecca Boles
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Andrew Palacios
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Jumping Genes Revisited: Giant Transposable Elements Hop between Animal Genomes Jainy Thomas
Transposable Elements Mediated Capture, Diversification and Expansion of Gene Families in Late Potato Blight Agent, Phytophthora infestans Komal Vadnagara
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Hydrogen Generation from Texas Lignite Coal Electrolysis

Moustafa R. Ali Abou Shabana

Faculty Mentors: K. Rajeshwar

Session: Concho, 9:20a

Group Names: Prof. K. Rajeshwar, Prof. Norma de Tacconi, Dr. Williwan Chanmanee

Lignite coal is plentiful in Texas and its electrolysis is sustained by coal oxidation at the anode and hydrogen generation at the cathode. Thermodynamic potential for this process is 0.22 V which is remarkably low compared to water electrolysis (1.23 V). Proof-of-concept experiments in our laboratory have shown the feasibility of using lignite coal for hydrogen generation and therefore a newly-designed coal electrolysis cell consisting of two individually sealed compartments and membrane connected is now being used: one compartment for the oxidation of coal slurry and the other for conversion of the acidic electrolyte into H₂. Current/potential polarization curves and galvanostatic runs are being performed in this new coal electrolysis cell at different temperatures (20 - 60 °C) showing that H₂ evolution occurs at an applied potential of 0.8 V (vs. Ag/AgCl electrode), while in the absence of the coal slurry it requires ~ 1.8 V (vs. Ag/AgCl electrode). The electrolysis in the coal compartment is mainly sustained by iron ions leached from the carbonaceous material into the solution and catalyze the coal oxidation. This reaction generates several products ranging from useful fuels to CO₂ and performs more efficiently as the temperature increases. Therefore, two birds with one shot: hydrogen generation with low energy consumption and partial amounts of useful fuels.

Passive Attack against Anonymity Systems using Selective Cross Correlation

Titus Abraham

Faculty Mentors: Dr. Matthew Wright

Session: San Jacinto, 1:00p

A mix is a communication proxy that attempts to hide the correspondence between its incoming and outgoing messages. Routing communication through a path of mixes is a powerful tool for providing privacy. When mixes are used for interactive communication, such as VOIP and web browsing, attackers can undermine user privacy by observing timing information along the path. Mixes can attempt to stop these attacks by inserting dummy packets (cover traffic) to obfuscate the timing information in each stream. Recently proposed defenses, defensive dropping and adaptive padding, enhance cover traffic by ensuring that timing information seen at the sender is very different from that seen at the receiver. In this work, we propose Selective Cross Correlation (SCC), an attack that an eavesdropper could employ to deanonymize users despite the use of defensive dropping or adaptive padding. The main insight of our approach is that, with either defense, the timings at one end of the stream are a subset of the timings at the other end of the stream. By considering the network conditions and the defensive mechanism used, an appropriate filter window can be used to effectively remove the cover traffic, thereby enabling us to correlate both ends of the stream. We have conducted real network experiments and have found that SCC greatly improves attacker effectiveness over prior techniques against both the defenses. With SCC, the attacker is nearly as successful as when neither defense is applied. Thus, we have demonstrated the need for more robust defenses against statistical timing attacks.
Solar Shroud Design Using Computational Fluid Dynamics

Keduse Agonafer

Faculty Mentors: Dereje Agonafer

Session: Guadalupe, 4:00p

The radio control devices that are responsible for delivering the newest technologies to end-users are subject to stricter requirements of power than predecessors in compact space. These scenarios compel an increase in power density. In addition to these internal heat sources, external solar loading comes as a natural consequence of standard outdoor telecom installations. Direct sunlight induces a heat flux onto as many as three sides of an outdoor device. The thermal management of the resulting system requires a simple yet effective solution against solar loading the device while allowing for adequate air flow. In this paper, we examined the benefits of a solar shroud placed over a high-powered radio control unit combined with 12 different vent configurations installed on the surface of the shroud using Computational Fluid Dynamics (CFD). Natural convection cooling methods don’t require fans or pumps and hence are low maintenance and bear a low initial cost. The simulations were conducted under natural convection conditions. Both the flow and thermal phenomena was examined in the quest for optimal design. One of the benefits of having performed this analysis in a CFD environment was being able to examine the relationship between the mass flow of air through the primary heat sink and the corresponding drops in temperature levels at the internal heat sources. In this study, we were able to reduce the board temperature by 10%. The results suggested that external slat designs provided the lowest resistance to natural convection air flow and delivered the largest reduction in board temperature.

Why Do Conscientious Students Perform Better Academically?

Ashley Aikman

Faculty Mentors: Dr. Lauri Jensen-Campbell

Session: Concho, 1:20p

Conscientiousness has been consistently linked to better academic performance (AP) (e.g., O'Connor & Paunonen, 2007). However, virtually no study to date has examined the possible micro-behaviors (mediators) that may explain this relationship (but see Chamorro-Premuzic & Furnham, 2003). In other words, are there certain academic behaviors that conscientious students engage in that help them succeed? This study examined whether conscientiousness predicted motivational style (intrinsic, extrinsic, amotivated), self-control, study habits, and actual AP. Moreover, motivational style, self-control, and specific micro-behaviors associated with study habits were expected to mediate the link between personality and AP. College students (N=299; Men=104) completed surveys that assessed personality, motivational style, self-control, and 63 behaviors/study habits and gave permission to access their grades. Conscientious students had lower levels of amotivation, which has been linked with poorer self-determination (Deci & Ryan, 1985). Amotivation in turn mediated the link between personality and AP (Z=1.98, p<.05). In other words, conscientiousness was positively related to self-determined forms of motivation, which in turn predicted AP. Conscientiousness was also related to better general self-control, study habits, attendance, attitude toward schoolwork, material synthesis, academic goals, organization, preparation, and health habits and less distraction when studying. A positive attitude toward schoolwork, attending class, study habits, and lack of distracters while studying (e.g., television/music/phone) mediated the link between conscientiousness and AP. Additional analyses will examine these associations in more detail as well as examining possible moderators of these effects. These findings, however, provide preliminary evidence that conscientious students are behaving in ways that improve their AP.
Sleep Disordered Breathing Detection Using Heart Rate Variability and R-Peak Envelope Spectrogram

Mohammad. Al-abed

Faculty Mentors: Khosrow Behbehani

Session: San Jacinto, 9:20a

Sleep-Disordered Breathing, especially Sleep Apnea, is estimated to have a prevalence of 6% in US adults. SDB has been shown to affect the productivity and quality of life of the patient, and an increase in the morbidity & mortality risk due to congestive heart failure for untreated SDB patients. Recently, sleep apnea has been linked to increasing risks of renal failure and diabetes. The gold standard for diagnosing SDB is nocturnal polysomnography (NPSG), which is relatively expensive and not readily accessible. Cost effective and more accessible means to screen the at-risk population for SDB are highly desirable.

We present here a method to detect sleep apnea with high accuracy using features extracted from single-lead electrocardiograms (ECG). Heart Rate Variability (HRV) and R-Peak Envelope (RPE) are two signals extracted from ECG recordings. The algorithm proposed here extracts textural features from the spectrograms of HRV and RPE, and uses the textural features to train an Artificial Neural Network (ANN) classifier. A Monte Carlo Training and Testing scheme is employed to test the performance of the algorithm. We found that the average classification accuracy of this method is 97.8%.

Estimation of the Metabolic Variations using Blood Pressure during Simulated Sleep Apnea

Raichel Alex

Faculty Mentors: Dr. Khosrow Behbehani

Poster # 20

Group Names: Mohammad Al-Abed, Aditya Bashaboyina, Gauri Suresh Bhave, Swathi Parameswaran Iyer, Essam Ahamad

Sleep Apnea is a serious sleep disorder characterized by complete cessation or reduction of breathing for 10 seconds or more during sleep, which adversely affects the quality of sleep. Studies show that in North America, among people who are 30 to 60 years old, 4% to 24% of men and 2% to 9% of women have Obstructive Sleep Apnea. Sleep Apnea plays a major role in the development of Hypertension, Heart Failure, Stroke and is also responsible for poor performance in everyday activities due to lack of proper sleep. In our study we simulated the apnea in healthy subjects having an average age of 29 ± 5 yrs and BMI of 24 ± 5 kg/m^2. The protocol is designed in a way that subjects will have a period of normal breathing for about 30 to 90 seconds followed by episode of breath hold which will simulate sleep apnea. This is repeated five times in both sitting position and supine position. The beat to beat Blood Pressure is acquired using Nexfin Finger cuff monitor throughout the experiment. The features extracted for understanding the physiological changes during simulated apnea are time span of waveform, slope of the trend, area under the curve, systolic and diastolic pressure values, pulse pressure and the dicrotic notch. The physiological changes during breath hold compared to normal breathing and supine position vs sitting position within the subjects and across the subjects will be presented.
YouTube and News Media Corpus Unveils Stereotypes of Arabs

Dalal Almubayei

Faculty Mentors: Laurel Smith Stvan

Session: Palo Pinto, 3:00p

Although people have reservations about overtly expressing ethnic stereotypes for fear of being perceived as racists, one way to capture these attitudes is to look for instances where people are more spontaneous and honest. A methodology that can yield such authentic data would capture opinions expressed anonymously in online chat rooms, blogs, or discussion boards. The aim is to uncover stereotypes of Arabs that are articulated in a manner that is less monitored. I address two research questions: Has the keyword "Arab" come to be a loaded term expressing negative feelings? And if so, what sorts of negative perceptions do people have of Arabs? The corpus is compiled from two sources: English language online academic and newspaper articles amounting to 90150 word tokens, and comments from YouTube, discussion boards, and blogs collected in 2007 amounting to 25244 word tokens. The online data are entered and analyzed in AntConc concordance software. High frequency words are calculated, concorded, and then interpreted in their immediate linguistic environments. This method of collecting abundant naturally occurring online data of peoples’ attitudes towards an ethnicity and then analyzing it in concordance software reveal a number of stereotypes of Arabs: in particular Middle Easterners are presented as all Muslims, oil-rich, and terrorists. The study’s simple methodology unveils stereotypes of an ethnic group not only exposing the occurrence of the stereotypes, but also clearing the falsehood of such stereotypes perpetrate with the goal of creating more successful interethnic relations.

In vitro Studies of Polymer-coated Magnetic Nanoparticles

Nesreen. Alzoghoul

Faculty Mentors: Dr. Nguyen

Poster # 14

Group Names: Nesreen Alzoghoul, Aniket Wadajakar, Bhanu Kopulu, Kyta Nguyen

The objective of this research is to characterize polymer-coated magnetic nanoparticles (PMNPs) as a drug delivery system for cancer treatments. The nanoparticles were prepared by free radical polymerization of N-isopropylacrylamide-acrylamide-allylamine (NIPA-AAm-AH) on the surface of functionalized magnetic nanoparticles (MNPs) using Pluronic F-127 as a surfactant instead of the common surfactant, sodium dodecyl sulfate (SDS). The size of these nanoparticles was around 100nm as indicated by transmission electron microscopy (TEM). Biocompatibility studies of these nanoparticles on fibroblasts and smooth muscle cells were done using MTS assays. The results demonstrated lower toxicity with PMNPs formulated using Pluronic F-127 than those using SDS. Fluorouracil (5FU) was loaded in these nanoparticles and used as a cancer drug model in order to investigate the drug release profile of nanoparticles at different temperatures. We found that 5FU was released more at 41°C compared to that of 25°C, which is evidence for its temperature sensitivity. Also, the results showed that PMNPs made with Pluronic F-127 released more drug compared to nanoparticles made with SDS. The particle uptake studies also indicated that cell uptake was higher with nanoparticles formulated using Pluronic F-127 surfactant. Future work will investigate the pharmacological and targeting capabilities of the synthesized nanoparticles in vitro and in vivo for possible applications in targeted and controlled drug delivery to treat cancers.
Human Steadiness/Tremor Measurement Using General Systems Performance Theory

Jonathan Armstrong

Faculty Mentors: George Kondraske

Session: Red River, 3:00p

Group Names: George Kondraske

Steadiness/tremor measurement is important in medical and occupational contexts. Inexpensive, lightweight inertial sensors enable complete, six degree-of-freedom (DOF) motion capture of a body segment. There is consequently a need for a conceptually sound approach to form a composite measure (i.e., single numerical value) that reflects the “overall steadiness” of that body segment. General Systems Performance Theory (GSPT) incorporates components that are directly applicable to this problem, suggesting the multiplicative combination of “performance resources” (i.e., volume of a performance capacity envelope). This, along with a more traditional approach using simple averaging, was explored experimentally. Subjects (n=28), with inertial sensors attached to their hand, participated in a protocol in which they held their hand as steady as possible and also mimicked tremor-like motions. Three translational and rotational displacement motion time series were extracted from sensor data. The inverse of a measure of average displacement for each DOF produced six steadiness performance resource measures. GPST-based and simple average composites were formed with these. The GSPT-based composite was orders of magnitude more sensitive than the simple average composite (sensitivity = ratio of most to least steady subject) and also had the highest test/retest reliability (Pearson r = 0.798). GSPT is argued to be conceptually valid (preserving dimensionality and measurement units) whereas the averaging approach is flawed (requiring addition of quantities with different units). This is frequently and inappropriately justified by using normalization that produces what appear to be unitless values that can be added. Nonetheless, the quantities are different (e.g., translational vs. rotational steadiness).

Nano-manufacturing of Gold Break Junctions Fabricated with Focused Ion Beam Scratching and Electro-migration

Waseem Asghar

Faculty Mentors: Samir M. Iqbal

Poster # 48

Group Names: Azhar Ilyas, Priyanka P. Ramachandran, Mohammud R. Noor and Samir M. Iqbal

The “Break Junctions” have been extensively explored by different research groups for probing electrical properties of single biological molecule. It is a very simple device consisting of the gold electrodes separated by few tens of nanometers. Typically break junctions are fabricated by different techniques i.e. optical/e-beam lithography, electromigration, mechanical control of suspended conductive electrodes/strips, electrochemical deposition of conductive material and nanowires. All these processes are time consuming and suffer low-yield of nano-gap devices. We explored a new process of fabricating break junctions with the help of focused ion beam (FIB) scratching and electro-migration. FIB is used for nanometer scratching of 3 um wide gold lines followed by breaking the junction by applying specific voltage. The scratched region faces higher current density which results in breaking the gold wire due to electro-migration. The final gap is around 100-200 nm range. Our proposed technique give higher yield of 67% as compared to the 15-20% reported elsewhere. Using FIB scratching we have a better control on the final gap in nano-electrodes.
The Effects of Using Honey as a Supplemental Fuel Source on Cardiovascular Endurance

Jennifer Bailon

Faculty Mentors: Dr. Judy Wilson, Brad Heddins, Dr. Mark Ricard

Poster # 16

Sport gels are commonly used as a supplemental carbohydrate form. Honey, a carbohydrate, is composed mainly of glucose, fructose, and water. The purpose of this study was to determine if honey could be used effectively as a supplement to enhance maximal exercise performance.

Five male triathletes completed a maximal oxygen consumption (VO\textsubscript{2} max) test on two separate occasions. The trials consisted of cycling to the point of exhaustion on a bicycle ergometer with an increasing workload. Prior to each test, subjects consumed 18 g of honey with half a pint of water for the honey trial, and just the water for the control trial. Heart rate, blood pressure, rating of perceived exertion, and VO\textsubscript{2} were recorded. VO\textsubscript{2} max was the variable of primary interest.

The subjects’ results revealed no significant difference in the variables measured at VO\textsubscript{2} max between the two trials \((p > 0.05)\). The VO\textsubscript{2} max values also had no significant difference \(((t(4) = -.318, p = .767))\). The values from the honey trial \((37.06 \pm 8.85 \text{ ml/kg/min})\) were similar to the control trial \((36.29 \pm 10.04 \text{ ml/kg/min})\).

VO\textsubscript{2} max is considered the best measure of aerobic capacity and is determined by the heart’s ability to deliver oxygen for the muscles to utilize. Supplements to improve aerobic capacity appear to have greater affect on increasing time to exhaustion during submaximal exercise. It is suggested for future studies to have subjects consume honey prior to a submaximal test while measuring time to exhaustion compared to a placebo.

Facility for Shock and Detonation Wave Interaction with a Reactive Turbulent Field

Thania Balcazar

Faculty Mentors: Frank Lu

Session: Neches, 1:40p

Group Names: Frank Lu, Eric Braun

A novel shock tube facility is described for studying the interaction of a reactive, turbulent field with a shock or a detonation wave. This shock tube concept is different from existing approaches due to the need to propagate a detonation wave into a reactive, turbulent medium. A turbulence-generating grid is pulled through the test section. The turbulence is allowed to decay prior to propagating either a shock or a detonation wave. Different arrangements are needed depending on whether a shock or a detonation wave is to be propagated through the medium. Some key features of our shock tube facility are: (1) Turbulence is generated by pulling a turbulence-generating grid through the test section; this allows time for the turbulence to develop. (2) Turbulence intensity can be controlled by the type of grids used. (3) Facility allows for strong shocks and detonations to be propagated. (4) Facility provides extensive optical access.
The Effect of Non-Gaussian Uncertainty on Timing Resolution

Swapnil Baral

Faculty Mentors: Dr. Andrew Brandt

Poster # 4

Group Names: Ryan Hall, Mason Macphail, Ian Howley

In this poster, I present results from a laser test stand that we have set up to study the timing and rate characteristics of micro-channel plate photo-multiplier tubes (MCP-PMTs). These MCP-PMT's will be a major component of a fast timing system proposed as an upgrade to the ATLAS detector at the Large Hadron Collider (LHC). The presentation includes the setup of the optics needed to focus the 405 nm light produced by the Hamamatsu PLP-10 pulsed picoseconds laser, and an analysis of data obtained using a LeCroy 8620 fast oscilloscope. I will present results on the effect of non-Gaussian tails of the timing distribution on the timing resolution.

Using Multi-Dimensional Fragmentation and High Mass Accuracy to Improve de novo Peptide Sequencing

Jeremy S. Barnes

Faculty Mentors: Kevin A. Schug

Poster # 52

The complexity of the field of proteomics is complemented by the potential therapeutic rewards offered through synthesis and application of proteins. Improved techniques for analytical characterization of protein sequences are warranted by the increased need to understand proteomic systems and further discriminate the sequences of newly synthesized proteins. Currently, one mass spectrometric approach at determining the exact order of amino acids making up proteins involves de novo sequencing. This technique utilizes tandem mass spectrometry (MS/MS) for fragmenting the ionized protein and peptide, followed by piecing the sequence of amino acids back together to discern sequence information. Tandem mass spectrometry-based de novo sequencing can be limited due to an incomplete continuous spectrum of ionized amino acids, identical or near identical masses of residues or combination of residues, and noise-related signals in spectra. These limitations can make determination of peptide sequences extremely difficult, and increasingly so as the number of residues increases or the peptides are non-linear (branched). Thanks to technological advances in instrumentation, multidimensional fragmentation and improved mass resolution may be helpful in overcoming some of these limitations. Our goal in this project is to improve on the ability to sequence known and unknown, linear and branched, peptide fragments utilizing electrospray ionization-ion trap-time of flight-mass spectrometry in combination with computational sequencing. Currently, bradykinin has been used as a model system for optimizing linear peptide analysis. In addition, collaborators at Virginia Tech have synthesized and provided experimental branched peptides, which are being used to optimize testing of non-linear peptide systems.
Assessment of Metabolic Variations during Simulated Sleep Apnea Events Using CO2 and ECG

Aditya Bashaboyina

Faculty Mentors: Dr. Behbehani Khosrow

Poster # 47

Group Names: Raichel Alex Mary, Essam Ahmad Altuwaijri, Gauri Suresh Bhave, Swathi Iyer Parameswaran, Mohammad Al-Abed

Sleep Apnea is a sleep disorder where cessation of breathing occurs. It is characterized by abnormalities in respiratory pattern and quantity of ventilation during sleep. According to a study 4% of men and 2% of women have sleep apnea. Obstructive sleep apnea, Central sleep apnea and mixed sleep apnea are three kinds of sleep apneas. The easy way to simulate a sleep apnea in a healthy subject is to make the person hold his/her breath. The experimental set up includes the Capnogard (for measuring the CO2) and Electrocardiogram (ECG). The healthy subject was selected with an average age of 29 ± 5 years. In our study there are two protocols. Protocol A has a normal breathing for 1 minute followed by breath hold and 90 seconds of normal breathing, this is repeated 5 times. Protocol B has a normal breathing for 1 minute followed by breath hold and 30 seconds of normal breathing, this is repeated 5 times. Both the protocol A and B are conducted in sitting and supine positions and the selection of protocols are randomized. The features extracted from the CO2 are peak to peak and valley to valley distances, Area and the Inspiration to Expiration ratio. Pre-breath hold and post breath hold periods are used to identify changes in these features. The feature extracted from the ECG wave form is Heart Rate( HR). All the features are compared within and across the subjects and the results will be presented.

Analysis of Frequency Spectrum of a Two-layer Photonic Crystal

Ezgihan Baydar

Faculty Mentors: Tuncay Aktosun

Poster # 1

Group Names: Ernesto Garcia, Antonio López

Photonic crystals are dielectric (nonconducting) nanostructures (with typical length of 200-350 nm, half the wavelength of visible light) where the index of refraction is a periodic function of location. Because of the periodic nature of the refractive index, light sent onto a photonic crystal will either propagate in the crystal or it will not even be allowed to enter the crystal, depending on the frequency of that incoming light. At a forbidden frequency the light cannot penetrate the crystal, whereas at an allowed frequency the light will move into the crystal. Our goal is to understand and to determine the allowed and forbidden frequency bands of a two-layer photonic crystal, where the unit cell of the crystal is made up of two layers, each of which has a constant index of refraction. This is the analog of the Kronig-Penney model from quantum mechanics. We determine the allowed and forbidden frequencies for such a two-layer photonic crystal, and we analyze the dependence of the spectrum on the refractive indices of the two layers as well as on the thicknesses of the layers. We conjecture and verify our conjecture that the forbidden frequency bands become broadened as the contrast between the two refractive indices increases. We also observe and explain how the spectrum changes as the two layers become thinner or thicker. In our demonstration we use the mathematical software Mathematica.
Study of Physiological Effects of Sleep Apnea by Measurement of Cerebral Blood Flow Velocity

Gauri Bhave

Faculty Mentors: Dr. Khosrow Behbehani

Group Names: Mohammad Al-Abed, Aditya Bashaboyina, Raichel Mary Alex, Swathi Iyer

Sleep Apnea is estimated to have a prevalence rate of approximately one in fifteen or 6.62% in the US. Sleep apnea has been shown to affect the quality of life in patients. Recently sleep apnea has been linked to subtle brain damage and memory loss. It has been suggested that sleep apnea patients show gray matter loss in areas that regulate breathing and speech. To study the effects of apnea on cerebral blood flow, we simulated apnea in healthy control subjects. During the simulated apnea, we measured the cerebral blood flow velocity using a Trans Crainal Doppler (TCD). We tested 15 subjects and asked them to simulate apnea by holding their breath. This was done 5 times in both the sitting and supine positions. We had 2 protocols in each position where the length of time for normal breathing between breath holds was different. We randomized the order for every subject. We present here the physiological interpretation of the effects of sleep apnea on the cerebral blood flow by extracting features from the blood flow velocity waveform for normal breathing and simulated apnea periods and comparing them. We compare the trends of the velocity profiles, the area under the curve for each pulse and the maximum blood flow velocity. We also compare the changes during the sitting and supine positions. We discuss the possible physiological effects of the changes in cerebral blood flow velocity during simulated apnea.

Novel Magnetic-based Multilayered Nanoparticles for Targeted and Controlled Drug Delivery and Imaging of Skin Cancer

Zarna Bhavsar

Faculty Mentors: Kytai T. Nguyen

Group Names: Bhanu Prasanth Koppolu

The objective of this research was synthesis and characterization of multilayered nanoparticles for targeted and controlled drug delivery to treat skin cancer. The core of the multilayered nanoparticles consist of biodegradable polymer Poly(Lactide-co-glycolide) (PLGA) core, which are embedded with functionalized iron oxide nanoparticles, and the temperature-sensitive polymer shell made of Poly(N-isopropylacrylamide-acrylamide-allylamine) (PNIPA-Am-AH) tripolymer shell. The size of the multilayered nanoparticles was 450-550 nm using transmission electron microscopy (TEM). The presence of PLGA core, functionalized iron oxide nanoparticles and PNIPA-Am-AH tripolymer in the multilayered nanoparticles was verified by Fourier transform Infrared spectroscopy (FTIR). The conjugation ability of the nanoparticles to targeting biomolecules was confirmed by conjugating a fluorescent Fluoro-PEG-SCM on the multilayered nanoparticles. The effects of nanoparticles at various doses and incubation times on cell viability of human dermal fibroblasts evaluated by MTS assays found no significant cytotoxicity at low particle concentrations. The uptake of the nanoparticles by the B16F10 melanoma cell line was also evaluated. The optical property of the multilayered nanoparticles was measured by Magnetic Resonance Imaging (MRI) which proved that these multilayered nanoparticles can be used as contrast agents for detection of tumors. In general, our primary results show that the novel multilayered nanoparticles are potential carriers for combined drug delivery of two anticancer drugs as well as contrast agents for imaging of tumor growth. Future studies include combined drug release study of Curcumin and Doxorubicin as anticancer agents from the novel multilayered nanoparticles, the efficiency studies of these drug-loaded nanoparticles in vitro and in vivo.
To[o] Jung for Answers (A 'Stage' for Maturation)...

Paul Blankenship

Faculty Mentors: Dr. Bridgitte Barclay

Session: Neches, 1:20p

Science fiction novels are often considered to be a critique of the real world in which we live, both social and political commentaries disguised by the veneer of fantastic stories taking place in different realities. One example of such a didactic text is *The Marriages Between Zones Three, Four, and Five*, in which several Zones and their occupants are forced to desegregate their wildly exclusive cultures. The author, Dorris Lessing, investigates the depths of the human psyche through her fictional characters to provide answers to hypothetical readers in the real world. By using a psychoanalytical perspective, especially Jungian psychology, to interpret the character interactions within the text, it becomes quite apparent that Lessing is providing answers to real-world problems through the scenarios presented in her world of science fiction. This presentation will demonstrate Lessing’s didactic purpose of the text by specifically investigating the defense mechanisms employed by characters from various zones, their reactions and interpretations to ‘the dream’ (which consists of taboo thoughts and behaviors between a mother and her son), their respective sexual behaviors and preferences, and how these factors interplay to eventually create a nearly perfect Jungian marriage between the Zones. Lessing’s science fiction novel employs and illustrates Jung’s ideas in a fantastic realm where she is able to more effectively teach hypothetical readers how to apply Jung’s concepts in a practical and efficient manner in order to improve their own lives and the lives of those around them well beyond the fictional realm of the text.

A Quantitative Comparison of the Shell Sort and Quick Sort Algorithms

Pinaki Bose

Faculty Mentors: Dr. J. Carter M. Tiernan

Poster # 10

In this study, the efficiency of the quicksort and shell sort algorithms are compared by measuring the time each takes to sort integer arrays. This study is conducted in the C programming language using the GNU C Compiler (GCC) on a multi-user GNU/Linux server using C’s clock() function available in the C package time.h. By finding the sorting time for integer arrays ranging by powers of ten from one integer to $10^7$ integers, the average-case runtime for each algorithm was determined. It was found that the average runtime for the quicksort was $O(n^{1.1})$ and the average runtime for the shell sort was $O(n^{1.2})$, only slightly slower than the quicksort. However the difference becomes significant as the size of the arrays increases to over a million integers.
Ionospheric Response to Sudden Changes in the Interplanetary Magnetic Field

Reception Theory and Studio Practices

Shannon Brunskill

Faculty Mentors: Professor David Keens

Session: Red River, 2:00p

When a piece of visual art is not fully understood by the viewer, one can ask if the artist is not communicating effectively, or is the viewer misinformed? The answer lies somewhere in the middle. Searching how to control what ideas people would get from viewing my work, I began to research reader response theories by Jaus, Iser and Fish. These theorists argue to varying degrees that the creation of a piece of work belongs either solely with the reader and the context through which they see the work; or as a shared collaboration between the reader and the writer. Though these theories are originated with and are still typically applied to literature, I began wondering how to use them in my studio practices to communicate my ideas more clearly to the viewer. I began applying the reader response, or reception theory models in my studio practices, creating visual works of art with the consideration of my audience and their socialization throughout the creative process. This allowed me to develop an expressive body of works that communicate with most viewers, the essence of my concerns with the fragility of childhood.

Chemical Vapor Deposition of Nanodiamonds and Study of Their Structural, Optical, and Electronic Properties

Rajarshi Chakraborty

Faculty Mentors: Prof. Suresh C Sharma

Poster # 55

Group Names: Kyle La Roque

Diamond thin films were grown on silicon substrates by hot-filament assisted chemical vapor deposition technique utilizing CH4 and H2 mixtures. During our investigations of diamond thin films in the 1990's, the emphasis was on the growth of continuous thin diamond films with exceptional structural, electronic, and electrical properties [1]. However, there is now renewed interest in the growth and unique properties of nanometer-size diamond [2]. We have, therefore, re-examined some of our previously grown diamond samples with emphasis on delineating the structural and optical properties of nanometer-size diamond particles in these samples. The nanoparticles are characterized by using AFM, SEM and Raman spectroscopy. The optical properties of the nanoparticles are further studied by carrying out photo-toluminescence measurements. In this contribution, we briefly review different growth techniques and present our results on the structure and optical properties of nanodiamonds.

Genetically Engineered Protein Mimics for Bioremediation

Subhash Chand

Faculty Mentors: Roshan Perera

Poster # 40

Toxic organic compounds have a devastating effect on human health. Oxidation of toxic organic compounds has become an area of huge interest in the field of environmental remediation processes, specifically those related to the petrochemical industry. Once oxidized, these compounds will be more water soluble and therefore, serve as a good carbon food source for microorganisms. In order to achieve this remediation goal, it is important to design novel biocatalysts that are remarkably tolerant and accessible towards a wide array of toxic petroleum organic byproducts. The powerful biotechnological technique, namely the genetic incorporation of unnatural amino acids into biological systems, allows the incorporation of unnatural amino acids site-specifically into proteins inside living organisms and has proven an effective method for investigating the structure and function of proteins. Furthermore, this technique potentially paves the way for de novo design of proteins displaying enhanced or unique functionality. Myoglobin was used as a model system since it is a well characterized heme protein that binds a variety of organic compounds without significant changes in protein structure. Our preliminary results suggest that we can carry out oxidation reactions with ~90-100% turnovers for thioanisole, benzaldehyde, benzylalcohol, styrene and toluene using novel bioengineered myoglobin mutant proteins. This is unprecedented and stretches the paradigm for how we can use bioengineered enzymes in environmental remediation.

Conscientiousness and Self-motivation as Mutually Compensatory Predictors of University-level GPA

Wen Cheng

Faculty Mentors: William. J. Ickes

Poster # 30

To help account for variability across studies in the predictive utility of conscientiousness, we proposed that conscientiousness and self-motivation mutually compensate for each other in predicting university-level academic performance. Consistent with this expectation, we found evidence of such mutual moderation in a sample of 377 college undergraduates. First, we found that conscientiousness and self-motivation compensated for each other in predicting university GPA: Students who were either high in conscientiousness or high in self-motivation had better academic performance (GPA) than those who were low in both conscientiousness and self-motivation. Second, these findings were still evident after we controlled for the students’ previous academic performance (high school rank) and academic ability (SAT/ACT). The study of mutually compensatory predictors not only offers the potential of developing better predictive models; it also helps to account for why some “main effect” predictors of university GPA are variable across studies in their degree of predictive utility.
Environmental Regulation of Stomate-based Defense against Bacterial Infection in Arabidopsis

Reejana Chitrakar

Faculty Mentors: Maeli Melotto

Session: Red River, 1:20p

Stomata are natural openings in the plant epidermis responsible for gas (O$_2$ and CO$_2$) exchange between plant interior and environment. They are formed by a pair of guard cells, which are able to close the stomatal pore in response to a number of external factors including light intensity, carbon dioxide concentration, and relative humidity. The stomatal pore is also the main route for pathogen entry into leaves, a crucial step for disease development. Recent studies have unveiled that closure of the pore is effective in preventing bacterial disease in Arabidopsis plants and the successful plant pathogen Pseudomonas syringae pv. tomato (Pst) DC3000 is able to re-open stomata by producing the phytotoxin coronatine. A major unanswered question is: “how do stomata respond to combined effect of biotic and abiotic stresses?” We found that coronatine can re-open dark-closed stomata as early as three hours post-incubation with purified coronatine or the coronatine producing Pst DC3000. Same trend did not hold for the coronatine deficient mutants, Pst DC3118 and Pst DB29. We also have evidence that high relative humidity (RH; 95 ± 5%) reduces bacterium-triggered stomatal closure. The same effect was not observed under low RH (60 ± 5%). Taken together, these results suggest that guard cells prioritize their response when exposed to multiple stimuli. Understanding this process should help elucidating the effectiveness of stomatal-based defense in nature where plant experiences constant influx of external stimuli and also implementing additional measures to control disease outbreaks in the field.

Evidentials and epistemic modality in Tohono O’odham: A preliminary study

Yujeong Choi

Faculty Mentors: Dr. Fitzgerald, Colleen

Session: San Jacinto, 1:20p

Although the phenomenon of evidentiality is quite common in many Native American languages, few studies have attempted to understand evidentiality in Tohono O’odham. This paper considers four suffixes classified as epistemic modals (-kì, -ş, -s, -p) to examine the relationship between epistemic modality and evidentiality in Tohono O’odham, a Native American language spoken in Southern Arizona and in Northern Sonora, Mexico. Evidentiality is defined as a way of encoding the source of information in a speaker’s utterance. Generally, the conceptual domain of evidentiality has been discussed in relation to epistemic modality as follows: 1) The domain of evidentiality subsumes epistemic modality (Chafe 1986), 2) the domain of epistemic modality subsumes evidentiality (Palmer 1986; Willett 1988), 3) the domain of evidentiality is separated from epistemic modality (De Haan 1999; Aikhenvald 2004), or 4) the domain of evidentiality (particularly, inferential evidentiality) is overlapped with epistemic modality (Fallen 2004, 2006). Four epistemic modals (-kì, -ş, -s, -p) are typically attached to mood and tense morphemes in Tohono O’odham. These suffixes are usually translated in the literature as follows: the suffix -kì is translated into ‘evidently/apparently’, -ş ‘reportedly/apparently’, -s ‘whether or not/if’, -p ‘perhaps/maybe’ in English, respectively (Saxton 1982). However, since these glosses are similar and actually overlap each other, a more precise distinction between these suffixes is sought. The present analysis is based on the morphological/syntactic/semantic distribution in existing materials. This preliminary analysis reveals that two suffixes –kì and -ş are evidentials, whereas –p and –s are epistemic modals.
Determining Sickle Cell Anemia and Beta-Thalassemia Carriers Rapidly, Accurately, and Inexpensively with a Dual Wavelength Light Source Light Scattering Analytical Instrument

W. G. Clemons

Faculty Mentors: Dr. Purnendu Dasgupta

Presently there are no accurate and affordable methods to rapidly identify carriers of sickle cell anemia, beta Thalassemia and other hemoglobin abnormalities in the field. It is a particular problem in developing nations in Africa and Asia with scant resources and high incidence of such diseases. The accuracy of inexpensive methods such as the Naked Eye Single Tube Red Cell Osmotic Fragility Test (NESTROFT) depends on the skill of the observer while accurate methods such as HPLC and isoelectric focusing (IEF) are expensive and beyond the reach of most of the affected population. Present status has economically disadvantaged children and adults misdiagnosed or not diagnosed at all. I propose a sophisticated yet affordable optoelectronic analytical instrument that will facilitate rapid identification of carriers and thus slow the rate at which these genetic disorders pass. The basic principle articulates that defective cells have thicker cell walls and upon placing in a modestly hypotonic solution, normal red cells lyse more rapidly than do sickle/thalassemic cells. Differentiation can be perceived optically if one wavelength is used as control. Not only is our device field portable, it only cost <$0.15 to run samples, very different from minimally $40 cost of alternatives. The most effective method of intervention is a large-scale carrier-screening program with subsequent genetic counseling. Furthermore screening programs can quickly identify carriers and remind those who may have tested when they were babies and are unaware of their carrier state. Nevertheless, we believe this to be an achievable idea whose time is now.

Veterans with Gulf War Illness Demonstrate Memory Impairments that Result from Functional Brain Differences

Crystal M. Cooper

Faculty Mentors: Timothy N. Odegard

Session: San Saba, 3:20p

Over 25% of our soldiers returned from the Persian Gulf War with a multisymptom condition now referred to as Gulf War Illness. While serving, many soldiers were exposed to one or more neurotoxins. Most of these were acetylcholinesterase inhibitors that target regions of the brain such as the limbic system, which is crucial for cognition, and memory in particular. Several veterans have reported memory deficits. However, these memory deficits have not been detected by standard neuropsychological tests. The current study investigated intermediate states of memory, rather than success versus failure in memory retrieval, in an attempt to detect the memory deficits reported by ill Gulf War veterans (GWV). Both ill and healthy GWV studied four lists of faces and face-name pairs while an MR scanner acquired functional brain images. After each study list, participants were shown all the faces they had studied, and were asked to judge if each face had been presented with a name or not. Both behavioral memory performance and corresponding brain activation was analyzed. Ill-GWV had poorer memory performance overall relative to healthy GWV. Differences in brain function between healthy and ill GWV were detected in areas of the limbic system including the left and right hippocampus, and the right amygdala. Moreover, activation in these areas was associated with the memory deficits observed in the ill GWV. The behavioral data suggest ill GWV to have memory deficits, and the brain imaging data suggest these memory impairments to be caused by differences in brain function.
Peripheral Nerve Gap Repair using a biodegradable Cross-linked Urethane-doped Polyester Multi-luminal Nerve Implant

Swarup Narayan Dash

Faculty Mentors: Mario Romero-Ortega

Group Names: Richard Tran, Jian Yang, Mario Romero

Approximately 50,000 cases annually in the U.S. involve loss of sensory and motor function due to injured peripheral nerves. Tissue gaps resulting from peripheral nerve loss are routinely repaired by autologous grafts, which remain the “gold standard” for nerve repair. This method however requires the sacrifice of normal donor nerves with consequent sensory loss and parasthesia at the donor site, often resulting in variable and sub-optimal functional recovery. Here we described the development of a multi-luminal biodegradable biosynthetic nerve implant (BD-BNI) repair strategy, as a scaffold to bridge the transected neurons across peripheral nerve gaps. The BD-BNI consists of a reabsorbable external tubing filled with a multiluminal hydrogel matrix, and collagen filler in each of the eight microchannels (300-500μm in diameter). Fabrication of the BD-BNI is based on a novel elastomeric cross-linked urethane-doped polyester (CUPE), which provides a strong, elastic and a completely biodegradable conduit for nerve repair. After sciatic nerve injury, the transected axons were successfully guided through the microchannels across a 15 mm nerve gap in the rat model, as demonstrated by histological and morphometric analysis. Functional recovery mediated by the BD-BNI is currently being evaluated using electrophysiological nerve conduction studies across the repaired nerve segment. The efficacy of this technology for guiding the functional regenerative process across a completely biodegradable biomimetic implant, offers an alternative to autograft nerve repair and the potential to provide an enhanced “off the shelf” nerve implant for peripheral nerve gap repairs.

Examining the Impact of Bilateral Primary Somatosensory Cortex Lesions on Mechanical Hypersensitivity and Escape/avoidance Behavior

Matthew A Davis

Faculty Mentors: Perry N. Fuchs

Group Names: Megan L. Uhelski

Since the proposal of the multidimensional sensory, motivational, and affective model of pain by Melzack and Casey (1968), efforts to elucidate these mechanisms have focused on two neural pathways, the medial and the lateral systems. The purpose of this study was to examine the specific role of the somatosensory cortex (S1) in sensory and affective aspects of pain. It was hypothesized that animals with S1 lesions would demonstrate decreased pain sensation in a chronic inflammatory state, as measured by elevated mechanical paw withdrawal thresholds (MPWT). Despite this, it was expected that these animals would show unaltered processing of pain affect, as demonstrated by preference for the light side of the chamber in the place escape/avoidance paradigm (PEAP), a measure of pain affect. In the PEAP, animals received repeated stimulation to the uninjured paw while in the light side of the chamber, and stimulation to the inflamed paw while in the dark side of the chamber. Additionally, all animals in the inflammatory state were expected to demonstrate increased paw volume compared to pre-inflammatory values. Results showed that S1 lesions produced significantly higher MPWT values in the presence of inflammation, but did not alter levels of pain affect or paw volume. Overall, these results are the first to demonstrate that the affective component of pain is maintained in the presence of a decrease in pain sensation. This suggests that there are indeed distinct neural pathways dedicated to processing the separate dimensions of pain originally described by Melzack and Casey in 1968.
**Wireless Micro Gastro-Stimulator for the treatment of Gastroparesis**

**Sanchali Deb**

Faculty Mentors: Jung Chih Chiao

Session: Concho, 8:40a

Group Names: Thomas Abell, Filip To, Christopher Lahr, Wen-Ding Huang, J.-C. Chiao

Introduction: Gastroparesis is a common disorder in patients with Diabetes, Cancer and Parkinson Disease where patients are not able to digest their food and suffer from vomiting, nausea and spasms. Gastric electrical stimulation (GES) is an accepted therapy for drug refractory Gastroparesis. Appropriately configured electrical stimulations injected into the tissues stimulate the electrical control activity components of the gastric contractile activity that is responsible for the motor properties of the stomach. Current GES requires surgical implantation of a large cardiac pacemaker device which is painful. In this work, we proposed two new miniature gastric stimulators which can be implanted endoscopically without surgery.

**Method:** Two designs have been accomplished. One design utilizes a rechargeable-battery driving a reprogrammable pulse generator. A magnetic Reed switch switches between charging and stimulating modes. An antenna placed outside the body against the skin remotely charges the battery. Another design features batteryless stimulation with a charge pump circuitry and a microcontroller harvesting radio frequency energy from an external coil antenna to generate the required pulse trains. Both designs have been implemented with different doses.

**True Barbarians?: The Role of Visigothic Iberia in Medieval Persecutory Discourse**

**Justin T. Dellinger**

Faculty Mentors: Professor Sarah Davis-Secord

Session: Palo Pinto, 2:00p

During the last twenty-five years, there has been wide-spread debate about whether or not medieval persecution existed. Those who believe that persecution did exist deliberate to what capacity, as well as when and where it took place. Historians that doubt it offer explanations of toleration, coexistence/convivencia, ambivalence, or simply repression. Most of this historical debate unfortunately tends to center itself in or after the eleventh-century, abstaining from discussions about socio-politico groups that existed in the fifth through tenth centuries. Groups such as the Visigoths are therefore largely omitted from these conversations. Compounding this deficiency is an issue with modern notions of persecution, which can distort the social, cultural, and economic interactions that took place between Jews and the Muslims and Christians they shared territory with. Since most of the recent persecutory historiography neglects the Visigoths, extensive examination of works about Spanish Jews and Iberia is necessary to identify the historical trends. The reading of these texts illuminates an extensive persecutory discourse as the Visigothic treatment of the Jews proved to be both cruel and hostile at times through discriminatory laws, compulsory conversions, polemical disputations, expulsion, and general acts of violence. The purpose of this paper is to offer insight into the academic dialogue that has generally overlooked the role of the Visigothic social, political, intellectual and ecclesiastical entities with regard to persecution in the Middle Ages, and calls for historians to include mention of Visigothic Spain in future persecutory discourse.
Molecular Basis of Avoidant Behavior in Sprague-Dawley and Wistar-Kyoto Rats and the Implications for Substance Use Disorder

Torry Dennis

Faculty Mentors: Dr. Linda Perrotti

Group Names: Samara Morris-Bobzean, Brocke Addison

Individuals exhibiting a reserved behavioral response (behavioral inhibition) have an increased vulnerability to pathological anxiety and substance use disorder (SUD). A common behavioral phenotype exhibited in both of these psychopathologies is lack of impulse control, which may manifest itself as compulsive behavior. Accordingly, a common symptom of anxiety disorders is persistent avoidant behavior. Similarly, compulsive drug-seeking is observed in those suffering from SUD. While a great deal is known about the mesocorticolimbic dopamine (DA) system in mediating drug-seeking behaviors, little is known about how differences in DA transmission within this circuit increase vulnerability for those exhibiting behavioral inhibition to SUD or pathological anxiety. Thus, our hypothesis is: abnormal cortical regulation of the mesolimbic DA system causes behavioral inhibition which, in turn, leads to compulsive responding. We are interested in the long-term neural adaptations that occur during the development of compulsive responding and how they may cause a neurobiological vulnerability to develop anxiety disorders and SUD. The Wistar-Kyoto (WKY) rat exhibits a unique set of features for the study of anxiety; features unobserved in a control strain, Sprague Dawley (SD). WKY rats display exaggerated avoidance sensitivity and compulsive responding in an active-avoidance paradigm. We have observed increased levels of the transcription regulator DeltaFosB, a marker associated with long-term changes in DA signaling, in the prefrontal cortex of WKY rats after acquiring an active-avoidance response. These data support our hypothesis that abnormal cortical regulation of the mesolimbic DA system causes behavioral inhibition which, in turn, leads to compulsive responding.

The Role of Symbolic Interactionism in a Firearm Identity

Oleksandr A. Dobrov

Faculty Mentors: Sara Jane Phillips

Session: Guadalupe, 10:00a

The symbolic notion of a firearm is a unique concept that is pervasively observed throughout American history. However, American culture has evolved in a peculiar direction; some no longer treat firearms as weapons; rather, they are tools of sport, competition, or leisure. One can make the argument that firearms have a symbolic meaning for many Americans today through the influence of various social factors, constructing a symbolic American identity. This work examines the historical emergence of firearms in America, the subsequent expansions to firearm ownership, and how history relates to the concept of gun culture. The National Rifle Association is of particular note as it pertains to the concept of gun culture. After examining the Symbolic Interactionist perspective, a connection between firearms and several other topics is observed. Primarily tradition, masculinity and family, protection, political conservatism, and power. This work argues that gun culture may not be particularly limited to gun owners or those who subscribe to the values of the National Rifle Association, instead it may connect to a broader American identity. This symbolic identity may in turn influence firearm related behavior, contributing to our academic understanding of violence with a firearm, reasons for firearm ownership, and the debate on gun control. It is then the objective of the current work to lay a foundation for future research in this direction.
Study of Function of Two Nuclear Transport Retrogens (Dntf-2r and Ran-like) in Relation to Sex Chromosome Evolution

Susana Domingues

Faculty Mentors: Esther Betrán

Poster # 33

Group Names: Mansi Motiwale, Esther Betrán

Dntf-2 and Ran are two genes involved in nuclear transport. We have showed that these two genes were convergently retroduplicated in different Drosophila lineages from the X chromosome to the autosomes. We previously described that Dntf-2r (the retroposed copy in the D. melanogaster lineage) has a strong testis biased transcription pattern and has evolved under recurrent positive selection. Ran-like (the retroposed copy of Ran in D. melanogaster lineage) has also been described to have strong testis-bias transcription and we recently reveal that it has also evolved under positive selection. These facts suggest strong selective pressures acting on the origin and evolution of these retrogens. We are generating D. melanogaster transformed lines with constructs of the retrogens, parental genes and putative promoters fused to EGFP or RFP and in situ to study male pattern of expression and function. This will allow us to know the expression pattern of the parental gene and retrogens, as well as, if they co-localize and interact in testis. Knock out lines (i.e. P element insertions), knock down (RNAi phenotype) and deletions are also being studied for male fertility and genomic conflict related phenotypes. The results observed until now point to a different and nonessential function of the retroduplicated genes compared to the parental genes.

Bilinguals in India and 'Hinglish' in the media

Namrata Dubey

Faculty Mentors: Dr. Cynthia Kilpatrick

Session: San Jacinto, 10:00a

'Hinglish' is a mix of Hindi and English – a language heard on streets, schools and colleges and nearly everyplace targeted by youngsters in India. Use of 'Hinglish' helps in introducing fresh metaphors and enhances rhyming in addition to helping to reach out to a wider cross-section of the population. The use of 'Hinglish' in bilingual advertisements has had a profound effect on the day-to-day speech of speakers in India. This paper will focus on two main claims – First, irrespective of the matrix language of the advertisements, the speakers incorporate the punchlines into their speech and accept them as phrases present in their language. This illustrates that the Hindi language is slowly and gradually embracing the advertisement punchlines and incorporating them into Hindi metaphorically or as idiom chunks. This is bringing and will continue to bring about a change in the language such that the Hindi spoken 10 years from now will look very different from the Hindi spoken today. Secondly, in addition to changing spoken language, these advertisements are also affecting the written language. In informal writing, Hindi words are written in Romanized script and English words are written in Devanagiri script; this is affecting the writing styles of the bilingual speakers. People are open to playing with multiple linguistic resources that are available to them and therefore they are willingly incorporating into their language innovative forms presented in the media. And this seems to be just the beginning!
Development and Testing of a Continuous Detonation Wave Engine

Nathan Dunn

Faculty Mentors: Dr. Frank K. Lu

Session: Neches, 3:00p

Group Names: Eric M. Braun

Utilizing detonation waves for propulsion systems is seen as possibility for achieving high speed flight. Several different engine concepts have been proposed in recent years. One of these concepts, called a continuous detonation wave engine (CDE), consists of a detonation wave rapidly rotating around an annulus with steady inlet and nozzle conditions. No successful tests with a duration of more than a few seconds have been reported in the literature. Two different CDEs with swirled injection to improve mixing and combustion were developed at the UT Arlington Aerodynamics Research Center. The mixture was ignited with an ordinary automotive spark plug, and data indicates that detonation was achieved with the detonation wave(s) traveling in one uniform direction. Several parametric variations were performed during testing. Pressure readings were recorded from both engines, and results from the data analysis are described.

Novel Computer Controlled Device Models Spinal Cord Distraction Injury

Bradley Elmer

Faculty Mentors: Mario Romero

Poster # 22

Group Names: Jennifer Stearns, Jennifer Seifert, Dan Sucato

Correction procedures during spine deformity surgery impart significant stresses to the spinal cord, which may result in spinal cord injury (SCI) and paralysis. Significant reduction or loss of transcranial motor and somatosensory evoked potentials (TcMEPs and SSEPs, respectively) alert spine surgeons of possible unintended SCI. The device was designed according to anatomical measurements of the rat spine. Metal clamps are attached to two linear actuators mounted at separate ends of an aluminum frame. The reliability of the device was tested in six anesthetized adult Long Evans in which the distractor was affixed to T9 and T10 vertebrae. After distraction the animals were evaluated for behavioral deficits using the Basso, Beattie and Bresnahan (BBB) scale at days 1, 3 and 7 days after the spine distraction. The average peak bidirectional force recorded during distraction was 25 ± 4 Newtons. After distraction, and compared to preoperative recordings, we observed a drop in TcMEP amplitude of 88.1µV +/- 18.9% and a variable reduction in the SSEP amplitudes (21.8µV +/- 50.3) All animals showed permanent paralysis in the hind limbs quantified by drastic reduction in the BBB scale (mean = .17) We have developed an animal model of bidirectional spine distraction which incorporates intraoperative motor and sensory monitoring, closely mimicking damage to the spinal cord that might occur during spine deformity surgery. The high precision, control, and reproducibility of this animal model could enable the research of neuroprotective strategies aimed at preventing unintended new neurological damage in spine corrective surgery.
Lanzhou Street Dust Particle Analysis

Steven Emenhiser

Faculty Mentors: Andrew Hunt, Ph.D.

Session: Concho, 3:00p

The city of Lanzhou is considered as one of the most polluted cities in China. The city is highly industrialized; dominated by major petrochemical, manufacturing, and oil refining operations. Studies have found that Lanzhou has the highest rates of respiratory diseases in China. Obtaining element fingerprints for metal particles in dusts from different city locations can potentially provide information on the origins of the contamination of the dust. The aim of this study was to investigate the composition of the metal bearing particles in street dust from Lanzhou by Computer Controlled Scanning Electron Microscopy (CCSEM) in order to assess the origins of these metals. Four street dusts from Lanzhou were submitted for CCSEM analysis. The analysis was configured to capture data from only the heavier element particles in the dusts. A variety of heavy metal-bearing particles were observed, namely: Pb-, W-, Cu-, Ni-, Cr-, and Zn-bearing. In addition, the metal-bearing particles presented different morphological forms. Different proportions of the specific metal-bearing particle types were found in each of the street dusts. By combining the composition and morphology information produced from the study, researchers can potentially lead to the origins of the contaminants. Subsequent study of additional dusts should provide further insights.

Study of Band Broadening Using Flow Injection Analysis and Electrospray Ionization Mass Spectrometry

Hui Fan

Faculty Mentors: Kevin A. Schug

Poster # 35

Group Names: Carlos A. Serrano

Electrospray ionization mass spectrometry (ESI-MS) has become a valuable tool in determining host-guest binding constants. Host-guest interactions can be visualized in the gas phase through ESI-MS. Recently our group has advanced these measurements into a more high throughput realm by incorporating on-line band broadening (BB) techniques. The purpose of this study was to optimize experimental parameters, such as flow rate, concentration of the sample, and loop size, which affect the shape of the BB curve, in order to provide a better quantitative determination of concentration distribution for the host, the guest and the host-guest complex. The BB was studied using flow injection analysis (FIA). Three model analytes, tetramethylammonium acetate (TMAA), tetraethylammonium acetate (TEAA) and tetrabutylammonium acetate (TBAA) were injected into a carrier stream of 50/50 methanol/water where the sample zone disperses into the carrier solution and the BB occurred. Data collected from the MS detector placed downstream were processed using Excel solver and in-house software programs by nonlinear least squares minimization procedures with the aid of modified Gaussian and polynomial-modified Gaussian functions.
Treatising Neural Disorders: A Smart Brain-Machine-Brain Interface (BMBI)

Aydin Farajidavar

Faculty Mentors: Dr. J. C. Chiao, Dr. Yuan B. Peng

Session: Red River, 3:40p

Group Names: Christopher E. Hagains

Deep brain stimulation has revolutionized the treatment of many neural disorders, such as depression, epilepsy, pain, and Alzheimer. Physician implants an electrode in a specific site that delivers electrical pulses (doses) to the patient’s nervous system. In order to make the stimulation effective, dose specifications has to be modified continuously and manually. Currently, no system exists that can automatically adjust the stimulation; hence, patients still suffer from inconvenience and low efficacy. This deficiency is due to the lack of a system that can detect neural signals, feed into an electronic device and feed back to the brain in a closed loop in real-time. Brain-machine interface (BMI) techniques have been used to acquire signals from the brain to control prosthetic limbs. We are developing a system that can acquire information from the nervous system, process them electronically, and deliver the essential stimulation back to the nervous system whenever necessary. The information flows from the brain and get backs to the brain via a machine, it is called “brain-machine-brain interface”. The system, can deliver optimal treatment to the patients as desired by the doctors. A prototype of such a smart BMBI system has been developed in our laboratory and examined successfully in-vivo for the pain management purpose. The BMBI system acquires neural signals wirelessly and in real-time, transmits the data to a computer for processing the neural signals. Once pains detected, our wireless system delivers the most suitable dose to inhibit the pain. The results showed significant pain reduction and real-time optimization.

Relationship of Reading Networks in the Brain to Reading Skills

Emily Farris

Faculty Mentors: Timothy Odegard

Session: Palo Pinto, 9:00a

A distributed network of brain regions is engaged when reading. Typically developing readers engage frontal and posterior left hemisphere brain regions. In contrast, individuals with dyslexia often exhibit over-activation in the left frontal areas as well as activations in right inferior frontal regions not observed in typically developing readers. The present study investigated the activation of brain regions while performing a basic phonics task and comparable control task in fifteen children diagnosed with developmental dyslexia and fifteen age and gender-matched non-impaired readers. Children completed this reading task in an MR scanner prior to the children with dyslexia beginning a multi-sensory reading intervention. A network of brain regions including the left and right inferior frontal lobes, and left superior temporal lobe demonstrated greater activation during simple letter-decoding events than tone-symbol events (i.e., the control task). Activation in these regions was related to children’s reading skills at the time of scanning. Specifically, activation was related to measures of phonological awareness and decoding. Children’s reading skills were reassessed following one year of participation in the reading intervention for children with dyslexia, or one year of regular schooling for the non-impaired readers. The relationship between these later reading skills and the previously measured activation of the reading network in the brain was also investigated.
A New Generation of Latinos: The Impact of Gentrification on Latino Families in East Dallas

Stephanie Fenniri

Faculty Mentors: Dr. Maria Martinez-Cosio

Session: Guadalupe, 1:40p

This research explores the views of Latino homeowners on the impending gentrification of their neighborhood in the Southwest region of the United States. It also investigates public opinion of Latinos, specifically Latino immigrants. The targeted neighborhood is in an area of Dallas experiencing rapid commercial development and residential transformation. Latino (mostly Spanish-speaking) homeowners' experiences are analyzed through an interdisciplinary approach. Previous studies on Latinos and gentrification focus on major East Coast cities. There is not a significant amount of research about Latino displacement in the Southwest, despite U.S. Census data showing Latinos as the fastest growing minority group in the U.S. According to Kennedy and Leonard (2001), indigenous residents of inner cities are dually displaced by gentrification because they lose both their homes and any potential opportunities presented by neighborhood change. Interviews were conducted with 15 Latino families in Lower Greenville, an older neighborhood in Dallas, Texas. The Findings indicate that Latino homeowners have a strong sense of place, supporting Logan & Molotch's (1987) use versus exchange value concepts. Results also indicate that the Latino immigrant community shows signs of increased middle-class status and related aspirations. Despite the changes taking place in the community, Latino homeowners in the study area were adamant about staying in their homes and their strategies for resisting gentrification are analyzed. Policy recommendations include developing a formula for limiting the percentage of a gentrifying neighborhood available to developers by creating a process that integrates a community's cultural characteristics into the new developments.

"Firmness Tempered with Moderation": John Dickinson's Position on Independence, 1774-1776

Jessica Ferguson

Faculty Mentors: Dr. Narrett

Session: Palo Pinto, 10:40a

The life and career of John Dickinson oscillated between continental hero and continental outcast. Achieving fame during the protests against the Stamp Act and Townshend Acts, Dickinson's reputation was such that other figures respected his opinions on independence. Dickinson was not simply a conservative afraid of breaking away from the England; he was a prudent, cautious man who did not believe the colonies were ready to become one united nation. He considered the timing of revolution as important as motivating the public and winning battles. While fully supporting defensive measures, Dickinson did not vote for independence because he wanted reconciliation to remain an option and he feared the unity of the colonies would not last without a strong central government. Dickinson’s mantra involved preparation for defense, prudence, and efforts at reconciliation. Dickinson stayed the course of his beliefs while the members of the Continental Congress became more radical and pushed for independence.
A Comparative Study of Physical and Chemical Properties of Dahlia Nanohorns and Powdered Activated Carbon

Roja Haritha Gangupomu

Faculty Mentors: Melanie Sattler, David Ramirez

Poster # 21

Air pollution remains an important and international issue, with 150 US regions still exceeding National Ambient Air Quality Standards, and over a billion people globally breathing unhealthy air daily. Nanoadsorbents hold promise for improving air pollution control systems. Because of their high-energy binding sites, nanoadsorbents can enhance adsorption of pollutants, particularly for hazardous pollutants difficult to control using conventional sorbents. In particular, Dahlia nanohorns (NHs, 2-4 nm tube diameter, 30-50 nm long) are carbon tubes made of a single-graphene sheet with coning caps (20% cone angle) resembling a horn. Dahlia NHs self-assemble as spherical aggregates resembling a dahlia flower with aggregate diameter of 80-100 nm. Due to this unique structure, NHs have the potential to adsorb more gas molecules compared to other kind of nanoadsorbents. The objective of this study is to characterize thermally-treated Dahlia NHs and compare their physical and chemical properties with same properties of commercially available powdered activated carbon (PAC). NHs was thermally treated at 600°C, 700°C, and 800°C for 60 min using steam in a tube furnace. This study will report physical and chemical properties of Dahlia NHs and PAC including morphology, Brunauer, Emmett and Teller-nitrogen surface area, micro and meso pore volume, pore size distribution, and chemical elemental composition. These properties are important to assess novel materials and develop unique air pollution control devices.

Determining Allowed and Forbidden Frequencies for Photonic Crystals and a Numerical Implementation

Ernesto Garcia III

Faculty Mentors: Professor Tuncay Aktosun

Session: Concho, 2:00p

Group Names: Ezgihan Baydar, Antonio Lopez

Photonic crystals are dielectric, periodic nanostructures exhibiting the interesting behavior that light can propagate in the crystal at some frequencies (allowed frequencies) whereas it cannot even penetrate the crystal at other frequencies (forbidden frequencies). Our goal is to determine the frequency spectrum of a layered photonic crystal and implement a practical numerical procedure to determine all the allowed and forbidden frequency bands when the periodic index of refraction is known. Using a piecewise-constant approximation for the refractive index of a single cell of the crystal, we explicitly evaluate the corresponding allowed and forbidden frequency bands. By letting the number of pieces in the approximation become very large, we are able to determine the frequency spectrum accurately for any one-dimensional photonic crystal and provide a practical numerical implementation via the mathematics software Mathematica. The frequency spectrum is readily and quickly evaluated by feeding the refractive index to our Mathematica program.
Estimating Percent Body Fat in Disabled Individuals with Spinal Cord Injury: A Pilot Study

Rebecca Garner

Faculty Mentors: Dr. Judy R. Wilson

Session: San Jacinto, 3:40p

Group Names: Dr. Judy R. Wilson, Dr. Abu Yilla, Dr. Mark Ricard, Brad Heddins, Dr. Barry McKeown

Accurate and simple to administer field methods that currently exist tend to underestimate values when used to determine percent body fat (%BF) in individuals with spinal cord injury (SCI). The purpose of this study was to evaluate the accuracy of three methods of measuring body composition as compared to total body dual-energy x-ray absorptiometry (DEXA) scan. Ten male college students, in the Department of Kinesiology and/or members of the collegiate wheelchair basketball team, participated in the study. Five of the participants were disabled athletes with SCI and five participants were physically active, non-disabled students. Of the ten participants, six completed all four of the body composition measures. Both forced vital capacity (FVC), via a flow volume test, and residual volume (RV), via nitrogen washout, were obtained for use in estimating %BF as determined by underwater weighing. The %BF values obtained from the HW using the Siri and Brozek equations had the highest correlation to the DEXA (r=.916). The results of the %BF as measured by the Bod Pod also showed a high correlation (r=.867). Although the SKF method showed a high correlation with the DEXA, (r=.798), it is evident that, with more participants, this method would severely under-predict %BF in the disabled group. In addition, the predicted DEXA from HWSM had a significant relationship (DEXA = 1.342* HWSM -4.795, R2 = .938, SEE = 3.108). These findings suggest that HW and Bod Pod are accurate methods of estimating %BF in both disabled and non-disabled individuals as compared to DEXA.

Rapid Metabolic Imaging of Brain Cancer

Sairam Geethanath

Faculty Mentors: Vikram D. Kodibagkar

Session: San Saba, 3:00p

Group Names: Hyeonman Baek, Aditya Patel, Changho Choi, Vikram D. Kodibagkar

The significance of understanding the underpinning metabolic activity in breast, prostate and brain cancer has been well established. Magnetic resonance spectroscopic imaging (MRSI) is a non-invasive technique capable of providing specific information about the spatial distribution of metabolites present in the human body. Its ability to quantify therapy and aid in prognosis has been well documented. However, the major disadvantage is the long acquisition time, which increases patient discomfort and likelihood of early termination of the study along with increased cost. Therefore there is a strong need for reducing the acquisition time to enable this powerful technology to be more routinely used in the clinic. An ideal solution to this problem would be to be able to reconstruct the MRSI data with as few acquisition data as possible. Compressive sensing has been shown to be able to reconstruct data with high fidelity from highly undersampled acquisition data. This study involves implementation and validation of such reconstruction methods on compressively sensed 1H MRSI data to enable application of this technique in the clinical setting. The application of compressed sensing to 1H MRSI of in vivo normal and cancerous human brain data has been performed for the first time. Our results indicate a potential to reduce acquisition times by 80% thus potentially decreasing the time spent by the patient in the scanner in addition to decreasing cost. The promising results have encouraged us to extend the application of this technique to breast and prostate cancer MRSI.
A Novel Framework for Data Dissemination in Wireless Sensor Networks

Giacomo Ghidini

Faculty Mentors: Dr. Sajal K. Das

Session: Palo Pinto, 10:00a

Group Names: Prof. Cristina M. Pinotti (Visiting scholar from University of Perugia, Italy)

A wireless sensor network (WSN) consists of a large number of small devices that can sense the physical world, process sensed data, and wirelessly communicate them to a base station via multi-hop paths. WSNs have wide applications such as environment monitoring and control, security (target detection), and health care (monitoring vital signs). Wireless sensor nodes have severe resource limitations (e.g., CPU, memory, energy). To save energy and enhance network lifetime, each sensor follows a sleepawake schedule called duty-cycle. Since wireless sensor nodes might not be physically accessible, sensors can be managed by transmitting software updates and data to them over the wireless network. This work proposes a novel framework to disseminate data to deployed sensors in a duty-cycle WSN. In our novel approach, data are first distributed to a small subset of sensors, which in turn relay them to neighbors with overlapping awake schedules, eventually igniting a chain effect across schedules and further disseminating the data. Rigorous analysis using results from coupon collector's problem and Chernoff bounds yields an accurate probabilistic model to derive the expected number of neighbors of a sensor and their schedules. We also derive the relationship between sensor density and the probability of data dissemination to all sensors, leading to an adaptive protocol to achieve desired performance. Experimental results presented in our paper at the IEEE International Workshop on Sensor Networks and Systems for Pervasive Computing (PerSeNS) 2010 validate our model in that data are distributed to almost all sensors across all schedules.

Mathematics of Ultrasound Tomography

Rim Gouia

Faculty Mentors: Dr. Gaik Ambartsoumian

Session: Palo Pinto, 8:40a

Group Names: Dr. Tuncay Aktosun(UTA) Dr. Gaik Ambartsoumian(UTA) Dr. Matthew Lewis(UT Southwestern Medical Center)

Along with improved treatments, the use of mammographic screening for the early detection of breast cancer has been a key factor in the reduction of breast cancer mortality since 1990. Although, mammography is now a widely accepted screening modality for breast cancer, its limitations and side effects have long been recognized. In fact, mammography does not detect all breast cancers and has a negative rate of at least 10%. Also it uses doses of ionizing radiation to examine the patience breast that can subsequently generate cancerous cells that if not eliminated by the body could lead to a cancer. Therefore, other breast imaging modalities have been intensely investigated. A research group composed of multiple organizations and across disciplines is currently working on improving the ultrasound imaging resolution in order to develop a non-ionizing and cost efficient method for microcalcification detection in breast phantoms. The aim of my oral presentation is to describe the mathematical challenges of this endeavor and present briefly the raising field of ultrasound tomography. This is one of the many newly explored fields of inverse problems that flourished with the increase of computing capabilities made available in the recent years.
Knowledge-based Strategies can Improve the Memories of Younger and Older Adults

Laura Gresens

Faculty Mentors: Timothy N. Odegard

Poster # 8

Group Names: Charise J. Johnson, Crystal M. Cooper

Past research has observed older adults to have intact item memory, yet have impaired source memory relative to younger adults. The current experiments were intended to investigate the tendency of younger and older adults to use knowledge acquired during encoding to guide source memory judgments at test and whether or not older adults can use this new knowledge to improve their source memory performance. To test this, participants studied a list of words with each word belonging to one of four categories. Each category, and the words chosen for that category, were assigned to a corner of the computer screen which contained one of four mathematical probability structures, 100%, 75%, 50%, and 25%, reflecting how many exemplars from a given category was to be presented in it. Both older and younger adults learned and later used the probability structure to guide source memory judgments. Additionally, Experiment 1 observed that dividing the attention of younger adults hindered their ability to do this. Experiment 2 found that the implementation of this new knowledge appears to be automatic considering that requiring younger adults to respond quickly did not hinder their ability to infer a word’s source based on the probability structure. These results replicate past research that has found younger and older adults to use existing knowledge to improve source memory judgments and has extended it to newly acquired knowledge.

Tangible Social Support Moderates the Relationship between Resilience and Academic Stress

Jessica Grimm

Faculty Mentors: Angela Liegey Dougall

Poster # 61

College is a time when major life stressors may occur, such as social, academic, interpersonal, intrapersonal, and financial problems. Past research has shown social support to be a protective factor against stress and a moderator of the relationship between trait resilience and stress. More specifically, tangible social support has predicted completion time and dropout rates, such that students with more tangible support had lower college completion time rates and lower dropout rates. Because social support, resilience, and stress were interrelated, it was hypothesized that lower resilience levels would predict higher levels of academic stress differentially based on the amount of social support that was available. Data were collected from 97 male and 263 female undergraduate students (mean age = 20.16). A moderated multiple regression analysis was run in order to test the hypothesis with the predictor being resilience, the outcome variable being academic stress, and the moderator being tangible social support. As predicted, high resilience/high social support resulted in the lowest stress, low resilience/low social support resulted in the highest stress, and high resilience/low social support and low resilience/high social support resulted in moderate stress. These findings are beneficial for future resilience and stress management interventions directed toward college populations. Future research should focus more on tangible social support, possibly on enabling students to better identify financial resources such as scholarship and grant opportunities.
Monitoring Tissue Response to Hyperbaric Oxygen Intervention using 1H MRI

Praveen Gulaka

Faculty Mentors: Vikram D. Kodibagkar

Session: Guadalupe, 8:40a

Group Names: Edmond Richer

Hypoxia or low tissue oxygen tension (pO2) has been shown to promote the malignant progression of cancer cells, induce genes promoting angiogenesis, and reduce the efficacy of photodynamic and radiotherapies. To improve therapeutic efficacy, efforts have concentrated on eliminating the hypoxic state of tumors by the use of normobaric oxygen (NBO) or hyperbaric oxygen (HBO) breathing. Nuclear Magnetic Resonance (NMR) based oximetry relies on the linear dependence of spin lattice relaxation rate (R1) on pO2 of exogenously administered reporter molecules like Hexafluorobenzene (HFB-using 19F MRI) and Hexamethyldisiloxane (HMDSO-using 1H MRI). Our previous research demonstrated PISTOL (Proton Imaging of Siloxanes to map Tissue Oxygenation Levels) as an oximetry technique to quantitatively measure tissue oxygen tension. We now present data demonstrating the use of HMDSO based nanoemulsions for mapping tissue oxygenation using PISTOL technique in response to hyperbaric oxygen challenge following intra tissue injection. 1-way ANOVA followed by Dunnett’s multiple comparison test found significant increase in pO2 values during NBO (178.5 ± 55 torr) and HBO (437± 97 torr) interventions when compared to initial baseline pO2 (49.7 ± 10 torr) and no significant differences while animals breathed air in between interventions. In conclusion, we measured dynamic changes in tissue oxygenation, showing the feasibility for use of these nanoemulsions as pO2 nanoprobes for systemic delivery. Our results suggest that quantitative 1H MR oximetry by PISTOL technique to monitor tissue/tumor hypoxia response to interventions may help to identify tumors that can be successfully reoxygenated and, thus, sensitized for various therapies.

Effects of Spinal Nerve Ligation on Cutaneous Blood Flow in Rats

Christopher Hagains

Faculty Mentors: Yuan B Peng

Poster # 23

Group Names: Paula Huntington, Arun Senapati, Hilary Wilson, Perry Fuchs, Hanli Liu, Yuan Peng

Cutaneous blood flow (CBF) can be affected by primary afferent fibers (PAFs) and sympathetic nerves. Spinal nerve ligation (SNL) alters many aspects of peripheral and spinal physiology. It causes a neuroma proximal to ligation that produces ectopic firing to increase the nociceptive signals into the spinal cord and trigger dorsal root reflexes (DRR), which in turn increases CBF. The goal of this study was to determine the affects of L5 SNL on CBF. It was hypothesized that SNL would increase CBF in both hindpaws. Twenty-one rats were used in this experiment. Fifteen rats had a tight ligation in the left L5 spinal nerve. Seven days following nerve ligation, Laser Doppler Imaging was used to measure CBF in the rats’ hindpaws before and after laminectomy. Then, SNL rats were split into 2 groups and CBF measurement was conducted either ipsilaterally or contralaterally for baseline, responses to GABA, and electrical stimulation applied to the left L5 dorsal root entry zone. An ANOVA followed by post-hocs revealed: 1) the contralateral (non-ligated) paws had significantly more CBF before laminectomy; 2) after laminectomy, CBF was greater for both paws of SNL rats compared to non-SNL rats, and the contralateral increased significantly more than the ipsilateral in SNL rats; 3) application of GABA significantly increased CBF in the contralateral paw compared to baseline; 4) electrical stimulation elicited a significant increase of CBF compared to baseline in the ligated paw, whereas a significant increase was observed only in the image following electrical stimulation in the contralateral paw.
Saturation Effects in a Microchannel Plate Photomultiplier Tube

Ryan Hall

Faculty Mentors: Dr. Andrew Brandt

Session: Concho, 1:40p

Group Names: Ian Howley, Mason MacPhail, Swapnil Baral

My research project is studying the high rate response for a detector to be used at the Large Hadron Collider (LHC) in Geneva, Switzerland. The light generated by a proton passing through the quartz detector is converted to an electrical signal by a photomultiplier tube (PMT). We have used a pulsed laser to simulate the light expected from the detector, allowing us to evaluate the performance of the Burle Planacon Microchannel Plate PMT (MCP-PMT). In actual experimental conditions, we expect a maximum rate of 10 MHz, so it is imperative that the equipment be able to function adequately at this high rate. At high rate, the output signal is decreased—an effect known as saturation. In this presentation, I will discuss our experimental setup, the physical causes of current saturation, and our results to date. I will also mention suggested improvements to the equipment that will be considered for a new generation of MCP-PMTs for various fast timing detectors, as well as in solar-cell applications.

Hemodynamic Responses to Innocuous and Noxious Stimulations in Rat Primary Somatosensory Cortex and the Spinal Cord

Jiwei He

Faculty Mentors: Hanli Liu, Yuan Bo Peng

Session: San Jacinto, 3:20p

Group Names: Sweta Narvenkar

The nearby vascular structures surrounding neurons (e.g. arteriola, venula, and capillaries) play a critical role of maintaining a routine cell functioning. This relation is termed neurovascular coupling. The vascular activity can be quantitatively measured by various parameters, such as regional blood flow velocity, blood volume ([HbT]), oxy- ([HbO]), deoxyhemoglobin ([Hb]) concentrations, and oxygen saturation rate (SO2). Functional brain imaging technologies, such as fMRI, PET, CT, are using either blood flow or an indirect method to measure oxygen consumption level. There is unclear how these multiple hemodynamic parameters contribute to the nature of neurovascular coupling. In our study, we used a novel optical method, near infrared needle probe, to measure absolute regional [HbO], [Hb], and SO2 simultaneously in rat primary somatosensory cortex (S1) and the spinal cord (n = 10), by introducing graded mechanical and electrical stimuli (e.g., ranging from non-painful to painful). Results showed a typical increase in [HbO] with a concomitant decrease in [Hb] in the ipsilateral spinal cord in response to both noxious and innocuous stimuli. This pattern was also found in the contralateral S1 in response to electrical stimuli. An increase in SO2 was concurrent with the [HbO] and [Hb] changes in the spinal cord and S1. The magnitude of SO2 increase was positively related to the intensity of stimulation in the spinal cord, but not in the S1. In conclusion, the neurovascular coupling tended to depend on regions of the nervous system and type of stimuli. NIR technique can be used to detect neuronal activity.
Repeated Horizontal Transfer of a DNA Transposon in Squamates

Sharon Hernandez

Faculty Mentors: Cedric Feschotte

Poster # 9

Group Names: Clement Gilbert

The term “horizontal transfer (HT)” refers to the transfer of genetic material between two reproductively isolated organisms. HT is thought to occur rarely in eukaryotes compared to vertical inheritance, the transmission of DNA from parent to offspring. A recent study based on bioinformatic analyses of whole genome sequences reported evidence that a family of DNA transposons, called SPACE INVADERS or SPIN, independently invaded horizontally the genome of seven distantly related tetrapod species including 5 mammals, one frog and one lizard. Here we set out to investigate more in depth the distribution of SPIN in reptiles using PCR/sequencing on a large number of species representing most of the diversity of squamates (lizards and snakes). Surprisingly, we found that SPIN is present in most of the species tested (35 Out of 57 species). Sequence analyses revealed a very high level of nucleotide similarity between widely divergent species with for example >96% identity between Heloderma horridum and Sceloporus adleri which diverged more than 170 million years ago. We were able to show that the different SPIN sequences are not under functional constraint and therefore that the high similarity between them cannot be explained by sequence conservation since the divergence of the different taxa. This and other sequence characteristics strongly suggest that SPIN has independently invaded the genome of at least 20 squamate lineages via horizontal transfer. Interestingly, in addition to America and Africa, the geographic distribution of the taxa included in this study extends the spread of SPIN HT to Asia and Oceania, showing that the SPIN “pandemic” was seemingly worldwide. A question that remains to answer is whether or not the different SPIN HTs occurred simultaneously on every continent, which will be addressed by estimating the timeframe of the SPIN amplification in the different taxa.

ZoneTrust: Fast Zone-Based Node Compromise Detection and Revocation in Sensor Networks Using Sequential Analysis

Jun-Won. Ho

Faculty Mentors: Sajal K. Das, Matthew Wright

Session: Concho, 10:20a

Due to the unattended nature of wireless sensor networks, an adversary can physically capture and compromise sensor nodes and then mount a variety of attacks with these compromised nodes. To minimize the damage incurred by compromised nodes, the system should detect and revoke them as soon as possible. To meet this need, we propose a zone-based node compromise detection and revocation scheme in sensor networks. The main idea of the proposed scheme is to use the sequential hypothesis testing to detect suspect regions in which compromised nodes are likely placed. In these suspect regions, the network operator performs software attestation against sensor nodes, leading to the detection and revocation of the compromised nodes. Through analysis and simulation, we show that the proposed scheme provides effective and robust node compromise detection and revocation capability with little overhead.
US Poets Laureate and Digital Poetic Literacy

Toni M. Holland

Faculty Mentors: Tim Morris

Session: San Saba, 2:20p

My dissertation is entitled “US Poets Laureate to the Library of Congress: A Literary and Cultural History.” One chapter focuses on ways in which national poets engage in presenting their work to the public. Many have consigned their poems to be translated into digital presentation. Poetry comes from an oral tradition; the printing press created a visual tradition. Trends out of these two traditions created sound and concrete (visual) poetics. Presenting poems through digital media is a hybrid-poetic form, creating new ways in which to appreciate poems. The program Poetry Everywhere—sponsored in part by the Public Broadcasting Service—is one example of an emergent presentation of poetry. Poetry Everywhere has filmed poets giving readings or has had poems illustrated; the poems are aired between PBS programming. The significance of this hybrid is the layering of former traditions of poetry: the poet's voice is preserved, which allows for future study of poetic color (American speech performance); oftentimes text is written across the visual field, preserving the concrete tradition of poetry; and illustrated poems create additional layers of meaning as some visual cues are not from the poet's written work, but from the creator who illustrated the poem. This multi-modal presentation of poems is forming a new literacy for poetry. This new literacy opens up different methods of interpretation because of the concurrence of different poetic traditions; this new literacy opens up possibilities for interdisciplinary research between English and film scholars; and this new literacy opens up possibilities for students to interpret poems through digital illustration in addition to the literary essay.

Touchless Interactive Art in the Personal Computer

Collin Hover

Faculty Mentors: Seiji Ikeda

Session: San Saba, 1:00p

Exploration of human-to-machine interaction will be presented through the context of art. A case study of a touchless, gesture-based system using only consumer-level technology/software and a “zero-dollar” budget will be used to demonstrate possibilities in motion interpretation and interaction. Ideas for expanded use of this system in other fields may be discussed as well. Presentation and Plan: The audience will be encouraged to use this system to explore new ways to interact with each other, their environment, and the system itself during the entirety of the presentation. The audience members will be asked to create movement in front of a web cam and see their video reflection interact live with objects on the projection. The technology is using only a Mac laptop with the built in web cam and Adobe Flash; which is distinct from other touchless interaction in both cost and availability, where custom software and equipment are necessary. The unique prospects of the system make it realistic, affordable and immediately available. The possibilities stretch out from creative fields to gaming to physical rehabilitation to educational formats. The system benefit removes the stigma of such technology reserved only to the elite or high budget institutions and eliminates the typical waiting time for it to be implemented.
Sensitivity of Joule Heating to the Solar Wind Velocity

Yanshi Huang

Faculty Mentors: Yue Deng

Session: Red River, 8:40a

The importance of solar wind condition to the magnetosphere and its energy input into thermosphere-ionosphere system has been realized. However, the energy transfer process through the solar wind, magnetosphere and ionosphere is still not clear. In this proposed study we will investigate Joule heating, one primary energy deposition method from magnetosphere and solar wind. Specifically, data of 2005 and 2006 from AMIE will be analyzed to show the existence of 7-day and 9-day periodic oscillations in Joule heating. WHI (Whole Heliosphere Interval, 08080-08107) will be studied in detail to examine the variation of the magnetospheric energy inputs caused by solar wind change and the consequence in the ionosphere-thermosphere. To understand the physical mechanism, we will also examine the sensitivity of Joule heating to the solar wind velocity in three different types of models AMIE, LFM and Weimer [2005]. The results from this study will advance our understanding of the energy transfer process from solar wind into magnetosphere and ionosphere-thermosphere, and also will shed light on the capability of the community to simulate the ionosphere-thermosphere variations caused by the solar wind velocity, which is one of the biggest concerns of the space weather.

Understanding the Physiology of Blood Oxygen Saturation on Simulated Sleep Apnea

Swathi Iyer

Faculty Mentors: Dr. Khosrow Behbehani

Poster # 36

Group Names: Al-abed, Mohammad; Alex, Raichel; Altuwaijri, Essam Ahmad; Bashaboyina, Aditya; Bhave, Gauri Suresh;

More than 18 million of the people in US suffer from obstructive sleep apnea (OSA) and approximately 10 million of them remain undiagnosed. OSA can cause high risk of diabetes, cardiac problems, high blood pressure and strokes. Our research involves understanding the physiology of the oxygen saturation of the blood during sleep apnea. To study the effect of this, simulated sleep apnea was performed. Pulse oximeter (Nellcor N 600 Oximax) with a forehead sensor was used to collect data from 15 healthy subjects (aged 29±5). To mimic severity of the sleep apnea, two protocols were designed. Five breath holds were performed in each protocol. In the first protocol subjects were asked to exhale completely followed by breath holding for as long as possible. The duration of rest time between two consecutive breath hold was one and half minute. The second protocol was the same except that the duration of rest time now was 30 seconds. The dependency of the oxygen saturation on sitting and supine position was also studied. Results include the comparison of 1) Normal breathing and breath hold for each posture between the subjects and across the subjects. 2) Breath hold between sitting and supine position for the same subject.
Curious Couplets in a Jarai Poems

Joshua Jensen

Faculty Mentors: Colleen Fitzgerald

Session: Guadalupe, 10:20a

This paper sheds light on the nature of couplets in folk verse, looking at formulaic sayings in Jarai, a minority language of Southeast Asia. I argue here that a single poetic line can be a member of two couplets. This argument is grounded in the rhyme structure of Jarai formulaic sayings, where each line has a backward- and a forward-linking rhyme. My analysis of Jarai couplet structure adds to our understanding of how binarity can be instantiated in metrical forms, while adding a novel study of a Non-Western meter to the literature. The Jarai formulaic saying is a poem of two or more 2- to 4-beat lines. The total line-count can be even or odd. Adjacent lines are linked by hook-rhymes: the final word in one line rhymes with a non-final word in the next. This study is based on a corpus of about 100 lines of formulaic sayings, 80 of which were collected by the author from speakers of Jarai, with the remainder coming from Dournes (1976). In my analysis, each line in the Jarai formulaic saying (other than the first and last) belongs to two overlapping couplets. This analysis employs a binary couplet requirement to derive a poem having an odd number of lines. The Jarai facts—the odd-numbered lines and interwoven hook-rhymes—present a challenge to traditional binary analyses of folk verse. This approach resolves that challenge, while also adding data to the literature in linguistic approaches to meter.

Sustainability with a Shipping Container

Ashley Johnson

Faculty Mentors: Rebecca Boles

Poster # 7

My project incorporates sustainable design into an interior design project. The project is a design studio catering to a very small firm. Students create their own programmatic elements based on the individual needs of their project. The requirements are to use four shipping containers (8'x20'x10' each) in a structurally sound configuration, and any material subtracted must be reused for another purpose on site. Any added architectural element has to be supported from the original shipping containers; no additional vertical structure is allowed. There is a requirement to investigate and incorporate other sustainable strategies such as photo-voltaic energy production, water harvesting, and geo-thermal supported heating and cooling. Every Interior Design project is based on a conceptual idea. My concept is, "A shipping container is a unique and independent object. In this studio, each of the four containers will be distinguishable from the rest, providing an interior and exterior understanding of the project. No interior walls will be used unless where privacy in necessary. Dropped ceilings occur in the transitional spaces between containers, and where there is an exterior wall, not part of the original container, glazing will be used. These techniques illustrate my premise for this project while at the same time incorporating sustainable concepts." My graphic poster will illustrate this design with photos, graphic renderings, and line drawings. Sustainable research concerning the previously specified strategies, at the end of paragraph one, will be included as well.
Exhibiting Sex: Aids and Sex Education in India

Kendra A. Jones

Faculty Mentors: Ritu G. Khanduri

Session: Concho, 10:00a

In 2002, the Antarang Museum was opened in the “red light” district of Mumbai as India’s first and only sex museum, with a mission to raise awareness about sex and the consequences of unsafe sexual behavior and to teach preventative methods to counter the spread of sexually transmitted diseases (STDs) such as HIV/AIDS in India. With my research project, I will examine and evaluate the effectiveness of the Antarang Museum in meeting its institutional goal of raising an understanding and awareness about sex and the consequences of unsafe sexual practices amongst the Mumbai community, further, proving the relevance of and the need for the existence of such a museum within Indian society.

Guidance of Receiver Aircraft to Rendezvous with Tanker in the Presence of Wind

Jane-Wit Kampoon

Faculty Mentors: Dr. Atilla Dogan

Session: Red River, 10:20a

This work addresses the problem of aircraft rendezvous in the presence of prevailing wind for automated aerial refueling operations. A modified point-parallel rendezvous procedure is defined. The tanker aircraft performs a racetrack maneuver along a pre-specified refueling orbit. The receiver aircraft enters the refueling area through a fixed point and flies along the refueling line that is aligned with one of the straight legs of the race track. A virtual target is used to define the trajectory of the refueling orbit. A nonlinear guidance algorithm is used to generate yaw rate commands for the tanker to follow the virtual target. An existing low-level controller is employed for the tanker to track the commanded yaw rate as well as commanded airspeed and altitude. The receiver aircraft has a controller to track a commanded trajectory relative to a moving reference frame. The concept of virtual tanker is introduced to synchronize the motion of the receiver along the refueling line with the tanker flying on the refueling orbit. The guidance algorithms are implemented in a high fidelity simulation environment that includes the 6-DOF nonlinear models of both aircraft with terms for the dynamics effect of wind as well as the low-level controllers. The simulation of the refueling rendezvous in a realistic prevailing wind demonstrates that the nonlinear guidance logic coupled with the low-level controller is capable of flying the tanker along the refueling orbit. Further, the guidance algorithm based on the virtual tanker concept along with the trajectory tracking controller can successfully achieve the rendezvous of the receiver with the tanker even in the presence of strong time-varying prevailing wind.
An Improved Model to Predict Gas Generation from Bioreactor Landfills

Richa Karanjekar

Faculty Mentors: Melanie Sattler, Sahadat Hossain

Poster # 59

Group Names: Arpita Gandhi

It is important to accurately estimate the emissions of methane (CH$_4$) and carbon dioxide (CO$_2$) in a landfill, for quantifying its greenhouse gas (GHG) emissions and power generation potential. The two most commonly used models for predicting landfill gas emissions are the U.S. Environmental Protection Agency (EPA) Landfill Gas Generation Model (LandGEM) and the Intergovernmental Panel on Climate Change (IPCC) methane generation model. The goal of this research is to improve our ability to estimate landfill gas production with any anticipated waste composition, moisture, and temperature. $k$ values will be determined for waste components (food, paper, yard, and textile), and for combined waste, in a laboratory scale simulated landfill. Regression equations will be developed to predict CH$_4$ and CO$_2$ $k$ values for waste components as functions of moisture content. The relationship of temperature with $k$ will be determined for combined waste by installing simulated landfills at 70°F, 85°F, and 100°F, as representative ambient temperatures. An attempt will be made to closely represent field conditions in the laboratory. The best way of combining $k$ values from individual waste components in a multi-phase model will be determined by comparing the calculated $k$ values with the $k$ values for the combined waste. Laboratory results will be compared with CH$_4$ and CO$_2$ generation rates from landfill, using LandGEM and IPCC’s model. This information will enable better estimation of the rate constant $k$ for waste components. Overall, this study will develop a model which will enable us to more accurately quantify landfill gas production rates.

Identification of Abnormal Motor Cortex Activation Patterns in Children with Cerebral Palsy by Functional near Infrared Spectroscopy

Bilal Khan

Faculty Mentors: George Alexandrakis

Poster # 51

Group Names: Fenghua Tian, Khosrow Behbehani, Mario Romero-Ortega, Mauricio R. Delgado, Nancy Clegg, Linsley Smith, Dahlia Reid, Hanli Liu, and George Alexandrakis

We demonstrate the utility of functional near infrared spectroscopy (fNIRS) as a tool for physicians to study cortical plasticity in children with cerebral palsy (CP). Motor cortex activation patterns were studied in five healthy children and five children with CP (8.4 ± 2.3 years old in both groups) performing a finger tapping protocol. Spatial (Distance from Center and Area Difference) and temporal (Duration and Time-to-Peak) image metrics are proposed as potential biomarkers for differentiating abnormal cortical activation in children with CP from healthy pediatric controls. In addition, a similarity image analysis concept is presented that unveils areas which have similar activation patterns as that of the maximum activation area, but are not discernible by visual inspection of standard activation images. Metrics derived from the images presenting areas of similarity are shown to be sensitive identifiers of abnormal activation patterns in children with CP. Importantly, the proposed similarity concept and related metrics may be applicable to other studies for the identification of cortical activation patterns by fNIRS.
A Comparative Study on Personal Pronouns in Written Discourse: English he/she and Korean ku ‘he’

Sok-Hun Kim

Faculty Mentors: Dr. Laurel Smith Stvan

The purpose of this paper is to study grammatical gender of personal pronouns in English and Korean with a corpus-based analysis, and suggest a preferable approach to it. Pronouns function as discourse anaphora, where an anaphor refers back to an antecedent in a given discourse with different pro-forms. Pronouns interact with grammatical gender, distinguished from biological/social notion of natural gender. Grammatical gender is a (pro)noun class system in the grammar, where nouns are divided by gender: masculine, feminine, and neuter. This is declension, the inflection of (pro)nouns indicating gender features. Grammatical gender declension of 3rd person singular pronouns is distinguished between two languages. Personal pronouns in English are referred to with gender agreement, whereas those in Korean are not. In English, a male and a female referent are referred to by the masculine pronoun he and the feminine pronoun she, respectively. However, in Korean, both male and female referents are referred to by the masculine pronoun ku ‘he’ instead of the corresponding pronoun ku ‘he’ and kunye ‘she’, respectively. This phenomenon has been discussed within four theories: the topic continuity (Givón 1983), the hierarchy (Fox 1987), the cognitive model (Gundel et al. 1993), and the pragmatic theory (Grice 1975; Horn 1984, Levinson 2000). It is argued that the last theory have a preference over the first three models in terms of typological perspective. It is suggested that the gender-specific pronoun in English is explained by Levinson’s hearer-oriented Q-principle, while the gender-neutral pronoun in Korean by Levinson’s metalinguistic M-principle.

Multi-Ligand Platelet Mimicking Biodegradable Nanoparticles for Targeted Drug Delivery after Cardio-Intervention: An In Vitro Assessment

Soujanya Kona

Faculty Mentors: Kytai T. Nguyen

Group Names: Jing-Fei Dong

Nanoparticle drug delivery to the vasculature after cardiovascular interventions such as angioplasty requires effective particle adherence onto the arterial walls under physiological flow conditions. This study aims to improve the adhesion, targeting and uptake of nanoparticles to inflamed endothelial cells (ECs) under dynamic flow conditions using multi-ligand (GPIb-TAT) functional nanoparticles. Our approach mimics the natural binding ability of platelets to injured ECs through GPIb bound to P-selectin expressed on inflamed ECs. Our hypothesis is that these multi-ligand nanoparticles would show an increased accumulation at the injured site since GPIb specially binds to both P-selectin expressed on damaged ECs and vWF deposited on injured subendothelium while the cell penetrating peptide TAT would facilitate higher uptake of these nanoparticles into the targeted cells. To test this hypothesis, we formulated fluorescent drug loaded poly (D, L-lactic-co-glycolic acid) (PLGA)-polyethylene glycol (PEG) nanoparticles (PLGA-PEG NPs) using double emulsion method and carbodiimide chemistry. Cellular uptake studies in ECs analyzed using fluorescent and protein assays indicated an optimal incubation time of one hour and optimal dose of 400 µg/ml. Biocompatibility results showed these particles to be minimally toxic to ECs. We further conjugated GPIbα and TAT via carbodiimide and avidin-biotin chemistry to PLGA-PEG NPs. Static and dynamic uptake studies of control, GPIb-conjugated and GPIb-TAT conjugated PLGA-PEG NPs on activated ECs exhibited an increased adhesion and uptake of GPIb-TAT conjugated PLGA-PEG NPs compared to control nanoparticles. Future studies would involve in vitro flow studies and in vivo studies of these novel platelet-mimicking, endothelial-targeting biodegradable nanoparticles. This work was supported in part by the grant from National Institute of Health (NIH).
Defeating Regularity-based Detection in Active Covert Timing Channels

Kush Kothari

Faculty Mentors: Dr. Matthew Wright

Session: Guadalupe, 10:40a

A covert timing channel is a hidden communication channel based on network timing that an attacker uses to sneak secrets out of a secure system. The exploration of the design of advanced covert timing channels is important to understand them and defend against their use. A promising technique for detecting covert timing channels focuses on using entropy-based tests. This method is able to reliably detect known covert timing channels by using a combination of entropy (EN) and conditional entropy (CE) to detect anomalies in shape and regularity, respectively. In this work, we show that such detection techniques can be defeated by a channel that intelligently manipulates the statistical properties used as detection metrics. We show a theoretical model that can be used by an attacker to modify statistics of generated traffic. In particular, we modify the regularity of network traffic to evade detection based on CE, which uses a tree structure to track how often different patterns are used in the traffic. We try to mimic the tree generated by legitimate traffic to remove regularity from the covert traffic. In simulation, we validate this model and demonstrate that the proposed channel greatly reduces the effectiveness of current detection techniques. As our model is complex, we are only able to mimic three levels of the tree. However, we were able to reduce the detection rate from 100% to 22% while keeping throughput high. By sending additional packets designed to mimic users more precisely, we can trade off throughput for stealth and reduce the detection rate to 0%.

A Reinforcement Learning-based Model in Understanding Intruder Behavior in Autonomous Sensor Networks

Pranav Krishnamoorthy

Faculty Mentors: Matt Wright

Session: Palo Pinto, 1:20p

A priority task for homeland security is the coverage of large spans of open border that cannot be continuously physically monitored for intrusion. Low-cost monitoring solutions based on wireless sensor networks have been identified as an effective means to perform perimeter monitoring. A scattering of an ad-hoc sensor network over a border could be used to perform surveillance over a large area with relatively little human intervention. Determining the effectiveness of such an autonomous network in detecting and thwarting an intrusion is a difficult task. We propose a model for an intelligent attacker that attempts to find a detection-free path in a region with sparse sensing coverage. In particular, we apply reinforcement learning (RL) a machine learning algorithm. RL technique that is well suited for scenarios in which specifying and finding an optimal solution is difficult. By using RL, our attacker can easily adapt to new scenarios by translating constraints into rewards. We compared our RL-based technique to a reasonable heuristic in simulation. Our results suggest that our RL-based attacker model is significantly more effective, and therefore more realistic, than the heuristic approach.
Comparing Effect of Capsaicin and Formalin on Bilateral Cutaneous Blood Perfusion

Ailing Li

Faculty Mentors: Yuan B Peng

Poster # 38

Group Names: Ji-Wei He, Christopher E Hagains, Yuan B Peng

Increase in blood perfusion is an important physiological index for neurogenic inflammation. Dorsal root reflex (DRR) is one of the mechanisms that promote this reaction, through release of neuropeptides (Substance P and Calcitonin gene-related peptide) from the primary afferent terminals. It was hypothesized that capsaicin or formalin injection on one paw would generate action potentials that propagated to the spinal cord and evoked DRRs on both ipsilateral and contralateral paws to increase cutaneous blood perfusion. To test this hypothesis, the blood perfusion of both hindpaws was recorded by Laser Doppler Imager after injection of 50 µl capsaicin, or formalin, or saline in the plantar skin of rats in three groups (N=5/group). Raw data and increased percentage were analyzed. Our results indicated: 1) Blood perfusion of ipsilateral paw increased significantly after capsaicin and formalin injection which lasted to the end of recording (p<.05). But for saline group, the increase was observed only at last few images. 2) Blood perfusion of contralateral side increased gradually after injection of capsaicin, or formalin, or saline, with significant increase at last few images (p<.05). 3) Significant differences were observed between two sides for all post-injection in formalin group, but a few post-injection images after saline injection. However, no difference was observed in capsaicin group. Conclusion: Capsaicin and formalin injection induced significant neurogenic inflammation ipsilaterally and contralaterally. Formalin induced much higher effect ipsilaterally. Saline as control may have slight effect on the blood perfusion towards the end as compared with capsaicin and formalin effect.

Protecting Link Privacy in Publishing Online Social Networks

Na Li

Faculty Mentors: Prof. Sajal K. Das, Prof. Nan Zhang, Prof. Gautam Das

Session: Red River, 1:40p

Many online social network services (e.g., FaceBook, LinkedIn) regularly republish their social network data to offer further utility to research and advertising. Such a republishing process incurs significant privacy concerns, especially over sensitive linkage that many users may not be willing to disclose. Existing work focused on anonymizing user identities in a published network under topology-equipped attack models, assuming that link privacy is automatically guaranteed once user identities are anonymized. However, in reality, some users can still be identified from an identity-anonymized network by an attacker holding more than topology-based knowledge (e.g., the nationality and/or affiliation of a user). Therefore, we intend to preserve the link-privacy associated with a user, who can even be identified from the published network. To address this issue, we introduce the L-diversity privacy model to formally define the problem of link-privacy protection in republishing social networks. Our L-diversity model guarantees no attacker can infer a sensitive link with confidence greater than 1/L. We devise two algorithms to achieve the L-diversity guarantee – one only inserts nodes/edges while the other only removes them – for the purpose of maintaining as many topology properties of the original social network as possible to reduce the utility loss for research and advertising. We conduct extensive experiments on both synthetic and real-world social networks to demonstrate that except the achievement of link-privacy preservation, the utility loss caused by manipulating the original graph is acceptable according to the number of edge/node changed as well as some empirical metrics (e.g., degree or distance distribution).
Feasibility Study of Volumetric diffuse optical tomography in Small Animal Using CCD-camera-based Imaging System

Zi-Jing Lin

Faculty Mentors: Hanli Liu

Poster # 57

Group Names: Haijing Niu, Hanli Liu

There has been a highly increasing attention in using diffuse optical tomography (DOT) to image the small animals since animal models allow to be developed for a variety of human diseases. Also, DOT can provide non-invasive detection and reconstruct the optical properties inside biological tissue. This can be interesting in detecting, for example, a cancer tumor. Fiber-based and CCD-based DOT techniques are well-developed and widely performed both in human and animal studies. In terms of the fiber-based DOT system, it takes advantages on flexible use in both human and animal studies, and also lower shot noise, that is, higher sensitivity since fibers are directly contacted on the tissue. However, CCD-based DOT system is suitable for animal study because of less complexity and also inexpensive comparing with the fiber-based DOT system. Nevertheless, although DOT can be a tool to detect the non-invasively, the accuracy of the deep location is the major issue since near infrared (NIR) light is highly diffused in biological tissues, the photons drop off quickly with increasing of depth, resulting the measurement sensitivity of DOT in deep tissue significantly lower than that in superficial tissue. Although a variety of efforts have been made by different groups to accurately image the deep object, a significant improvement in depth localization is still big challenge. In this study, we present our recent development on a depth compensation algorithm (DCA) to improve the accuracy in measuring depth and also report the phantom experimental results by using non-contact CCD-camera-based DOT combined with DCA.

The Effects of Different Bicycle Pedals on Performance

Andres Lopez

Faculty Mentors: Judy Wilson, Brad Heddins

Session: Neches, 2:00p

The sport of cycling has evolved greatly since the invention of the bicycle. One major component affecting cycling performance is the bicycle pedal which connects the rider to the bicycle at the foot-pedal interaction. Purpose: To determine differences in cycling performance between a toe-clip pedal (TC) and a clip-less pedal (CL) during a submaximal exercise session as determined from heart rate (HR), rate of perceived exertion (RPE), relative oxygen consumption (RVO2), Gross Efficiency (GE), and Net Efficiency (NE). Methods: Five triathletes completed two submaximal cycling tests (20 min) at 65% Heart Rate Reserve, pedaling at 90 RPM. In the last 5 minutes of the exercise test, data on HR, RVO2, RPE, GE, and NE were collected. Results: No significant differences were found. The mean HR measured was 150.4 ± 0.04 bpm and 154.4 ± 10.06 bpm for TC and CL, respectively (p=0.49). The average RVO2 was 37.2 ± 8.48 mL/kg/min (TC) and 34.56 ± 4.57 mL/kg/min (CL; p=0.40). For the average RPE, the results indicated a mean of 14.6 ± 2.03 (TC) and 13.44 ± 4.57 (CL; p=0.23). In addition, there were no significant differences in the means for GE, between TC and CL (15.41 ± 1.53 % and 15.51 ± 3.04, respectively; p=0.90) or for NE, between TC and CL (17.17 ± 1.40 % and 17.4 ± 3.51 %, respectively; p=0.83). Conclusion: The results of this study indicated that, for experienced cyclists, there was no significant difference in performance measures between a toe-clip pedal and a clip-less pedal.
Neuron-Specific Growth Factors Segregate Regenerative Axonal Types in the Injured PNS

Parisa Lotfi

Faculty Mentors: Dr Mario Romero

Session: San Saba, 1:20p

Group Names: K. Garde, E. Bengali, M. Romero

After peripheral nerve injury functional axonal regeneration is partial, presumably due to pathfinding errors during target reinnervation. Modality-specific neurons are mixed in peripheral nerves and segregate prior to exiting the nerve and innervating specific target tissues. This process is highly regulated during development via molecular cues including signals provided by the neurotrophins. Here we evaluated the possibility that type-specific neurotrophins can be used to preferentially entice and segregate the growth of defined axonal populations from transected peripheral nerves. Segregation of mixed sensory fibers from dorsal root ganglion neurons was evaluated in vitro by compartmentalized diffusion delivery of nerve growth factor (NGF) and neurotrophin-3 (NT-3), to preferentially entice the growth of TrkA+ nociceptive and TrkC+ proprioceptive subsets of sensory neurons; respectively. The preferential growth of two distinctive subpopulations of sensory neurons towards the specific neurotrophin source was demonstrated by morphology and immunocytochemistry. Using immunolabeling of CGRP and N-52 axon markers we were able to demonstrate an approximately 10% increase in pain fibers and 30% increase in large diameter axons inside the conduit arms filled with NGF and NT-3, respectively. These results were similar to those obtained in conduits where the Y arms were connected distally to the tibial and sural nerve; respectively. Our results indicate that neuron-type specific guidance molecules can be used to direct the regenerative path of injured peripheral nerves, which in turn might assist in achieving proper target reinnervation after peripheral nerve injury.

Time Smearing Due to Variable Pulse Heights in a Photomultiplier Tube

Mason Macphail

Faculty Mentors: Dr., Andrew, Brandt

Session: Neches, 2:20p

Group Names: Ian Howley, Ryan Hall, Larry Lim, Swapnil Baral

My research project is studying the timing response for a detector to be used at the Large Hadron Collider (LHC) in Geneva, Switzerland. The light generated by a proton passing through the quartz detector is converted to an electrical signal by a photomultiplier tube (PMT). We have been using a pulsed laser to simulate the light expected from the detector allowing us to evaluate the performance of the Burle Planacon Microchannel-Plate PMT (MCP-PMT). A well known feature of PMT’s is that the size of the electrical signal can vary, and due to this one can get an error in the time measurement introduced solely by the variable pulse height. I will discuss this effect, called “time walk,” and show the size of the effect and how we correct for it.
De-anonymizing User Relationships using the Combined Statistical Disclosure Attack

Nayantara Mallesh

Faculty Mentors: Asst. Prof. Matthew Wright

Session: Red River, 2:20p

Group Names: Dr. Matthew Wright

The Statistical Disclosure Attacks (SDA) is a well-studied form of intersection attacks on mix based systems. Most of studies of the SDA to date are based on eavesdropping of traffic sent and received by users via the mix system. Prior work on the Two-Sided SDA showed that traffic from receivers to senders, along with models of user replying behavior, could also be used by the attacker to enhance the SDA. In this paper, we investigate the effect of eavesdropping on all messages sent and received by all users and not just the target user. The information collected is used to perform the SDA and produce profiles of all users. The attacker then goes a step further and combines individual user profiles in a specific way in order to target a single user. The combined information when used to target a single user, enables the attacker to reach his goal in much shorter time. We tested our attack using a threshold mix and a binomial mix system and show that the combined attack outperforms both traditional and Two-sided SDA. Earlier work showed that cover traffic can be used to mitigate SDA. Our simulation results show that combined SDA continues to be effective in the presence of moderate cover traffic and much higher amounts of cover traffic must be sent in order to slow combined SDA.

The "Vandergriff Years" and the Growth of Arlington

Christopher Mangus

Faculty Mentors: Barton Weiss

Session: Neches, 3:40p

With a land area of approximately one hundred square miles and a population of roughly 360,000 residents, Arlington, Texas ranks as the largest city in the United States without a public transportation system. In a classic example of suburban sprawl, city leaders past and present aggressively annexed and re-zoned available land until Arlington's physical growth was halted by its neighbors' borders. And while the city's density is still rather low at 3,600 residents per square mile, census estimates predict it will be home to 600,000 residents by 2030, a future density of 6,000 people per square mile. Arlington was planned, for better or worse, to be a sprawling, low-density and entertainment-minded suburb on the model of Anaheim, California. Under the leadership of the legendary Mayor Tom Vandergriff, who served from 1951-1977, Arlington expanded rapidly through aggressive annexation and re-zoning of land. From a population of less than 8,000 in 1950, Arlington grew to a city of about 160,000 residents by 1977. At no time in his twenty-seven years as Mayor did Vandergriff and other city leaders create solutions to meet its transit needs. Besides the growing public transit needs of Arlington in the last century, this paper examines the 2002 city transit election, focusing on the circumstances and factors in its failures. Contributing to the proposal's defeat were certain vocal anti-transit groups (SMART, CTA, ACV) the lack of a proposed rail provision, public fears of subsidizing such a venture, especially after the demise of a city funded Marine Park, the pressing need for street repair, and other factors.
Modeling Targeted Drug Delivery in a Vascular Network

Manohara Mariyappa

Faculty Mentors: Dr. Yaling Liu

Poster # 26

Group Names: Jifu Tan, Samar Shah

Nanoparticle drug delivery poses a new frontier in medical technology with the advantages of targeted drug delivery and patient specific design. The delivery efficiency of nanoparticles is controlled by physical properties of the particles such as size, shape, ligand density as well as external environmental conditions such as flow rate and blood vessel diameter. Proper drug dosage choice relies on the determination of the attachment and detachment rates of the nanoparticles on the active site. A few particulate and continuum models have been developed to study the adhesion dynamics of spherical and non spherical particles which assume specific attachment and detachment rates. However there has not been any study that links the particulate level nanoparticle size and shape information to the system level bounded particle concentration. A hybrid particle binding dynamics and continuum convection-diffusion-reaction model is presented to study the effect of shear flow rate and particle size on binding efficiency. The bounded nanoparticle concentration from the simulation results are then compared with the experimental results in flow chamber. The shear rate and particle size studies on nanoparticle bound density shows that higher shear rates leads to thinner depletion layer near the receptor coated surface thus accelerating the binding process. However higher shear rate also tends to wash away the particles thus increasing the detachment rates. The coupled particulate and continuum model provides a better understanding of the complex nanoparticle drug delivery process and a design tool to improve nanoparticle targeted delivery efficacy.

The Ripper: From Hell

Jesus Martinez

Faculty Mentors: Professor James Yakas, Dr. Michael Varner

Session: Guadalupe, 1:00p

Group Names: Jonathan Carroll, Zach Hollis, Ryan Miller, Sarah Bigler, Stephanie Whitehead

This piece depicts a musical journey into one of London’s darkest historical events. It is based on one of the five murders committed by Jack the Ripper and his most infamous letter to the police entitled, “From Hell.” The composition is written for a string quartet, piano, percussion, and small choir. The piece will portray three main acts: the murder, the surgery, and the writing of the letter. Act I, the murder, is an organic piece written to feature a variety of tonal harmonies and harsh melodic sequences to recreate the overall environment of the murder. Act II, the surgery, features the percussion section, with string accompaniment, meant to convey the imagery of the surgery through different percussive sounds and timbral changes through a variety of different pitched instruments, both wooden and metallic. Act III, the letter, features a small choir with string, piano, and percussion accompaniment. The soprano voice sings the text using strong inflections to portray Jack the Rippers insanity through a strangely joyous tune filled with modal mixtures and deceptive resolutions. The text was directly taken from the letter itself. The entire production is a variety of dissonant melodies and abstract harmonic patterns that allow the listener to experience the gruesome murder. This original composition will give the listener a deeper understanding of how dark and frightening this time was for many people in London.
Disney's Animal Kingdom: The Real, Surreal, and the Imagined

Kandice McCloud

Faculty Mentors: Stacy Alaimo

Session: Concho, 2:20p

The portrayal and anthropomorphism of animals in Disney films has resulted in a profound influence among audiences, leading to an objective, detached view of animals instead of a factual and accurate view of animals in their own environment with their own habitual behavior. The real animals in The Jungle Book and Bambi, the surreal animals in Dumbo, and the imagined animals in Alice in Wonderland exhibit the different ways in which The Walt Disney Company has put animals on parade in order to advance a statement or specific anthropocentric view of an animal in a narrative and animative context. While animal imagery is not unique to Disney alone, the aforementioned films subscribe to several of the central animal imagery concerns, including the symbolism of the animal and cultural desire for such symbolism, and the consequences of presenting animal imagery, particularly exaggerated and false imagery, to the public.

Sustainability and Endangered Languages

Lori McCain

Faculty Mentors: Colleen Fitzgerald

Session: Red River, 10:40a

Linguists estimate that more than half of the world's languages will become extinct in the next 100 years (Hale et. al. 1992, Harrison 2007). With the loss of language follows a loss of knowledge particular to a local culture. These languages hold information about the world's resources, from which all humanity can benefit. This presentation examines traditional models of research in the field and how those might be implemented within a weekend trip to a language community. I am currently in a graduate service-learning class that focuses on Language Endangerment in which we will take trips to the Chickasaw and Comanche Nations in February and March 2010. Rice (2006) details 3 models of language research: 1)Ethical Research which focuses on minimizing damage to the community, 2)Advocacy Research in which the researcher also takes up the cause of the community, and 3)Empowering Research in which the researcher and community work together as partners. Czaykowska-Higgins (2009) further details Community Based Language Research(CBLR) where linguists and community members are experts whose work on the language is equally valued. This presentation evaluates how a service learning experience might lead to a CBLR model for future research. Furthermore, can a research model, such as CBLR, be adapted for a shorter, weekend trip effectively? Beyond evaluating current research models against a weekend service-learning trip, I also explore how this experience may be transferred to my undergraduate introductory linguistics course to develop a more culturally aware, service-oriented and tolerant classroom.
Effects of two surfactants on the formation and properties of nanoparticles

Jyothi. Menon

Faculty Mentors: Kytai T. Nguyen

Poster # 54

Group Names: Soujanya Kona Foram R. Desai

Nanotechnology including nanoparticles for controlled drug delivery has been identified by the National Cancer Institute as an emerging field that can make significant contributions to diagnosing and treating various cancers. Poly(lactic-co-glycolic acid) (PLGA) nanoparticles are currently used for targeted drug delivery to cancer cells. This research studies the effects of two common surfactants - polyvinyl alcohol (PVA) and pluronic 127 (PF-127) in targeting cancer and overcoming multi-drug resistance. Our hypothesis is that nanoparticles (NPs) made using PF-127 would show better results in overcoming multi-drug resistance in comparison to PLGA NPs formulated using PVA, due to chemo sensitization. To test our hypothesis, we formulated PLGA NPs with these two surfactants using a standard precipitation technique. We characterized them for size and surface charge using dynamic light scattering (DLS) and examined their morphology with transmission electron microscopy (TEM). DLS showed that PF-127 nanoparticles had a size of 162.9 nm which was larger than the PVA nanoparticles (142.8 nm). PF-127 NPs exhibited a surface charge of -15.77mV while PVA NPs had a surface charge of -10.83mV. Both types of NPs showed good stability in phosphate buffer saline and fetal bovine serum. Future work would include drug release studies from the NPs, cellular uptake and drug resistance studies of the NPs in prostate cancer cells as well as attaching targeting ligands to these NPs and studying both their abilities to deliver drugs to cancer cells locally and to overcome multi-drug resistance within cancer cells.

"Friends of Our Fathers": Praying Indian Patriots and American-Native Relations in Revolutionary-Era New England

Kallie Kosc

Faculty Mentors: Dr. David Narrett

Session: San Jacinto, 1:40p

In traditional surveys of American history, the Native American communities of southern New England are rarely considered consequential after the close of King Phillip’s War in 1676. Of these native peoples, the Christian Indians who lived in Anglicized "Praying Towns" are given the least attention of all, particularly during the Revolutionary War era. While these Christian Indians were small in number and lost considerable autonomy throughout the eighteenth century, nearly all Christian Indian males volunteered for the patriot cause. My research investigates the effects of the war on Christian Indian communities and future American-Native relations. Due to their participation in the Revolutionary War, Christian Indians saw the further disintegration of their communities and, at war's end, sought compensation for their substantial losses. Christian Indians petitioned the government with a rhetoric that mirrored the new American republican ideology. Despite appealing to American patriotism, the government was not forthcoming in showing their gratitude. Americans’ general mistreatment of Christian Indians, as well as the subsequent removal of Christian Indian veterans from their land, provided political fodder for the growing Northwest Indian alliance in their campaign against the new United States. New England Praying Towns were small and seemingly inconsequential, but their participation in the Revolution had significant and far-reaching reverberations not only for their communities, but for American-Native relations on the frontier and into the nineteenth century.
Streamlined Method for Quantitation of Bisphenol-A in Saliva using Liquid Chromatography – Tandem Mass Spectrometry

Aaron Morgan

Faculty Mentors: Kevin A. Schug

Poster # 2

Group Names: Samuel H. Yang; Benjamin J. Figard; Kevin A. Schug

Plastic additives are added to endow desirable traits to plastics such as flexibility or hardness. Many of these plasticizers such as phthalates, parabens, and bisphenol-A (BPA) are known endocrine disruptors and have been shown to interfere with the endocrine system in animals. These endocrine disruptors are encountered in daily life and have been found in various products including polyvinyl chloride (PVC) plastic wraps, epoxy resins in cans, and cardboard or paper takeout food containers. Exposure to these plasticizers via food or other products is a source of public concern and recent media attention. In this study, a method was developed to measure the levels of BPA in whole saliva by high performance liquid chromatography mass spectrometry (HPLC-MS). BPA-containing saliva was prepared through a novel bulk derivatization procedure, which was fully optimized. A multiple-injection trap-and-elute chromatographic system was used to retain the smaller molecules (such as BPA) and remove the larger undesired molecules (e.g. proteins). Method validation indicated the method to be suitable for detecting as little as 19 pg of BPA in a sample of saliva. Finally, a saliva sample was taken after eating at a restaurant and analyzed for the presence of BPA using the established method.

Sex Differences in Cocaine Reward

Samara Morris-Bobzean

Faculty Mentors: Linda I. Perrotti

Session: Concho, 10:40a

Group Names: Torry S. Dennis, Brocke D. Addison, Linda I. Perrotti

Women account for nearly 40% of all cocaine addicts in America. Evidence suggests that women have an increased vulnerability to develop an addiction to cocaine than men as women transition from casual drug use to addiction more quickly and have higher rates of relapse. Recent studies have shown women and female rodents are more responsive to the stimuli that trigger relapse to former patterns of drug use than males. Interestingly, only a few studies have directly measured sex differences in such conditioned associations between drug stimuli and drug expectation. To this end, we subjected intact male and female Long Evans rats to an extended conditioned place preference (CPP) paradigm (acquisition test, extinction, and reinstatement test), for four doses of cocaine (0, 5, 15, 25mg/kg). Overall, our findings demonstrate that while there are no obvious effects of dose or sex on the magnitude of CPP initially acquired, females had significantly higher levels of reinstatement of extinguished preference in comparison to males. These results suggest that females more readily establish learned associations between drug administration and environmental cues. It is likely that the ability of the drug to cause the formation of such associations at optimal doses is due to hormonal mediation of dopamine signaling in reward-relevant regions of the brain. Studies are currently underway to elucidate the neural signaling mechanisms via which estrogen and dopamine mediate such behavioral output.
Cakes as Cultural Commentary

Janet Morrow

Faculty Mentors: Darryl Lauster

Poster # 45

I have created a series of sculptures in the format of cakes, but made of inedible materials about which we have ambivalent feelings. In these sculptures, I seek to open a dialog about certain aspects of our culture. For example, one cake is called, “Coming of Age,” and is made of Tampons. Another called, “Bravado,” is constructed of cigars. A third piece called, “Pharma-Cakes” consists of 23 plaster cupcakes, decorated with pills and capsules instead of candy sprinkles. These three pieces have been accepted for an exhibition called, “Examining Culture” at The Smithsonian International Gallery in Washington D.C. June – September 2010. The exhibition is part of the VSA Arts International Festival. VSA Arts is an organization for artists who have disabilities. I have received a Termini Grant to travel to Washington to present the pieces.

Biomaterial Implant Mediated Autologous Stem Cell Recruitment and Differentiation

Ashwin Nair

Faculty Mentors: Dr. Liping Tang

Poster # 39

Group Names: Parisa Lotfi, Dr. Jinhui Shen, Paul Thevenot, Cheng-Yu Ko, Dr. Liping Tang

A novel strategy has been developed wherein a biomaterial implant directs the recruitment and subsequent differentiation of autologous stem cells to a specific location in the body. Firstly, mesenchymal stem cells were found in aspirates recovered from subcutaneously implanted polymeric wound chambers. Importantly these cells could differentiate into an osteogenic lineage in vitro. Subsequently, the implantation of a microsphere suspension in the subcutaneous space of mice was found to prompt the recruitment of both hematopoietic and mesenchymal stem cells at the implantation sites. Since inflammatory cells peaked before stem cells, the results suggested that inflammation could play a role in stem cell recruitment. Indeed, we find that treatment with anti-inflammatory drug – dexamethasone – substantially reduced stem cell recruitment. In addition, using various microspheres with different surface chemistry, we found that there is a good relationship between inflammatory and stem cell numbers. This coupled with expression of several pro-inflammatory cytokines that have been implicated in stem cell recruitment further elucidates this link. Since the ultimate aim of such stem cell recruiting strategy is to differentiate them into a specific lineage locally, we used a PLLA scaffold loaded with osteogenic differentiation inducing factor BMP-2 and found indications of osteogenesis over a longer term (9 weeks). Such findings have tremendous implications from a regenerative tissue engineering perspective as such strategies can be applied to a wide range of clinically relevant applications.
Metabolic Markers of Hippocampal Dysfunction in Veterans with Gulf War Illness

Michael C. Natishyn

Faculty Mentors: Timothy Odegard

Session: Red River, 9:20a

Roughly 697,000 U.S. military personnel were deployed to the Persian Gulf during the first Gulf War. Of these individuals 26-32% suffer from chronic health problems that has been defined as Gulf War Illness (GWI). Service during the first Gulf War exposed troops to acetylcholinesterase (ACHE) inhibitors, such as DEET containing insecticides, organophosphate nerve agents (Sarin), and pyridostigmine bromide, which could be the cause of GWI. The long-term consequences of low dose exposure to these agents were not well understood at the time of the conflict. Subsequent animal research has demonstrated long-term negative consequences on the brain and behavior to result from low dose exposure to ACHE inhibitors. In addition, MR spectroscopy and single photon emission computed tomography (SPECT) studies conducted with Gulf War veterans (GWV) have identified brain dysfunction in ill-GWV. The present study was conducted to confirm the brain dysfunction identified in veterans with GWI using single voxel MR spectroscopy performed on the left and right hippocampus. Neuronal dysfunction was observed in the left hippocampus for those GWV identified as having GWI syndrome 2. In contrast, neuronal dysfunction was observed in the right hippocampus for those GWV identified as having GWI Syndrome 3. These data suggest exposure to ACHE inhibitors to have resulted in long term dysfunction of an important brain region for memory and learning in some ill-GWV. Additional research is needed to further characterize brain dysfunction in GWV in attempts to provide important information for diagnosis and treatment of GWI.

How Guidance on Goal Orientation, Mentoring Relationship Processes, and Outcomes can Effect Mentor-Protégé Relationships

Michael A. Neeper

Faculty Mentors: Shannon A. Scielzo, Ph.D.

Poster # 17

Group Names: Shannon A. Scielzo, Ph.D.

The current study examined the effects of preparatory training designed to elicit desired states of goal orientation (GO) on mentoring relationship processes and outcomes. Individuals either received GO training, or training designed to inform participants regarding computer-mediated communication (CMC). Seventy-two mentor/protégé dyads were assigned to participate in one of four conditions (i.e., GO mentor/protégé, CMC mentor/protégé, GO mentor/CMC protégé, CMC mentor/GO protégé). Results indicated that the training did not have a direct effect on behaviors; however, it did affect perceptions regarding what occurred during the relationship. Moreover, mentor and protégé state learning GO interacted to predict protégé post-program academic self-efficacy.
A Housing Crisis of Minds and Souls: An Examination of Allen Ginsberg’s “Howl”

Christi Nickels

Faculty Mentors: Dr. Stacy Alaimo

Session: Concho Room, 4:00p

Allen Ginsberg’s poem “Howl” pays homage to the mentally ill and indicts the American systems and traditions to blame for the collapse of brilliant minds. The work expresses the poet’s feelings of loss, both personal and generational, blames the United States for the downfall of outsiders’ minds, and conveys hope for a future in which everyone has a place. Through the use of close reading and careful interpretation of word usage and unique phraseology, this paper analyzes the overall intent of the poem. The work exposes the damage done to intellectuals and also defines the main cause of the damage, the mainstream society of America. In “Howl,” the poet takes a great deal of responsibility for his contemporaries. He demands that people outside of the intellectual circle become aware of the loss of great minds. In addition to his insistence for understanding, the speaker provides a safe haven for the individuals destroyed by conventional society. Within the lines of the poem, Ginsberg has created a new society in which the mad are welcomed and loved.

Towards Understanding Coronatine-dependent Suppression of Innate Immunity in Arabidopsis Guard Cells

Nisita Obulareddy

Faculty Mentors: Maeli Melotto

Session: Red River, 1:00p

Group Names: Shweta Panchal

Recent studies have shown that stomatal pores in the leaf epidermis close as a part of the plant innate immune response against bacterial invasion of plant tissues. Counteracting this response, the plant pathogenic bacteria *Pseudomonas syringae* pv. *tomato* strain DC3000 has evolved the virulence factor coronatine, an important strategy contributing to pathogenesis. The mode of action of coronatine in plant cells has beginning to be elucidated. Two components of the coronatine receptor complex have been identified, namely COI1 (the F-box subunit of E3 ligase) and JAZ (a repressor of jasmonic acid pathway) proteins, suggesting that coronatine acts in the plant by inducing the degradation of proteins and hijacking the jasmonic acid signaling pathway. However, an unanswered question is whether coronatine induce stomatal opening using the same molecular mechanism. Here, we report that among all JAZ genes, *JAZ1, JAZ2, JAZ3,* and *JAZ9* are induced in guard cells within 30 minutes of exposure to 60uM coronatine. In addition, coronatine-dependent binding of COI1 and these JAZ proteins has been demonstrated using yeast-two-hybrid system. We have developed single and multiple knock out plants for these genes. The phenotype of these plants and the biological significance of coronatine action in the guard cell will be further discussed.
Ecology of a Toxic Algal Species: Growth of *Prymnessium parvum* in Different Water Media

Andrew Palacios

Faculty Mentors: Dr. James Grover, Dr. Joan Reinhardt

Poster # 12

*Prymnessium parvum* (golden alga) forms harmful algal blooms. The recent apparent increase in incidences of algal blooms is worldwide. Since its arrival in Texas in 1985, *P. parvum* has killed thousands of fish and has directly affected fishing and tourism around some of the major water reservoirs in Texas. This experiment provides a direct comparison of *P. parvum* growth in laboratory media versus growth in natural lake waters of Texas. Five sets of water media were compared in a 21-day time period: a standard artificial medium (ASW), unaltered lake water (U), lake water with added salt (+S), lake water with added salt and nutrients (+SN), and lake water with added nutrients (+N). Results showed that *P. parvum* grows equally well in ASW, Lake Granbury +SN, and Lake Waco +SN. While growth in neither water medium was significantly greater than in the others, the ASW still provided the highest cell density count after a 21-day time span. This study is important because *P. parvum* poses toxic threats to water resources in Texas. It is currently uncertain what causes these algae to "bloom" and release their toxins. Effective means to manage *P. parvum* and its negative impact have yet to be established.

Low Cost Microparticle Separator: CFD analysis and experimental validation

Deval Pandya

Faculty Mentors: Dr. Brain Dennis

Session: San Saba, 2:00p

Microparticle continuous separation is an important preparation and/or analysis step in various biological, biomedical and microchemical processes. This research presents design and CFD analysis of a new low cost and easy to manufacture Microparticle separator. It is an arrangement of microscale centrifugal fluid-only type of separator i.e. only geometry and hydrostatic forces separate particles on basis of its size and densities. A single unit is designed considering the parameters like ease in manufacturability, low cost and sufficient pressure drop. It consists of a cylindrical cyclone generator with no moving parts. Model is created in Pro-E, meshing is done in Pointwise and simulations as well as effect of inlet velocity on pressure drop is studied commercial finite volume code Fluent. Increase in inlet velocity increases collection efficiency but also increases pressure drop. Thus, a tradeoff for velocity and efficiency becomes necessary at some stage. A specific arrangement of 4 -7 numbers of single unit in parallel and series to give sufficient collection efficiency is proposed. Further experimental validations will be conducted. This separator will have low manufacturing cost, simple design and high mobility. It will be promising for various applications like fluid-fluid separation in biodiesel manufacturing and microchemical purification processes.
**Environmental temperature and virulence in marine bacteria**

**Jaundell Parker**

Faculty Mentors: Laura Mydlarz

Session: Neches, 3:20p

In recent years massive outbreaks of disease have devastated coral populations around the globe and a number of bacteria are known to be affiliated with coral disease. Temperature change plays a pivotal role in the way coral bacteria normally function. This research examined the affects of temperature on several different bacterial virulence factors; Bacterial growth, protease activity, bio-film production and anti-bacteria activity. This study investigated *Vibrio alginolyticus*, *Vibrio cambelli*, *Vibrio splendidys*, *Aeromonas trotai*, from a *Montastraea faveolata* infected with Caribbean yellow band disease. Testing was also conducted using *Serratia marcesens* (Pdl100); isolated from *Acropora palmata* infected with White pox disease. This study establishes that as temperature is increased, the virulence of all the bacterial strains increased. While the results from the allelopathic interactions and protease activity revealed no clear trends, the growth rates as well as the bio-film production were shown to be influenced by environmental temperature. These data support our hypothesis that as environmental temperature is increased the virulence of coral pathogens is amplified. Further investigation must be conducted to fully understand how thermal anomalies impact coral bacterial communities.

**In Field Conditions, Avian Predators Attack Blue Sections of a Potential Prey Item at a Higher Frequency than Black Sections: Empirical Evidence of an Underlying Premise of the Decoy Hypothesis.**

**Paul Pasichnyk**

Faculty Mentors: Charles M. Watson

Poster # 6

Group Names: Corey E. Roelke, Charles M. Watson

Worldwide, many lizards exhibit a suite of characters that include a black, longitudinally striped body and a blue tail. In North America, this phenotype is most commonly associated with the five-lined skinks (Genus *Plestiodon*) of the Southeastern United States. The utility of the blue tail has long been a subject of debate. It has been suggested that the primary use of this tail coloration is to serve as a decoy that steers predatory attacks away from vital areas and toward the less-vital tail. We placed 120 12cm cylindrical plasticine models (half black and half blue) in the field for 48 hours and recorded avian attack frequencies for each color. A chi-square analysis of the data shows that avian predators attack the blue half of at a significantly higher frequency than the black half. These findings lend support to the underlying premise of the decoy hypothesis, showing that avian predators will choose to attack blue-colored portions of a potential prey item over black-colored portions under field conditions.
A Defense of Poe's "The Philosophy of Composition"

Thomas Pickering

Faculty Mentors: Henderson, Desiree

Session: Concho, 1:00p

I enter into a debate surrounding Edgar Allen Poe's critical essay, "The Philosophy of Composition," in which Poe describes the process by which he created his most popular poem, "The Raven." I make the argument that the essay is a serious indicator of Poe's compositional process by addressing specific subtleties of language and placing it in the context of Poe's overall body of work. I then examine and refute the arguments of two major critics - Daniel Pahl and Leland Person - who hold the essay is another one of Poe's "hoaxes," or satirical works.

Jenna N. Pieczonka

The Synergistic Effect of Elevated Temperature and the Presence of Caribbean Yellow Band Disease Pathogens on Symbiotic Algae Growth

Faculty Mentor: Laura Mydlarz

Group Names: Elizabeth S. McGinty

Poster:

Recent global climate change has adversely affected shallow water ecosystems, specifically coral reefs. The subsequent rise in ocean temperatures interferes with the fundamental relationship between the coral animal and their intracellular symbiotic algae, known as zooxanthellae. The photosynthetic products of the zooxanthellae provide a high percentage of the corals' nutritional requirements. When exposed to external stressors like elevated temperature, the coral may expel their zooxanthellae, resulting in a condition known as coral bleaching. Bleached corals are compromised resulting in adverse consequences such as starvation and susceptibility to disease. Foreign pathogens may also infiltrate the coral tissue and directly afflict the zooxanthellae. An infectious disease suggested to be associated with zooxanthellae is the increasingly prevalent Caribbean Yellow Band Disease (CYBD). The present study investigated a possible correlation between zooxanthellae growth when exposed to elevated temperatures and the presence of CYBD strains. Zooxanthellae strains from clades A-D were grown in controlled water baths at an ambient temperature of 27 °C and elevated temperature of 32 °C. Random cultures were inoculated with seven strains of combined, freeze-dried CYBD. Studies suggest that different zooxanthellae clades exhibit characteristic levels of tolerance to environmental stressors. It was expected that clades A and D would exhibit a higher level of thermotolerance compared to clade C. However, there is limited information addressing cladal CYBD tolerance. These preliminary results will be discussed in the context of previous studies to determine if certain zooxanthellae clades are more resistant to climate change stressors and CYBD pathogens.
Design, Analysis and Fabrication of Sheet Metal Motorcycle Frame

Hardikkumar J. Prajapati

Faculty Mentors: Prof. Joshi From India

Session: San Jacinto, 2:20p

The motorcycles that are presently sold in the market all have a similar construction as far as their basic frames are concerned. Each and every motorcycle is composed of a diamond shaped frame constructed out of tubes bent and formed and then welded together. The loads on a motorcycle frame are in no way torsion but mostly bending, tensile and compressive. Due to tubular section and other extra part attached to it increases lots of weight so what i have done is Replacing the tubing with sheet metal of thickness 3mm, and taking a cross section of 75 mm where initially the Down tubes of the frame were located. The advantage of using sheet metal is that it can easily be cut into any shape for mass production using high tonnage presses and appropriate dies and punches. Then all that remains is welding appropriate parts together. According to this design, there is very little bodywork, but bodywork can easily be added to become an integral part of the frame (and not a separate part to be attached to it) just by adding an extra FORMING process and taking into account the dimensional changes to the initial blank for it. Advantages to use this frame are Strength is more than I will prove by static and dynamic analysis, Manufacturing is so easy that you can’t believe when I show the technique that I made, Light weight and No attachment for mounting extra body panel and amazing looks.

A cellular Automata Model of S. Epidermis-Neutrophil Interactions on the Surface of a Medically Implanted Device

Alicia Prieto Langarica

Faculty Mentors: Dr. Hristo Kojouharov

Session: Guadalupe, 9:00a

S. epidermidis infections on medically implanted devices are a common problem in modern medicine due to the abundance of the bacteria. Over 4 million people in the United States have long-term biomedical implants. Once inside the body, S. epidermidis gathers in communities called biofilms and become extremely hard to eradicate, causing the patient serious complications such as inflammation, thrombosis, infections and fibrosis, which have a direct effect on the stability of the implanted device. In this project we study different possible ways of optimizing the immune response in order to eliminate the bacteria covering the implant. We simulate Neutrophil-S. epidermidis interactions based on a cellular automata model to come up with the best possible mixture of Albumine and Fibronigen to cover the implant so that Neutrophils can be as effective as possible. The model also helps us determine the maximum amount of bacteria that can cover the implant initially if the infection wants to be contained.
Evidence for X-chromosomes Without Dosage Compensation

Eldon Prince

Faculty Mentors: Jeff Demuth

Group Names: Donna Kirkland, Jeff Demuth

Sex chromosomes have independently evolved in diverse eukaryotic taxa, resulting in either heterogametic males (male=XY, female=XX) or females (male=ZZ, female=ZW). Regardless of which sex is heterogametic, the evolution of differentiated sex chromosomes has two main consequences: the inability of sex chromosomes to pair during meiosis and unequal gene dose of the common sex chromosome (X or Z) between the sexes and relative to the autosomes. Several studies show that the inability of sex chromosomes to pair during meiosis is overcome by temporarily inactivating them. Further studies in mammals, the fruit fly and nematode reveal mechanisms for chromosome-wide transcriptional regulation of the common sex chromosome to overcome unequal gene dose. Although the specific mechanisms vary, these taxa exhibit equal gene expression levels of the common sex chromosome between the sexes and relative to the autosomes. Indeed, complete transcriptional compensation of unequal gene dose appeared to be the rule in sex chromosome evolution until recent studies in several ZW organisms revealed incomplete dosage compensation. Since mammals, the fly and nematode all have XY sex determination, to reconcile these data, it was proposed XY organisms require complete dosage compensation whereas ZW organisms do not. We report the first instance of incomplete dosage compensation in an organism with XY sex determination, the red flour beetle (Tribolium castaneum). This discovery invalidates prior thinking that all XY organisms require complete dosage compensation. In addition, our finding suggests differentiation of sex chromosomes may not be as constrained by unequal gene dose as previously thought.

This work was supported in part by the National Institutes of Health

Faster mapping for Jamming in Wireless Sensor Networks

Nabila Rahman

Faculty Mentors: Dr. Matthew Wright

Session: San Jacinto, 2:00p

Self-organized wireless sensor networks have tremendous potential for detecting intruders in secured areas and for monitoring international borders. However, an intruder can jam the sensors' wireless signals, thereby disabling communications in the network and preventing the sensors from reporting intrusions. Thus, it is critical to detect and map out regions that have been jammed so that the network operators can send help or best guess the location of the adversary. The state-of-the-art approach for mapping the jammed region is complex and requires many messages, which would quickly drain the energy of low-power sensor nodes that run on batteries. We propose a simple, flexible method for jammed area mapping that is designed to be both faster and more efficient than the prior technique. This protocol overcomes the problem of high overhead by applying randomization techniques instead of performing a complete mapping. Here nodes are being selected probabilistically to notify the base station. When the base station gets messages from the sensors, it starts to locate and map out the jammed areas based on this information. To evaluate our approach we developed a simulation of sensor network. There is an attacker who can place jamming sensors anywhere in the network. These sensors can jam the nodes around it up to a certain range, so the nodes inside that range cannot communicate with others. We experimented with different sizes of network with nodes of varied signal strengths. Our results show that this scheme is faster and approximates the actual jammed regions quite accurately.
A Flexible Architecture for Next Generation Network Convergence

Mayank Raj

Faculty Mentors: Sajal K. Das
Session: Palo Pinto, 3:40p


Legacy networks were mostly built to deliver voice, video and data services using their respective communication media. Recent technological advancements have created a plethora of heterogeneous service and access networks. This has led to the requirement for a converged and flexible next generation network (NGN) architecture wherein services can be created, deployed and managed dynamically over an all IP networks. Service and Network convergence are the two primary building blocks of next generation networks. Service convergence implies creation of a common transport framework for delivery of various services independent of the access media, such as voice or video over IP. Network convergence implies availability of the same set of services to the end user seamlessly across heterogeneous access media and network providers. After discussing various challenges associated with network convergence, like seamless session/call continuity, quality of service (QoS) provisioning, network discovery and seamless handover across heterogeneous networks, this work proposes various mechanisms to overcome such challenges. In particular, we propose a novel architectural framework for delivering and enabling end users access to a unified set of common services using a converged IP network. The architecture enables network and service convergence with minimal support from network operators while endowing the end user with a dynamic and flexible network environment. Through a test bed development and real experiments we demonstrate that the proof of concept of a flexible converged IP network environment that enables dynamic deployment and management of services in a home/enterprise environment by the end user.

Molecular Modeling of DNA Translocation in Bio-Functionalized Nanopores with Applications in Gene Sequencing

Abhijit Ramachandran

Faculty Mentors: Dr. Yaling Liu
Poster # 37
Group Names: Qingjiang Guo and Yang He

Solid-state nanopore based molecular analysis provides the potential to characterize and sequence DNA, based on the signature of the ionic current measured. A major challenge in using solid-state nanopores for DNA detection and sequencing is the molecular selectivity and sensitivity, and the control of DNA-nanopore interface. Presently, various approaches to modify nanopore surface properties and functionalized nanopores have been developed. However, the interaction between DNA and the bio-functionalized nanopores is still not well understood due to the small length scales of the DNA/nanopore and the dynamic nature of the translocation process. The aim of this poster is to understand the interaction between the DNA and chemically modified nanopore surfaces. The translocation process of a DNA is analyzed by probing the DNA-nanopore interaction mechanisms through full atomistic molecular dynamics and the DNA functionalized nanopore interaction mechanisms through coarse-grained molecular dynamics modeling. DNA translocation in nanopores coated with hairpin loop DNAs (HPL) and single stranded DNAs (ssDNAs) are compared. It is observed that a small effective pore diameter (EPD) provides a high confinement where the DNA translocation speed is dependent on the interaction potential, type, density of the coatings at voltages lower than 100mv/nm. Also, DNA is found to translocate in a ssDNA coated nanopore 900% faster when compared with the HPL coated nanopore mainly at a bias voltage of 0.01V, due to the less stiffness of the ssDNA as compared to the HPL. Such surface property-translocation dynamics relationship can be used for the optimal designs of future lab-on-chip molecular diagnostic devices.
Perception of Value Between Resources

Patrick Ramirez

Faculty Mentors: Daniel S. Levine

Poster # 46

A study was conducted using 54 participants to determine the relationship that emotions play in decision-making. This study specifically focused on the amount of risk a person may take when a choice is made for a situation that is emotionally charged versus a situation that is emotionally neutral. The goal of the study is important because decision-making research has traditionally treated all situations the same. For example, the assumption is that resources such as food, money or life, all possess the same value when predicting how a person may form a decision. To conduct this study, participants made repeated choices with feedback on two analogous computer simulations, one being monetary investments, the other a simulation designed to mimic social investing in the form of a pet. The results of the study showed a significant difference between the two types of investing which is not currently accounted for by decision-making theory. The results are believed to be attributed to the impact that emotions may play when value is assessed resulting in increases or decreases in risk taking.

Verrucomicrobia: A Model Phylum to Study the Effects of Deforestation on Microbial Diversity in the Amazon Forest

Kshitij Ranjan

Faculty Mentors: Jorge Rodrigues

Session: Red River, 9:00a

The Amazon rainforest is known for having a very high diversity of plants and animals. However, it is one of the least understood ecosystems regarding microbial diversity. Microorganisms are important for the ecological balance of any ecosystem and play important role in various biogeochemical cycles. As the Amazon rainforest undergoes rapid deforestation, loss of its biodiversity is expected. This research aims to determine the effects of deforestation on the soil microbial diversity of the Amazon forest. Toward this, we selected the phylum Verrucomicrobia as a model for observing changes in the microbial structure of rainforest soils. Samples were collected from a research site in the Eastern Amazon basis, Fazenda Nova Vida, State of Rondonia, Brazil. Three different treatments were considered during sampling: a primary forest, 25 year old pasture, and a secondary forest that was developed after the pasture has been abandoned. Total soil DNA was extracted and used for amplification of the gene 16S rRNA through PCR with specific primers targeting Verrucomicrobia. PCR amplicons were cloned and transformation was carried out into Escherichia coli. After screening, positive clones were sequenced and analysis of the 16S rRNA gene was performed. A total of 600 sequences has been obtained and their phylogenetic analysis is underway.
Characterization of Hexamethyldisiloxane (HMDSO) Nanoemulsion for 1H MR Oximetry

Ujjawal Rastogi

Faculty Mentors: Dr. Vikram Kodibagkar

Poster # 34

Group Names: Praveen Gulaka, Sairam Geethanath

Low oxygenation levels (hypoxia) lead to cellular dysfunction, damage and poor response to different therapeutic procedures. It has been identified that the oxygenation level (pO2) of tumor is a critical factor in the prognosis of cancer therapy. Thus, determination of oxygenation levels quantitatively, has become imperative for the treatment of cancer to be efficient. Hexamethyldisiloxane (HMDSO) has been found to be an efficient 1H MRI probe characterized by a linear dependence of spin lattice relaxation rate (R1) with respect to pO2. This probe is advantageous over 19F based probes for tissue oximetry as most of the clinical MR scanners are proton (1H) based. To facilitate systemic delivery of the reporter molecule (HMDSO), a nanoemulsion was prepared by sonification of 40% HMDSO along with 5% HS-15 and 55% PBS for 15 minutes with the sample placed in an ice bath. In vitro calibration studies were done by bubbling the nanoemulsion with various standard gases containing 0%, 5%, 10%, and 21% O2 (balance N2) at 37°C. A linear dependence of spin-lattice relaxation rate (R1) on oxygen tension was found and a linear fit to the data resulted in $R_1 = 0.119 + 0.0013*pO2$. Further we studied the effect of temperature on the calibration curve of this emulsion. These results and results of in vivo studies will be presented.

Modified Newtonian Dynamics and other Alternatives to the Theory of Dark Matter

Crystal Red Eagle

Faculty Mentors: Dr. Manfred Cuntz, Dr. Zdzislaw Musielak

Session: Guadalupe, 3:40p

An investigation on two different alternative theories to explain the proposed presence of the elusive Dark Matter is presented. Newton’s Second Law and the gravitational force are used while incorporating an experimental version of Modified Newtonian Dynamics (MOND). This is done using an acceleration scaled modification and an experimental length scaled modification using a specific form of the Yukawa potential. Both modifications are described and compared to the theory of dark matter. The main focus of the research performed for this study is based on mass calculations for the experimental Yukawa potential alternative to Dark Matter as compared to the classical equations for mass calculations which, by implication, include Dark Matter. Derivations of the classical and revised experimental length scaled equation for $M(R)$ are shown with explanations on important features. Four galaxies were chosen: NGC 1620, NGC 3145, NGC 4378, and NGC 7664 whose rotational curves, and therefore orbital speed at distances from the center, have been previously deduced by observations. Several data points were taken from the rotation curves and entered into the classical and revised Yukawa potential equations derived for $M(R)$ in order to compare the results with each other. When the results of $M(R)$ in the classical and experimental revised Yukawa potential equation data are compared, several conclusions are made. Some interesting and unexpected results are obtained. A brief mention of problems and strides are discussed for MOND and the revised Yukawa potential modification in order to layout the work that should be pursued in the future.
How Affective Dissonance Impacts Self-Reported Emotional Experience

Chelsea Roff

Faculty Mentors: Dr. Andrew Baum, Dr. Daniel Levine

Session: Guadalupe, 2:20p

Affective dissonance occurs when one’s emotional responses are inconsistent with other cognitive or emotional elements to which they are associated. Participants watched emotionally-evocative films clips paired with either affectively congruent or incongruent musical excerpts (e.g. positive movie paired with negative music). Subjective emotional states were assessed using the three sub-scales (valence, arousal, and dominance) of the Self-Assessment Manikin (SAM). We predicted that when film and musical excerpts were incongruent, participants would experience conflicting emotional responses. Thus, we hypothesized that the resulting affective dissonance would lead participants to report increased arousal, more negatively-valenced emotion, and less dominant feelings than when excerpts were congruent. Analyses of participants’ self-reported emotional responses did not confirm our hypotheses. A repeated-measures factorial ANOVA on participants’ SAM arousal ratings did not confirm our first hypothesis; there was no difference in SAM arousal ratings in congruent ($M = 4.41; SE = .33$) and incongruent conditions ($M = 4.95; SE = .29$), $F < 1$. Similarly, participants did not report more negatively-valenced emotion in incongruent ($M = 5.18; SE = .15$) than congruent conditions ($M = 4.82; SE = .16$), $F < 1$, and ratings on the dominance dimension of the SAM scale did not significantly differ between incongruent ($M = 5.18; SE = .81$) and congruent conditions ($M = 4.82; SE = .89$), $F < 1$. One possible explanation for these findings is that participants regulate arousal associated with affective dissonance by selectively attending to only certain aspects of stimuli (e.g. visual scene) while dismissing contradictory information (e.g. background music).

The Currency of Love in “The Merchant of Venice” and “Timon of Athens”

Pamela Rollins

Faculty Mentors: Dr. Amy Tigner

Session: Concho, 8:40a

My research explores the intricate facets of value in Shakespeare’s *The Merchant of Venice* and *Timon of Athens*, including the monetary, familial, marital, figural, and literal considerations that extend value beyond a simple monetary exchange and places them in the context of Elizabethan and Jacobean patronage systems. In *Merchant*, Shylock initially represents a selfish, greedy man who values money as his highest priority. However, Shylock’s notions about love and money are contradictory when he satisfies his hatred in lieu of money upon his insistence that Antonio fulfill his bond by forfeiting one pound of flesh. Alternatively, in *Timon*, Timon represents himself as an altruistic giver, yet his incongruous understanding of the monetary exchange system is exposed when he uses the system as a means to exchange companionship for currency. Though both plays are set outside of England, their historical connections to the country are undeniably present. *Merchant* and *Timon* are emblematic of the contrasting economic exchange systems in Elizabethan and Jacobean times. I analyze the relationships between Antonio and Bassanio, Bassanio and Portia, Shylock and Jessica, Timon and Ventidius, Timon and Apemantus, Timon and Flavius, and Timon and Alcibiadies in order to emphasize the complex realities of human kind involved in the vacillating process of exchange within which money and love reside forever together in *Merchant* and *Timon*. Ultimately, both *The Merchant of Venice* and *Timon of Athens* are indicative of their time periods through their successful exemplification of the complicated boundaries that intersect between affective and material exchanges.
The Angels Living in the Desert: Ecocriticism in Arturo Islas' novel, The Rain God

Neri Sandoval

Faculty Mentors: Dr. William Arce

Session: Guadalupe, 1:20p

During the Chicano movement, the Southwestern desert region emerged as the focal point for the political and literary movement of the 1960s and 1970s. For the Chicano community, the desert became a landscape of possibilities, one in which a different social reality could be crafted. This stood in direct contrast to representations of the desert in traditional American literature, where the desert was often associated with death. In part, this is an inherited legacy of Judeo-Christian religion where the desert is the landscape of destruction, decay, isolation, punishment, and temptation. Consequently, for those who inhabited the Southwestern desert such as Chicano author Arturo Islas, traditional biblical representations of the desert proved problematic. In this essay I argue that Arturo Islas' award winning novel, The Rain God: A Desert Tale, repudiates traditional imagery of the desert as a dry landscape of death to provide alternative interpretations of life/death cycles within traditional Judeo-Christian beliefs. I explain how previous research on the novel has not provided a thorough discussion of the desert as a central theme that directly impacts the life/death cycles in the Angel family. Methodologically, I provide an ecomarxist reading of The Rain God and isolate the desert as a place key to understanding the novel's representation of race and class.

New Ionic Liquid MALDI Matrices for Analysis of Biocompatible Polymers

Carlos Serrano

Faculty Mentors: Kevin A. Schug

Poster # 5

Group Names: Jian Yang, Yi Zhang, Kevin A. Schug

Matrix-assisted laser desorption ionization mass spectrometry (MALDI-MS) is a soft ionization technique often applied to the mass analysis of polymers. One area for advancing the use of MALDI-MS in polymer analysis is found in sample preparation, an important component of which is the addition of matrices, which are indispensable to the desorption/ionization process. Recently, room temperature ionic liquids, organic salts that exist as liquids while at ambient temperatures, have risen to the forefront in MALDI analysis of polysaccharides, lipids and polymers. Two novel ionic liquids (IL), developed in the Schug laboratory, have been successfully applied in determining structurally-specific differences between a series of derivatives in a family of biodegradable polymers, whereas traditional matrices could not. These ILs provide improvements to the resolution and signal-to-noise ratio compared to more traditional dry matrixes and closely match the analytical benefits of previous ILs.
Converting Photosynthetic Energy into Electrical Energy

Ahmed Shahid

Faculty Mentors: Dr. Samir Iqbal, Dr. Maeli Melotto

Poster # 3

Group Names: Azhar Ilyas and Nishitha Obulareddy

Plants and photosynthetic bacteria hold protein complexes that can efficiently harvest photons transforming light energy into chemical energy. The fundamental limits to harness photochemical activities in the conversion of photonic energy into electrical energy have been studied. We present electrical characterization of protoplast extracted from Arabidopsis plants in the presence and absence of light. The photo-induced reactions of photosynthesis are electrically interrogated using a patch clamp measurement system at a constant voltage. The protoplasts modulate and amplify electrical energy by one order of magnitude when they are exposed to light. The demonstration of electric power scavenging from plant protoplasts can open avenues for bio-inspired and bio-derived power with better quantum electrical efficiency.

Light Reflectance Spectroscopy Methods for Cancer Detection and Functional Neuroscience

Vikrant Sharma

Faculty Mentors: Dr. Hanli Liu

Session: San Jacinto, 10:20a

Group Names: Jiwei He,Yuan Bo Peng

Light reflectance spectroscopy using small probes is a powerful tool for measuring tissue optics. With a simple and low cost set-up (a needle-like optical fiber, a broadband light source and a CCD array spectrometer), a broadband reflectance spectrum of the tissue can be obtained, which provides a wealth of information about tissue properties. We have developed two methods: a) absolute quantification method (AQM) and b) relative change method (RCM). AQM is based on a previously published model, and provides absolute concentrations of hemodynamic parameters along with scattering, that allows us to differentiate between tissues with contrasting hemodynamic signatures/optical properties. Our major focus is clinical application of this method for improved guidance of prostate biopsy. RCM on the other hand, involves lesser computation time, and provides relative changes in hemodynamic parameters (similar to fMRI), which makes it more suitable for functional neuroscience studies, that require real-time monitoring. Our focus for RCM is to guide neurosurgeons during deep brain stimulation (DBS) surgeries. This study demonstrates the applicability of above techniques in phantoms and in animal models.

This work was supported in part by the Department of Defense and Texas Ignition Fund.
**Single Channel Time Correlated Single Photon Counting Technique to Detect Positive Prostate Cancer Margins**

**Shivaranjani Shivalingaiah**

Faculty Mentors: Hanli Liu

Poster # 44

Group Names: Nimit Patel

A needle biopsy is performed to investigate and confirm the presence of Cancer. This is an invasive procedure wherein small tissue samples are removed from the prostate for examination. Digital rectal exam (DRE) and Prostate-Specific Antigen (PSA) blood test are two procedures presently used for screening prostate cancer. However, PSA and DRE cannot diagnose prostate cancer. Hence, there is a dire need to find an imaging modality which is minimally invasive and also help diagnose cancer. In this study, we demonstrate the feasibility of using a single channel Time Correlated Single Photon Counting Unit for recording perturbations in the fluorescence lifetime of the auto fluorophores, in particular, Flavin, Lipopigments and Porphyrins. Lifetime measurements were performed on four rats (in-vivo and ex-vivo) at an excitation wavelength of 447nm and multiple emission wavelengths depending on the emission peak of the auto-fluorophores. The probes were placed superficially on the tumor making it minimally invasive. It can be derived from the experimental observations that the fluorescence life times are different for control tissue and cancerous tissue.

**Evaluation of a School-Based Pregnancy and Parenting Care Program**

**Holli Slater**

Faculty Names: Diane Mitschke

Session: San Saba, 1:40p

Adolescents who are pregnant or parenting are at an increased risk of dropping out of school, experiencing a subsequent pregnancy, and failing to maintain immunization compliance for their children. This evaluation of a school-based program in the southwestern United States utilizes an experimental, two group repeated-measures design to compare a comprehensive program providing transportation, childcare services, group counseling, crisis intervention, and job training, to an enhanced version of the program supplemented by intensive case management model. The enhanced program includes six curriculum-driven sessions with a counselor that focus on increasing developmental assets of the teen, directed goal setting and problem solving skills, and building happiness. Interim results indicate there were no significant differences related to graduation rates, immunization compliance, developmental assets, and levels of happiness between the treatment and control groups. Analysis of overall happiness at posttest revealed a slight increase for both groups ($M_{\text{enhanced}} = 4.6$, $SD_{\text{enhanced}} = .52$; $M_{\text{control}} = 5.8$, $SD_{\text{control}} = 9.9$). The difference in mean change between the initial and subsequent assessments for the enhanced group was statistically significant ($t_{(43)} = -3.18$, $p = 0.003$); it was not for the comparison group ($t_{(45)} = -.99$, $p = 0.33$) indicating students in the enhanced group are significantly happier at the completion of the intervention.
A Model for Student Adjustment Problems

Belinda Smith

Faculty Mentors: Dr. Shannon Scielzo

Poster # 27

Group Names: Dr. Shannon Scielzo

Many industries are finding it difficult to recruit and retain skilled employees for their organizations and businesses. This could be due; largely in part to individuals not adjusting well to their new environment and that maladjustment is subsequently impacting their overall performance at work. Another potential problem is that talented individuals may not even enter the workplace due to adjustment problems in their academic careers. One way to decrease this turnover is if a mentoring relationship was introduced to aid employees overcome these adjustment problems. In addition, if employees recognized that they needed a mentor to assist in their adjustment, they will be more receptive to the relationship. This study addresses this problem in a university setting. A model for student adjustment problems leading to the desire for a good mentor is proposed. One proposed mediator of academic adjustment problems is also examined. A student who is experiencing adjustment problems will then experience academic problems and that will lead to their desire for a good mentor. These relationships were tested using structural equation model within the AMOS program, with adjustment problems as the independent variable, desire for a mentor as the dependent variable and academic problems as mediator. Overall, the model was a good fit which showed that adjustment problems lead to desire for a good mentor, and this relationship is fully mediated by academic problems. If the antecedents to the mentoring relationship are better understood, then earlier interventions could decrease turnover and businesses would continue to grow and thrive.

Bumptious Women and Barbaric Men: A New Historical and Cultural Critique of Doris Lessing’s "The Marriages of Zones Three, Four, and Five"

Lorena Smith

Faculty Mentors: Dr. Bridgitte Barclay

Session: Guadalupe, 3:00p

In 1980, Doris Lessing published the science fiction novel *The Marriages Between Zones Three, Four, and Five*. The novel is set on another planet, but it mirrors issues from the time period in which it was written: the aftermath of the second wave feminist movement of the 1960’s and 70’s. A large portion of Lessing’s novel focuses on a marriage between the leader of militaristic, masculine Zone Four and the leader of peaceful, feminine Zone Three. While many central tenets of feminism are supported, *Marriages* also shows fallibility, and the novel appears to deconstruct itself- the feminine zone which originally appears to be more desirable starts to show cracks. In my paper, using a historical and cultural critical approach, as well as existing feminist criticism, I show how the acknowledgment of mistakes within this fictional world is reflective of mistakes within our own world’s women’s movement, and that the novel intends to reignite the aspirations to correct oversights that accelerated the decline of the second wave feminist movement. The two mistakes that will be focused on in this paper are the exclusion of minority women and the “anti-men” stance, both of which appear in the novel and the women’s movement history. These problems led to a negative public discourse about feminism around the time that Lessing was composing the novel, and this paper will serve to examine the moments in which *Marriages* unravels just as the feminist movement did, and what impact, if any, Lessing’s novel had on her world.
MALDI-TOF-MS Imaging of Proteins from a Western Blot Gives More Information than
Conventional Techniques

Sandra Spencer

Faculty Mentors: Young-Tae Kim, Samir M. Iqbal, Kevin A Schug

Poster # 13

Proteins, long chains of amino acids, are essential to the structure and function of the human body. Separation and purification of these macromolecules by sodium dodecylsulfate polyacrylamide gel electrophoresis, a size separation technique, is important in many fields. Separations of proteins are performed in research to identify, quantify, and evaluate the structure and function, as well as in the nutrition industry in order to purify supplements such as enzymes or natural products. Obtaining pure proteins is also essential to human health; for example, the purification of insulin for diabetics. After separation, the proteins may be transferred to a thin membrane for analysis. Conventional protein analysis from this membrane often omits information, is time consuming, and complex. Current methods for protein identification require knowledge of the identity of a protein in advance and only allow for one or two proteins to be identified in a given separation. In contrast, general protein staining is the alternative. Though it allows for visualization of all proteins present, those of similar size may not be resolved from one another, hiding valuable data, and no discrimination based on protein identity can be gained. In order to obtain the most complete data set possible, a matrix assisted laser desorption/ionization-mass spectrometry method was developed to image a membrane and evaluate the proteins transferred from the electrophoresis separation. This method allows for the identification of any number of a broad range of proteins, however similar in size, while identifying possible contaminants in protein samples that might otherwise be overlooked.

Protein Biochip Technology for Medicinal Drug Discovery

Brian Stamos

Faculty Mentors: Roshan Perera

Session: Concho, 3:20p

Group Names: Tuan Phan, Sridev Mohapatra

Many of our body functions are carried out by proteins and therefore, proteins are directly connected to diseases. The elucidation of protein interactions will further our understanding of diseases and allow for the design and isolation of drugs to combat these problems. A significant advancement can be achieved by the development of permanent (covalent) immobilization of active proteins on solid surfaces of glass or silica for protein microarrays (small clusters of different proteins). From the commercial point of view this will be a commendable discovery as the current market value of this protein microarray technology is over $3 billion and it is believed that the potential applications are endless and priceless. There are, however, five challenges that exist in this immobilization of proteins on solid-supports - strong covalent (permanent) linkages, active natural protein conformation, homogeneous protein monolayers, active site orientation and preservation of protein activity after the immobilization. Our discovery is the ONLY method that satisfies all of these requirements and is the easiest and cheapest way to immobilize proteins on solid surfaces. This development will lead to several important applications such as: (a) drug discovery research (b) development of new methods for the chemical synthesis of rare compounds using covalently linked enzymes (biocatalysis) (c) development of disease diagnosis tools (d) detection of bioterrorism agents (e) biosensors and biomarkers (f) development of protein affinity chromatography for neutralizing antibody isolation (g) and can be used to study protein-protein; protein-cofactor; protein-DNA or RNA and protein-antibody interactions in the biomedical research field.
In vitro Elucidation of Mechanisms of Neuroprotection against Oxygen-glucose Deprivation Involving Energy Storage Modulation

Jennifer E. Stearns

Faculty Mentors: Mario I. Romero, Ph.D.  
Group Names: Jennifer L. Seifert, Ph.D., Guenter W. Gross, Ph.D., Daniel Sucato, M.D., Mario I. Romero, Ph.D.

Spinal cord injury is characterized by a primary mechanical insult followed by activation of secondary signaling pathways that lead to glutamate excitotoxicity, inflammation, and apoptosis. In vitro, these same pathways can be initiated by oxygen–glucose deprivation (OGD) and have been used to study the protective effects of target compounds on neuronal networks. Several neuroprotective strategies are aimed at the activation of pathways known to be involved in cell survival. These include the MAP and PI3 Kinase pathways, specifically targeting the Erk1/2 and Akt intermediates. However, the precise role of these pathways in promoting cell survival during OGD is controversial. This study aims to determine whether activation of these pathways through modulation of energy storage promotes neuroprotection of spinal cord networks. Specifically, we have observed that Erk1/2 phosphorylation increases while Akt activation decreases in a dose-dependent manner in response to glucose, as assessed by Western blot analysis. Conversely, creatine and phosphocreatine induce activation of Akt but not Erk1/2. In addition to the determination of signaling mechanisms, we are currently investigating whether such treatments regulating energy stores prevent OGD-induced loss of neuronal network activity, as assessed by multielectrode array technology. These data suggest that both pathways are preferentially activated by differing treatments and that a combinatorial approach may act synergistically to promote further neuroprotection.

Functionalized UPE Nanoparticle Scaffolds for Endothelium Regeneration

Lee-Chun Su

Faculty Mentors: Dr. Jian Yang, Dr. Kytai T. Nguyen  
Group Names: Richard Tran, Dr. Jian Yang, Dr. Kytai T. Nguyen

Vascular injury has been a serious issue worldwide as it results in the narrowing of the blood vessels’ diameters and blockage of blood vessels, leading to cardiovascular diseases. By combining the principles of tissue engineering, targeted protein delivery, and bio-nanotechnology, we develop a multi-functional nanoparticle system to treat vascular injury. The multi-functionality implies 1) platelet-mimicking: nanoparticles are conjugated with platelet glycoprotein Ib (GPIb) to target damaged endothelium and subendothelium; 2) EPC capturing: nanoparticles are conjugated with anti-CD34 antibody for capturing circulating endothelial progenitor cells; 3) tissue engineering scaffolding: biodegradable functional nanoparticles locally delivered to the vascular injury act as a temporary scaffold to allow a EPC-mediated healthy endothelium formation, while the nanoparticle layer can act as a temporary barrier to prevent the ingrowth of underlying smooth muscle cells (SMCs) until a complete endothelium formation; 4) drug-delivery: biodegradable nanoparticles are encapsulated with vascular endothelial growth factor (VEGF) to mediate EPC differentiation and endothelium regeneration. We has developed a novel biodegradable elastomer, urethane-doped polyester (UPE), and formulated nanoparticles using this polymer. Size of the fabricated particles ranges from 500nm to 1µm, which is the appropriate size range for the multi-functionality of nanoparticles. Zeta potential of UPE nanoparticles is about -40~30 mV, which demonstrates particle surface stability. Future work includes the investigation of degradation, biocompatibility, EPC targeting and recruitment, and the effectiveness of these nanoparticles to treat vascular injury in vitro and in vivo.
An Environmentally Improved Photocatalytic Approach to Disposal of Hazardous Wastes

Sulak Sumitsawan

Faculty Mentors: Dr. Richard B. Timmons, Dr. Melanie L. Sattler  
Session: Palo Pinto, 3:20p

Group Names: Dr. Wilaiwan Chanmanee

Studies to improve solar energy conversion represent a topic of intense research at the present time. Investigations encompass topics ranging from direct conversion of sunlight to electricity, to applications involving improved, i.e. “greener”, chemical processes. Work described in this presentation centers on the latter topic. It involves development of improved solar energy processes for photocatalytic driven conversions of hazardous wastes by titanium dioxide (TiO$_2$), a preferred catalyst for oxidation of many air pollutants. Surface modification of TiO$_2$, using plasma technology, was used for this purpose. TiO$_2$ nanoparticles, coated on a glass plate, were treated with hexafluoropropylene oxide (HFPO) monomer under pulsed plasma conditions. At high average power inputs, only direct surface fluorination was observed. At lower average power, thin nanometer thick perfluorocarbon films were deposited on the TiO$_2$. Plasma treated samples were subsequently used as catalysts in photocatalytic oxidation of m-xylene inside a closed loop batch reactor. Both fluorinated TiO$_2$ and TiO$_2$ coated with fluorocarbon exhibited dramatic improvement in destroying m-xylene, compared with untreated TiO$_2$: 70% conversion of m-xylene was reduced from approximately 140 minutes with untreated TiO$_2$ to less than 10 minutes with fluorinated TiO$_2$. Band gap energies of the perfluorocarbon coated, fluorinated, and untreated samples were determined to be 3.319, 3.345, and 3.475 eV, respectively. The decrease in band gaps translate to increased absorption of visible light. This fact, coupled with the increased photocatalytic activity observed, represent promising results in terms of environmental considerations. The generality of these findings with respect to other pollutants will be investigated.

Influence of Expressing Pride versus Shame and Guilt in the Face of Chronic Disease

Jeffrey Nathanael Swanson

Faculty Mentors: Angela Liegey Dougall

Poster # 19

Group Names: Jessica Grimm

Nonsmall cell lung cancer is a virulent disease that is primarily caused by smoking, a preventable health behavior. Lung cancer therefore carries a stigma that causes many who are diagnosed with the illness to harbor feelings of shame and guilt. However, the effect of such thoughts related to stigma on quality of life and disease progression has been understudied. We hypothesized that patients who express feelings of shame and guilt would endorse the use of maladaptive coping strategies that in turn yield poor mental and physical health outcomes. Conversely, patients expressing feelings of pride in their life in the wake of their diagnosis would employ adaptive coping strategies that yield better mental and physical health. 61 patients diagnosed with advanced stage lung cancer were assessed for state shame, guilt, and pride. The assessment also included measures of coping strategies, posttraumatic stress and posttraumatic growth symptoms, measures of symptom distress, and depression. In addition, medical chart and obituary searches were used to identify survival. As expected, it was found that the expression of feelings of shame and guilt predicted maladaptive coping strategies such as behavioral disengagement, while the expression of pride in life was predictive of active coping strategies. Maladaptive strategies in turn mediated the effect of shame and guilt on health outcomes. It was also found that general health quality of life was moderately related to survival in this sample, and that quality of life mediated the relationship between expressions of pride on survival.
Influence of Blood Cells on Targeted Delivery in Microcirculation

Jifu Tan

Faculty Mentors: Dr. Yaling Liu

Poster # 58

Group Names: Samar Shah

Nanoparticle targeted delivery in vascular system involves the interplay of transport, hydrodynamic force, and multivalent interactions with targeted biosurfaces. Current theoretical studies in nanoparticle therapeutic delivery are limited to nanoparticle suspensions in a Newtonian fluid without blood cells. However, blood is a complex biological fluid made of components such as red blood cells (RBC), monocytes, platelets, proteins, etc. The existence of blood cells in the core region of blood streams might change the nanoparticle dispersion rate through cell-nanoparticle interaction. It is thus important to understand how blood cells influence nanoparticles motion and binding. A combined Immersed Finite Element and particle Brownian dynamics model is developed to get the effective dispersion coefficient of nanoparticles inside a small vessel. A Mooney–Rivlin strain energy function is used to depict the material behavior of the RBC membrane. The motion of nanoparticles is governed by Brownian adhesion dynamics. The dispersion coefficient can be evaluated by tracking the motion of nanoparticles and calculate the mean square displacements. The dispersion rate with RBCs considered is much higher than that without RBCs. It is expected that the tumbling motion of RBCs act as mixers which leads to faster diffusion of nanoparticles. Nanoparticle binding rates is also largely influenced by the existence of RBCs, which occupy the core region of vessel and push the particles to the margin of the vessel thus increase the binding probability compared to pure particles in the same vessel.

A Well Array to Investigate Smooth Muscle Cell Responses toward Stretch Stimuli

Uday S. Tata

Faculty Mentors: J.C Chiao

Session: Guadalupe, 9:20a

Group Names: Smitha M. N. Rao, Kytai Nguyen and J-C Chiao

The development of cardiovascular diseases including hypertension-related atherosclerosis is believed to involve many pathological changes. Important among these changes are alterations in biomechanical or physical factors such as stretch stimuli which regulate vascular smooth muscle cell (VSMC) functions. A compact PDMS well array based stretch system was designed, built and tested to investigate VSMC responses toward stretch stimuli. The stretch system consists of arrayed wells in a two-layer PDMS membrane with a specially designed holder. The movable end of the holder was mounted on to cyclic stretching machine. The two PDMS layers have 10:1 and 30:1 cross-linker ratios to provide required elasticity for stretching and stability to be held in the holder. Twenty-four hours after the PDMS surface was corona-treated, the wells were coated with fibronectin to improve the cell adhesion to the surface. The cells were stretched with 10% and 20% strain at 1-Hz frequency for 6 hours, 24 hours and 3 days respectively. The orientations of the cells with respect to the strain direction from recorded images were compared before and after 24hours. The growth rates of cells for 10 % and 20% strains were also compared to the control. The results shows decrease in proliferation under 10% strain as compared to static control, while under 20% strain there is no significant change in the proliferation as compared to static control and increase in proliferation as compared to cells at 10% strained conditions.
Characteristics of Fresh Municipal Solid Waste

Tashfeena Taufiq

Faculty Mentors: Dr. Sahadat Hossain

Poster # 50

The characteristics of fresh municipal solid waste (MSW) are critical in planning, designing, operating or upgrading solid waste management systems. The composition of the waste, moisture content, organic matter content, permeability, particle size distribution, and specific gravity are important MSW characteristics to be considered in planning a system. When the landfill is operated as enhanced leachate recirculation (ELR) landfill, the physical and hydraulic characteristics are of particular interest in determining the amount of moisture to be recirculated and to design the leachate recirculation and gas collection systems. The City of Denton, Texas is operating a portion of their landfill as ELR landfill. This paper presents the physical and hydraulic characteristics of MSW collected from the working face of Denton Landfill in May, 2009. The results are based on 10 (ten) 30-lb bag MSW samples. The moisture content of the fresh MSW was determined to vary between 38.6% and 42.1% on wet weight basis. The unit weight varied from 27.6 lb/ft$^3$ to 38.55 lb/ft$^3$ with an average of 33.88 lb/ft$^3$ at initial moisture content. The hydraulic conductivity was found to be in the range of $10^{-3}$ cm/sec ($10^{-5}$ to $10^{-4}$ ft/sec) at a density of 5.32 kN/m$^3$ (33.88 lb/ft$^3$).

This work was supported in part by the City of Denton, TX.

Jumping Genes Revisited: Giant Transposable Elements Hop between Animal Genomes

Jainy Thomas

Faculty Mentors: Ellen J. Pritham

Session: Palo Pinto, 1:00p

Group Names: Sarah Schaack and Ellen J. Pritham

Transposable elements (TEs) are mobile pieces of DNA that have the unique ability to move and proliferate within the genome. Helitrons are a group of TEs that are present in a diverse range of eukaryotes and are well known for their propensity to capture and amplify gene fragments during their transposition. Recent reports show that TEs are also capable of moving across species by a process known as horizontal transfer (HT), however the mechanisms remain unknown. Here we report HT of four families of Helitrons in animals and a possible mechanism of HT. We used a combination of bioinformatic and molecular tools to identify, characterize, and validate the presence of Helitrons across a diverse array of genomes in which they are found. We have identified four families of Helitrons in different organisms including little brown bat, green anole, different groups of insects and polydnaviruses. Helitrons in these organisms have high level of sequence identity (80-95%) even though these species have diverged deeply. The patchy distribution and high sequence identity of Helitrons in widely-diverged species suggests multiple horizontal invasions rather than vertical inheritance. Our study also shows that polydnaviruses could be a potential vector for HT, as these viruses carry Helitrons that are also present in closely-associated insects. We conclude HT of Helitrons is a widespread and recurring phenomenon and can potentially influence the trajectory of genome evolution.
Evaluation of Multiple Liquid Chromatographic Modes in Terms of Sensitivity for the Quantification of Estrogen Metabolites by Mass Spectrometry

Heather D. Tippens

Faculty Mentors: Kevin Schug

Group Names: Hien P. Nguyen, Kevin A. Schug

Estrogens and estrogen metabolites have been shown to provide neurological protection but have also been associated with ovarian and breast cancers in women. Consequently, the separation and quantification of estrogens and estrogen metabolites from biological matrices holds significant interest in the scientific community. Liquid chromatography is a method of separating analytes based on their retention on a stationary phase in the presence of a flowing liquid mobile phase. Reversed phase liquid chromatography (RPLC), the most commonly used liquid chromatography mode, uses non-polar stationary phases (e.g. C18 functionalized) and polar mobile phases. Although, RPLC is applicable in many cases, hydrophilic interaction chromatography (HILIC) is more suited for analysis of highly hydrophilic compounds. HILIC uses polar stationary phases (e.g. amide functionalized) and mobile phases that contain polar organic solvents and water. A third separation mode, termed modified RPLC, exhibits features of both RPLC and HILIC. Modified RPLC is similar to RPLC but the stationary phase also contains a polar interaction site that helps retain polar molecules (e.g. an amide-C18 functionalized stationary phase). This study compares the sensitivity of estrogen glucuronides, a metabolized form of estrogens, using electrospray ionization mass spectroscopy (ESI-MS) coupled with HILIC, RPLC, and modified RPLC. The purpose of comparing each separate type of liquid chromatography is to investigate the relative retention of the compounds, as well as the increased sensitivity often seen when the HILIC mode is used. Sensitivity is tested in samples of known concentration and in samples prepared from human urine.

The Effects of a Psychological Intervention on Quality of Life in Head and Neck Cancer Patients

Lara Trevino

Faculty Mentors: Dr. Andrew Baum

Group Names: Andrew Baum, Angela Liegey Dougall

Oral cancer is a stressful disease. When diagnosed, patients are advised to quit smoking in order to improve prognosis. Treatment can be disfiguring to the patient and can eliminate basic uses of the oral cavity, such as speaking or swallowing. Because of these concerns diagnosis and treatment are associated with increased depression and anxiety. Patients report that sources of psychological distress are related to fear of death or recurrence, previous tobacco consumption, smoking cessation, and functional well-being. The purpose of the present study was to evaluate the effects of a psychological intervention on depression, anxiety, and quality of life in head and neck cancer patients. The first hypothesis was that patients who received the intervention would report reduced levels of depression and anxiety and increased quality of life compared to the control group. The second hypothesis was that patients with high levels of stress would report increased levels of depression anxiety and reduced quality of life compared to those with lower levels of stress. The third hypothesis was that patients in the intervention group with low levels of stress would report lower levels of depression and anxiety and increased quality of life and the control group with high levels of stress would report higher levels of depression and anxiety and reduced quality of life. The present study’s findings contribute to our understanding of psychological interventions to patients with cancer and how to improve the efficacy of these interventions.
Evaluating Neural Activation in Response to Place Escape/Avoidance Paradigm Testing: cFos Activity in the Anterior Cingulate Cortex and Nucleus Accumbens

Megan L. Uhelski

Faculty Mentors: Perry Fuchs, Linda Perrotti

Group Names: Christopher T. McNabb, Matthew A. Davis, Torry Dennis, Samara Morris-Bobzean, Brocke Addison, Linda Perrotti, Perry N. Fuchs

Many of the behavioral tests used to assess experimentally-induced pain conditions rely on reflexive behaviors that may or may not be influenced by activity above the spinal or brainstem level. Since clinical assessments have demonstrated that higher brain areas are involved in pain processing, it is important to evaluate behaviors in animals that are influenced by activity in these areas as well. The place escape/avoidance paradigm (PEAP) is a behavioral test that quantifies the level of unpleasantness evoked by painful stimuli and has been assessed using both inflammatory and neuropathic pain models in rats of both sexes and various strains and ages. The escape/avoidance behavior is dependent on activity in supraspinal areas, including the anterior cingulate cortex (ACC). Although previous studies have established the role of the ACC in the processing of the emotional response to pain, the underlying cellular activity that occurs in conjunction with escape/avoidance behavior has not been established. Therefore, the purpose of this study was to evaluate activity in the ACC after PEAP testing. Adult male rats were assessed in the PEAP and sacrificed two hours after the completion of behavioral testing and their brains prepared for immunohistochemistry analysis. The results confirmed that the escape/avoidance response to painful stimuli involves changes in neural activation in areas of the brain involved in the processing of pain affect. Behavioral tests such as the PEAP may be more sensitive to changes in pain processing and could contribute to the development of novel analgesics in the future.

Transposable Elements Mediated Capture, Diversification and Expansion of Gene Families in Late Potato Blight Agent, Phytophthora infestans

Komal Vadnagara

Faculty Mentors: Ellen J. Pritham

Session: Palo Pinto, 9:20a

The most notable member of the genus Phytophthora is P. infestans, the pathogen responsible for the Irish potato famine. The genome sequencing of P. infestans revealed that it was large (~240 Mb) and complex due to an infestation of virus-like genomic parasites called transposable elements (TEs). TEs are sometimes called jumping genes due to their ability to move from one place to another in the genome. Pathogens are in a constant arms race due to their reliance on the host to reproduce and persist and the negative fitness impact that they impart. It was hypothesized that the dynamic P. infestans genome allows for a rapid response to the ever-changing environment imposed by this arms race. However, TEs are potent mutagens and the result of their proliferation in the genome is usually detrimental, although occasionally they can contribute to the evolution of the host in a variety of ways. To determine the impact of TEs on the genome we analyzed the diverse populations of TEs. Much to our surprise we identified 12 TE families carrying host genes, totaling 178 complete copies and ~ 1830 partial copies dispersed throughout the genome. We report on the structure of these transduplicates, their capacity to encode a functional transposase and the existence of transcript evidence for the genes captured. Cross species analysis further reveals that a few transduplication events might have predated the split of P. infestans from other Phytophthora species. We present an in-depth analysis of the extent of TE diversity in this phytopathogen.
DNA Binding Activity of Human TIGD1 Protein- A Domesticated Transposase in Action

Mahima Varma

Faculty Mentors: Cedric Feschotte

Poster # 24

Group Names: Clement Gilbert, Don HuckS

Transposable elements (TEs) are mobile DNA fragments that make up a large fraction of most eukaryotic genomes (e.g., ~50% in humans and ~90% in plants). Since they are able to self-replicate and reach high copy number with no benefit for their host, they are usually considered as genomic parasites or selfish elements. But there is also increasing evidence that TEs can occasionally be co-opted as cis-regulatory sequences or as protein-coding genes to serve diverse cellular functions beneficial to the host. Here we focus on the functional analysis of TIGD1, a human gene derived from a recently domesticated transposon called Tigger1. The protein TIGD1 encodes four recognizable domains. Among them, the N-terminal DNA-binding domain shows the strongest signal of selective constraint, suggesting that it has preserved its original function. Using TIGD1 as a candidate we are testing two major hypotheses using in vitro and ex vivo experiments: (1) The proteins encoded by the transposons can perform a repertoire of activities which might be of interest to the host and they might have been domesticated for one or more of these activities; (2) Co-domestication of transposases and their binding sites within the cognate transposons can contribute to the creation of a new gene regulatory network ‘from scratch’ and to the modification of existing ones. Here we present explicit in vitro data for the DNA binding activity of TIGD1 protein. The results indicate that the N-terminal DNA binding domain has retained its activity, further suggesting that this protein might act as a transcription factor.

Words Should be Fun: Using Scrabble as a Tool for Language Preservation

Vitaly Voinov

Faculty Mentors: Cynthia Kilpatrick

Poster # 53

Use of the popular word game Scrabble is one small but practical way to empower speakers of an endangered language to maintain their language’s vitality amidst a climate of rapid globalization. This presentation examines how versions of Scrabble have been developed in various minority languages and used for the purpose of language preservation, with a focus on the Tuvan language of south Siberia, for which the author designed a version of the game. Playing Scrabble in their mother tongue offers several benefits to speakers of an endangered language: it presents a communal approach to group literacy, promotes the use of a standardized orthography, creates new opportunities for intergenerational transmission of the language, expands its domains of usage, and may heighten the language’s external and internal prestige. Besides demonstrating the benefits of Scrabble, the presentation offers practical suggestions concerning linguistic (e.g., choice of letters to be included, calculation of letter frequencies, dictionary availability) and non-linguistic (board design, manufacturing, legal issues, etc.) factors relevant to producing Scrabble in other languages that are undergoing revitalization.
**Theranostic Nanoparticles for Cancer Diagnosis and Treatment**

Aniket Wadajkar

Faculty Mentors: Kytai Nguyen  
Session: Red River, 10:00a

Group Names: Zarna Bhavsar, Yi Zhang, Jian Yang, Kytai Nguyen

Significant challenges in cancer management remain on the development of an effective “theranostic” system that enables efficient imaging and targeting drug delivery for cancer treatment. The aim of this research was to develop novel photoluminescent polymer-coated magnetic nanoparticles (PPMN) that can serve as a theranostic nanoparticle system with dual-targeting and dual-imaging capabilities. Dual-targeting strategy allows the recruitment of nanoparticles at the targeted tumor site by magnetic targeting and the facilitated uptake of drug-loaded nanoparticles by cancer cells through receptor-mediated targeting. In addition, via dual imaging modalities - magnetic resonance and fluorescence imaging, these nanodevices provide extraordinary tools to diagnose and monitor cancer during the treatment. The polymer used for coating is biocompatible, biodegradable, and photoluminescent. The physical properties of the PPMN were characterized and their imaging and targeting capability was tested. The nanoparticles were spherical in shape and approximately 200 nm in the diameter with a core-shell structure while observed under transmission electron microscope. The PPMN emitted a very bright fluorescence under the enhanced optical fluorescence microscope. SQUID-based magnetometer measurements revealed that the magnetic properties of the bare magnetic nanoparticles were maintained even after polymer coating. The magnetic resonance imaging of PPMN showed that our nanoparticles produce a very bright contrast at very low concentrations. Moreover, PPMN exhibited minimal cytotoxicity at concentrations 500 µg/ml when cultured with human dermal fibroblasts. Future studies include the evaluation of these particles for their targeting and drug delivery efficiency in vitro and in vivo using various cell culture and animal models, respectively.

**Aptamer-based Lab-on-chip for Cancer Cell Isolation and Detection**

Yuan Wan

Faculty Mentors: Samir M. Iqbal  
Poster # 25

Currently, most research endeavors to isolate tumor cells rely on immunohistochemistry. Aptamer have higher specificity and considerable affinity that are comparable to those of antibodies. Here, we use epidermal growth factor receptor (EGFR) aptamer biochip to identify and isolate cancer cells that overexpress EGFR. Anti-EGFR aptamers and mutant aptamers (control) were immobilized on the glass surface. Mouse glioma cells (MGC); patient’s glioblastoma (hGBM); and fibroblasts were used. The captured cells were quantified; cell activities were monitored. The average MGC densities of experiment and control groups are 392 cell/mm² (S.D.: 143.3) and 7 cell/mm² (S.D.: 2.8) respectively. In experiment group, 70.41% of total cells increased diameter over 30 µm compared to 25-30 µm normal size when in suspension. Meanwhile many antennas formed and cells reshaped on the surface. In control groups cells these changes are not obvious. The mutant aptamer structure, hydrophilic and negative charged surface might cause few cells found in control group. In hGBM experiments, the same phenomena were observed. However, the cell density (117 cell/mm² S.D.: 44.4) was lower than MGC, in agreement with relatively less amount of EGFR on hGBM cell surfaces. Further, the ratio of hGBM and fibroblast captured cells improved to 8:1 from 1:1 (the ratio of cell mixture at first). Fibroblast reshaped from irregular shapes to spherical. It might increase the aptamer EGFR interaction via decreasing the surface area. The results show that anti-EGFR aptamer biochip can specifically recognize and capture EGFR overexpressed cancer cells, providing a new modality to detect circulating tumor cells.
Keep an Eye on Your Green Roof: Energy Efficient Data Gathering for Environmental Monitoring Applications using Wireless Sensor Networks

Jing Wang

Faculty Mentors: Sajal K. Das, Yonghe Liu  Session: Palo Pinto, 2:20p

Wireless sensor nodes can be deployed to sense the environmental parameters and send the sensory data through multi-hop wireless links to a remote computer or even a gateway to Internet for the end-user to monitor the environmental changes. For instance, to monitor the green roof with a small scale wireless sensor network benefits both the installation and maintenance efforts in terms of shortening the time and reducing the costs. However, the lifetime of the wireless sensor network becomes a bottleneck as the sensor nodes are powered by batteries with limited lifetime. Thus, it is of great importance to achieve energy efficiency while gathering sensory data from the wireless sensor networks. An energy efficient data gathering scheme is proposed for environmental monitoring applications using wireless sensor networks. The scheme focuses on an information-theoretic approach consisting of information-driven sampling strategies and information-driven medium access control protocols. Models for sensory data were established to quantify the usefulness of the sensory data through entropy of joint random variables. The proposed approach is able to either extend the lifetime of the wireless sensor network through reducing the number of sample data required for the application or obtain more information from the sensory data without increasing the number of samples to be collected. The theoretical models and results have been justified by real data set from environmental monitoring applications. A test-bed has been developed for monitoring green roofs. The implementation of the energy efficient scheme is undergoing to further validate the performance improvement.

Modulation of Spinal Cord Neuron Network Activity by Skeletal Muscle

Collins. Watson

Faculty Mentors: Mario Romero  Poster # 60

Group Names: Rodrigo Lozano, Eduardo Martinez, Jennifer Seifert, Guenter Gross, Conrad James, Mario Romero.

The molecular mechanisms that regulate the interaction of motor neurons and skeletal muscle cells at the neuromuscular junctions (NMJs) underlie a number of important neuro-muscular physiological and pathological conditions which are currently incompletely understood. In order to characterize these mechanisms in vitro, mixed neuron-muscle cell cultures are commonly used. However, this technique has inherent limitations including difficulty in isolating the electrophysiological response of individual cell types and controlling the chemical composition of the culture media that bathe neurons and muscle cells. Microfluidic systems have been used to compartmentalize cultures in which neurons can be placed in compartments and allowed to extend axons through micro-channels that interconnect to separate chambers containing muscle cell cultures. Here we report the use of silicone compartmentalized chambers connected by microfluidic micro-channels placed over a multi-electrode array (MEA) as a method to ascertain the modulation of neuron network activity in response to target-derive molecules. Embryonic spinal cord neuronal networks were established either separately or in contact with skeletal muscle cells. The effect of shared culture media and direct cell-cell interactions on the electrical activity of the spinal cord neurons were evaluated. We have successfully directed axonal growth from cortical and spinal cord neurons to skeletal muscle cells via microfluidic channels. Using the underlying MEA, we are currently recording the effects of nerve-muscle interaction on the neural spike activity. This study will contribute towards our understanding of the molecular mechanisms that govern the communication between the motor neurons of the spinal cord and skeletal muscle cells.
Searching for Evidence of Convective Cells within the Magnetotail

Micah Weberg

Faculty Mentors: Ramon E. Lopez
Session: Guadalupe, 2:00p

Group Names: Robert J. Bruntz

The solar wind flows continually out from the sun, carrying energy and momentum in its stream of plasma, and deforming the Earth's magnetosphere. The magnetosphere is defined as the region of space dominated by the Earth's magnetic field. Viscous interactions have been suggested as one of the ways momentum can be transferred from the solar wind, across a boundary called the magnetopause, and into the magnetosphere. Current models indicate that this phenomenon should cause a cell of circulating plasma to form just inside the magnetopause. This flow pattern, sometimes likened to a convection cell, produces an electric current which is transmitted down magnetic field lines into the ionosphere near the polar cap. Using data from the THEMIS satellites, we will explore the motion of plasma near the magnetopause within the magnetotail to look for evidence of these "convective cells". We will compare some THEMIS observations to our expectations of convective cells and discuss what implications it may have for ionospheric physics.

“Tartar Emetic”: Chemically Known as Potassium Antimony Tartrate: The Best Kept Secret for Centuries

Aruna B. Wijeratne

Faculty Mentors: Kevin A. Schug
Session: San Jacinto, 10:40a

Group Names: Samuel H. Yang, Jose Gracia, Peter Kroll, Daniel W. Armstrong and Kevin A. Schug

“Tartar emetic”, bis-potassium salt of dianionic antimony(III)-L-tartarate, is a colorless crystalline substance which can be prepared inexpensively from tartaric acid and antimony oxide. The long history of tartar emetic traces back to medieval times and is filled with intrigue and peril. The term “emetic” signifies its original use, a medicine that was used to induce vomiting. It has also been used as a therapeutic indication for diseases like typhoid, bronchitis, pneumonia and schistosomiasis. Improperly administered, tartar emetic can exhibit severe side effects, which meant its use was generally dissuaded. To date, mechanistic details of its actions, especially its biomolecular recognition properties, are not very well understood. Since tartar emetic has also shown antibacterial properties, electrospray ionization mass spectrometric (ESI-MS) studies were carried out to visualize tartar emetic's selective binding towards amino acid enantiomers. Consequently, a previously unprecedented proton-assisted enantioselective character of “tartar emetic” towards D-amino acid enantiomers was observed. Antibacterial therapeutics, such as vancomycin and ristocetin, have shown selective binding towards D-amino acids which result in inhibiting the regulation of peptidoglycan polymer in the cell wall of Gram positive bacteria. The peptidoglycan is a stress bearing polymer containing D-amino acids. Additionally, theoretical studies, accompanied by low temperature nuclear magnetic resonance experiments revealed that tartar emetic possesses a previously unknown co-existing structural isomer which shows different binding properties to the known structure. These findings suggest this newly identified isomer is responsible for many of tartar emetic’s inexplicable observations.
Rare Earth Element Geochemistry of Aquia Aquifer Groundwater and Sediments, Maryland, USA

Stephanie Willis

Faculty Mentors: Karen H. Johannesson

Session: San Jacinto, 3:00p

Groundwater and sediment samples were collected along a groundwater flow path in the Aquia aquifer in Maryland, USA. Groundwater parameters measured in the field included pH, temperature, oxidation-reduction potential (Eh), dissolved oxygen, alkalinity, iron speciation, and the concentrations of sulfide, silica, manganese, ammonia, and nitrate. These measurements were used to determine the oxidation-reduction conditions and solution chemistry along the flow path. Rare earth element (REE) concentrations in both the groundwater and aquifer sediment samples were determined by inductively coupled mass spectroscopy. Nd concentrations of the groundwater range from ~56.6 to 71.4 pmol kg$^{-1}$ on the Eastern shore of the Chesapeake Bay and from ~41.5 to 77.9 pmol kg$^{-1}$ on the Western shore of the Chesapeake Bay. The North American Shale Composite (NASC) normalized (Yb/Nd)$_{\text{NASC}}$ ratios are relatively similar along the groundwater flow path with a slight increase toward the end of the flow path for both the Eastern and Western shore wells, ranging from ~0.7 to 1.1. Sediment samples were collected from an archived drill core sample stored at the Maryland Geological Survey and analyzed for REEs using a sequential extraction procedure. Our analysis indicates that Nd concentrations for the bulk aquifer sediment range from ~69.97 to 254 mmol kg$^{-1}$. The sequential extractions reveal that most the REEs in the aquifer sediments occur bound to carbonates. Furthermore, the sequential extraction data indicate that the LREEs are more readily exchangeable (i.e., outer-sphere complexed) on aquifer sediment surfaces than the HREEs, whereas the HREEs and MREEs are associated with Fe/Mn oxides/oxyhydroxides.

This work was supported in part by the National Science Foundation.

Environmental Factors that Affect Seventh Grade Readers: Motivations, Attitudes, Opinions, Experiences and Gender

Donna Lynn Wylie

Faculty Mentors: Dr. Shirley Theriot

Session: San Jacinto, 9:00a

The author discusses factors that affect middle school students’ motivations to engage in reading. First, reading research is reviewed to determine an outline of factors that are currently known to affect students’ reading motivations: gender differences, influences on reading/academic successes, interests and experiences with reading, motivational factors, reading methodology and material preferences, use of cornerstone reading skills, and learning styles. Second, building upon current reading research, the author presents results garnered from administered student and teacher reading surveys. Survey participants included fifty-two seventh-grade reading students and their six reading teachers. Students and teachers constitute reading programs in three separate middle schools X, Y, and Z of a Texas school district. Finally, all research data is synthesized providing implications for educators.
Mesh Screen Affinity Materials for Drug Discovery Using Transmission Mode Desorption Electrospray Ionization Mass Spectrometry

Samuel H. Yang

Faculty Mentors: Dr. Kevin A. Schug

Poster # 32

Group Names: Aruna B. Wijeratne, Sumit Bhawal, Rajendrasing Deshmukh Brian L. Edwards, Frank W. Foss, Jr., Richard B. Timmons, Kevin A. Schug

Many well-known and widely-used antibacterial compounds have lost their effectiveness due to resistances that certain bacteria strains have acquired over the passing decades. This provides an impetus to seek new antibiotics, in hopes of circumventing bacterial resistance mechanisms. Extraction of active compounds from natural sources has shown to be one effective approach for drug discovery. Isolation and subsequent identification of such natural products from complex extracts, however, can be an arduous task. Here, a novel approach towards drug discovery is presented through the use of a carboxy-functionalized poly(propylene) screen, onto which an L-Lysine-D-alanine-D-alanine (Kaa) peptide sequence was covalently attached. The specific Kaa peptide sequence has been well characterized as a critical binding site for antibiotics that inhibit cell wall synthesis in Gram positive bacteria. The synthesized screens are designed to selectively bind compounds which recognize this peptide motif. The goal of this work was to optimize selective binding of model compounds to the functionalized screens, an effort that will be crucial for their eventual use to extract bioactive compounds from natural product extracts. Importantly, compounds captured by the screens can be rapidly assessed with transmission-mode desorption electrospray ionization (TM-DESI)-mass spectrometry. With TM-DESI, electrosprayed solvent droplets can desorb bound analytes from the surface of the screen and transform them into ionic compounds by virtue of the electrospray process. The ions can then be characterized by mass spectrometry. This method should provide a rapid screening technique for new antibacterial compounds, particularly those which must be extracted from natural product sources of limited quantity.
Keynote Address
8:00, Lonestar Auditorium
E.H. Hereford University Center
Wednesday, March 24, 2010

Jeffrey Toobin

A high-profile senior analyst for CNN and staff writer for The New Yorker, Jeffrey Toobin is one of the country's most esteemed experts on politics, media and the law. With unparalleled journalistic skill, Toobin has provided analysis on some of the most provocative and important events of our time, including the O.J. Simpson trial, the Kenneth Starr investigation and impeachment of President Bill Clinton, and the disputed Florida recount of the 2000 presidential election. One of the closest watchers of the 2006 Martha Stewart trial, his accounts of the case for CNN and The New Yorker were among the most well-balanced and thorough.

Toobin received his bachelor's degree from Harvard College and graduated magna cum laude from Harvard Law School, where he was an editor of the Harvard Law Review.
ACES 2010

Annual Celebration of Excellence by Students in Graduate & Undergraduate Scholarly Activities

Wednesday, March 24, 2010
Keynote Speaker: Jeffrey Toobin
8:00 P.M. Lonestar Auditorium

Thursday, March 25, 2010
E. H. Hereford University Center
The University of Texas at Arlington

Undergraduate and Graduate Posters Installed – Palo Duro Lounge 8:00 – 10:00
Graduate Oral Presentations (upper level University Center) 8:30 – 11:00
Break 11:00 -1:00
Undergraduate and Graduate Oral Presentations (upper level University Center) 1:00 – 4:30
Judges Preview of Posters (Palo Duro Lounge closed to public) 1:00 – 2:00
Undergraduate and Graduate Poster Judging (Palo Duro Lounge open to student presenters and general public) 2:00 – 3:30
Reception, Rio Grande B and Club Room 5:00 – 5:30
Awards Ceremony, Rio Grande B 5:30 – 6:30