Research Day 2015

February 25, 2015

Bobby B. Lyle School of Engineering

Dedman College

Annette Caldwell Simmons School of Education & Human Development

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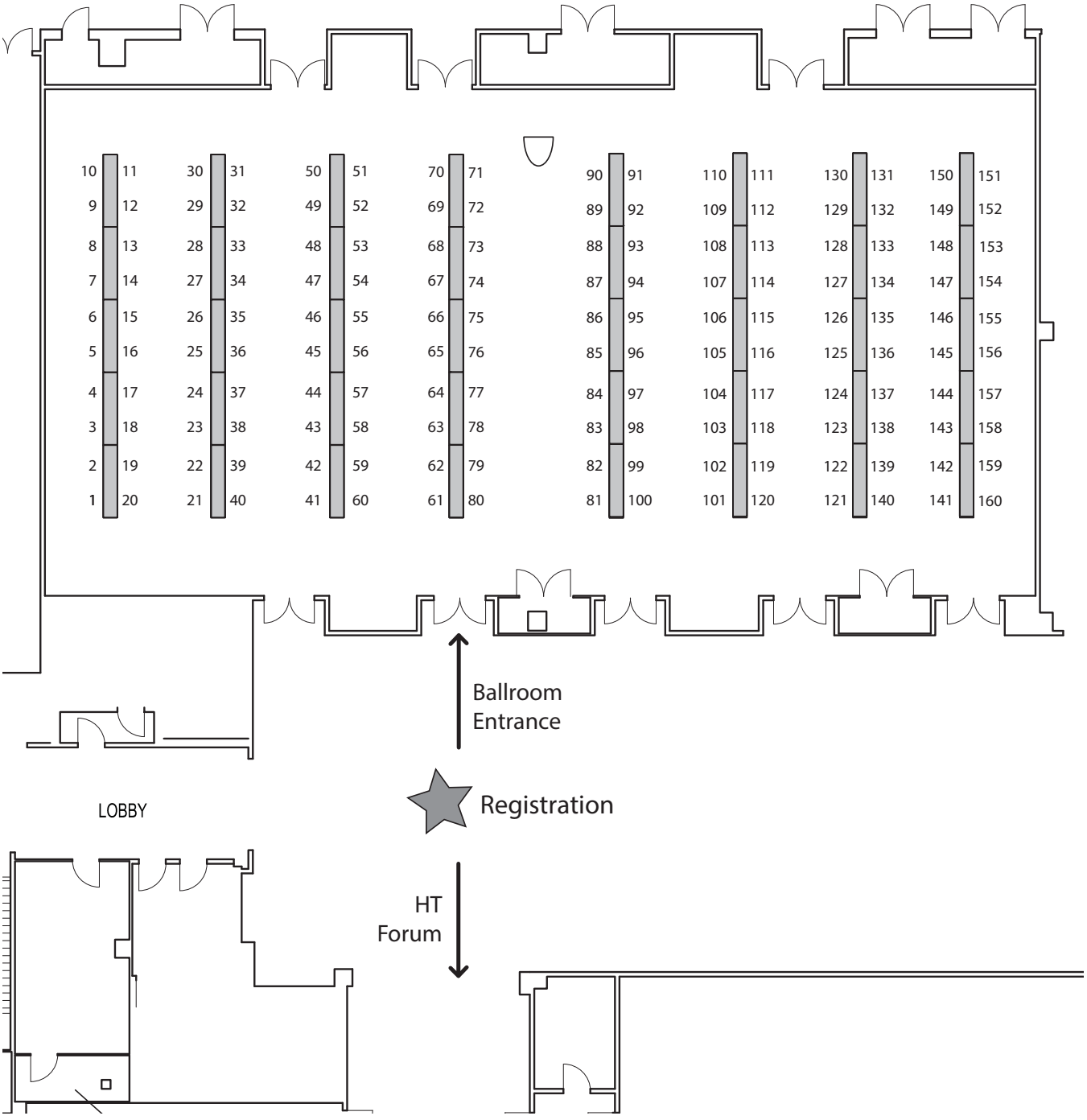

Map of Research Day: Ballroom and HT Forum

Michael Aiuvalasit
Advisor: Christopher Roos
Anthropology, Dedman College

COMMON GOODS IN UNCOMMON TIMES: DROUGHT, WATER, AND THE SUSTAINABILITY OF ANCESTRAL PUEBLOAN COMMUNITIES IN THE JEMEZ MOUNTAINS, NEW MEXICO, AD 1300-1700

Establishing causality between climate change and cultural history is often fraught by mismatched temporal scales and weak archaeological correlates. In the Jemez Mountains of New Mexico the abandonment of large villages on the Pajarito Plateau in the early 16th century has largely been attributed to drought, however the persistence of large communities on the adjacent Jemez Plateau, which shares similar climate histories, ecological settings, and prehistoric adaptations, has not been considered. Using expectations derived from game theory, hydrogeological models of prehistoric water availability before and after droughts, and geoarchaeological data collected from prehistoric water management features, this study evaluates whether or not differences in cooperative strategies practiced by communities between these regions affected the resilience of communities to climate change.

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Alejandro Figueroa
Advisor: Christopher Roos
Anthropology, Dedman College

CAVES AS PLACES OF LIFE AND DEATH IN PAST AND PRESENT SOUTHWESTERN HONDURAS

Caves and shelters hold a special place among Mesoamerican cultures. Some of the earliest evidence of human occupation in this region is found inside these natural features, where well-preserved materials attest to the detailed knowledge past populations had of their surrounding landscapes and resources. In later time periods, caves were treated as the portals to the underworld, the world of the dead, and became an essential part of Mesoamerican ideology. The Santa Elena highlands of southwestern Honduras is a landscape defined by its numerous shelters and caves, all of which have been used and continue to be used to some degree. This poster presents the results of a pilot study project for my dissertation research, which has demonstrated significant long-term use of sheltered sites, from overnight campsites, to seasonal homes, to sites of ritual activity. This study and previous work in the area suggest that a landscape categorized as "marginal" by traditional standards successfully supported populations for millennia, and that caves and shelters have been and continue to be sites charged with meaning and importance by the groups that have visited and inhabited them in the past 10,000 years.

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Whitney Goodwin
Advisor: Brigitte Kovacevich
Anthropology, Dedman College

FOODWAYS AS A NEGOTIATION OF IDENTITY IN A PREHISPANIC BORDER AREA

My research investigates the processes of identity negotiation that occurred in prehispanic communities of northeast Honduras, situated at the border between Mesoamerica and Lower Central America. From the Classic Period (A.D. 200-700) to the Terminal Classic Period (A.D. 700-1000) expressions of affiliation with distant cultures in ceramic styles shifted from the north to the south. Despite limited data, previous research in the region has started to disentangle how indigenous populations expressed cultural affiliation, highlighting the existence of widely dispersed populations connected through enduring social and political networks. Building on that work, my dissertation project will investigate the contexts in which ceramic vessels that portray symbols of group identities were used and the foods that were prepared, cooked, and served in them. This work will provide a long-term perspective on how the micropolitics of foodways – what people eat and how they eat it – can inform on identity and how social relations are reinforced or transformed through practices related to food, especially in border areas. This poster presents results of pilot study research for my dissertation project, including preliminary excavations and analysis of ceramics, faunal remains, and soils.

Maggie Hagen;[UG] Christopher Roos
Advisor: Christopher Roos
Anthropology, Dedman College

BAYESIAN CALIBRATIONS OF RADIOCARBON DATES FROM POST-FIRE EROSION DEPOSITS

Radiocarbon dating of charcoal collected from sediments and soils helps Quaternary geologists and archaeologists to date stratigraphic sequences in a variety of depositional settings. From well stratified alluvial and colluvial deposits in northern Montana, we have used radiocarbon measurements of charcoal from post-fire deposits to build a fire history chronology. The stratigraphic information is combined with radiocarbon measurements in a calibration method that utilizes Bayesian statistics to produce radiocarbon ages that are more precise than those that do not incorporate contextual information. The higher resolution radiocarbon dates facilitate comparisons of the dated fire histories with climate and human histories.

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Natasha Holden;[UG] Gillian Wright
Advisor: Neely Myers
Anthropology, Dedman College

WOMEN AND WELL-BEING

In 2013, Dr. Myers interviewed 120 men and women in three regions of Tanzania about women, children and well-being. The women represented three major cultural groups: the Maasai, the Nyataru, and the Pare. Data analysis by the research team using Atlas.ti (a qualitative data analysis software) suggested the following: 1) Although the groups were very different culturally, many women voiced the same concerns; 2) Concerns included: limited educational opportunity; continued practices of illegal "initiation" rites (e.g., female circumcision); early marriage and child marriage; and, basic subsistence 3) Resources (or hoped-for) sources for well-being included: women's business training; women's support groups; private counseling; entrepreneurial opportunities; continued support for those affected by HIV/AIDS; and basic support for their children (school fees, clothes, shoes, food) Conclusions: Future directions for research include following-up with women and children in the summer ahead, and helping non-governmental organizations develop interventions that can support women and well-being in ways that are meaningful to them.

Findings from this study may inform philanthropic efforts to provide sustainable solutions to poverty in Tanzania and for Tanzanian women and children; otherwise, commercial viability is limited.

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Nazia Hussain
Advisor: Carolyn Smith-Morris
Anthropology, Dedman College

HEALTH-SEEKING BEHAVIORS AND REPRODUCTIVE HEALTHCARE OF PREGNANT AND PARENTING WOMEN IN RECOVERY

Pregnant women late in their term (e.g. >17 weeks) often face barriers preventing access to reproductive healthcare in the United States, especially those identified as "drug users" or those without insurance. These barriers, including mandatory meconium (e.g. fetal stool) testing and doctors' attitudes of high-risk pregnancies, contribute to the ways in which pregnant women may seek and receive care. Active substance abuse strongly shapes the decision-making process with regards to healthcare, as the possibility of criminalization exists, which only hinders these women from access. Based on qualitative research at a large, urban residential treatment center, this report demonstrates how health-seeking behaviors and the process of recovery interact to influence women's healthcare outcomes. I find that seeking care is largely shaped by provider or institutional policies and by status of recovery. Further, despite present barriers, women in active recovery continue to seek general care in order to maintain long-term recovery.

Ashvina Patel
Advisor: Caroline Brettell
Anthropology, Dedman College

HEALTH CARE COORDINATION AMONG BURMESE REFUGEES IN DALLAS

Since 2007 the Dallas-Fort Worth Metroplex has resettled more than 17,000 Burmese refugees through a 2005 agreement brokered by the UNHCR, between the Thai and United States governments. This paper will present pilot research collected by a large Health Care Provider situated within walking distance from a major resettlement neighborhood in the DFW area. The preliminary data collected on the health behaviors within the Pediatric and Women's Clinic prove to set this population apart from the general population. Preference for formula over breastfeeding, translation issues, anemia, socio-cultural obstacles, and implications of cultural negotiations between the Burmese patients and the health care providers will be highlighted in this presentation. Finally, recommendations for a more integrated approach to health care and data collection will be suggested as this large Health Care Provider commits to providing targeted care for their refugee populations.

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Christina Stewart[UG]
Advisor: Dr. Sunday Eiselt
Anthropology, Dedman College

READING BETWEEN THE LINES: CERAMIC DESIGN PRODUCTION AND VILLAGE COLLAPSE AT THE EVE OF SPANISH CONTACT IN THE NORTHERN RIO GRANDE.

Biscuitware pottery is a characteristic feature of northern Rio Grande ceramic traditions and forms the bulk of ceramic assemblages at prehistoric archaeological sites in the Chama Valley, New Mexico. Produced from approximately AD 1375 to 1700, these wares are remarkable for their black and white decorations, thick walls and geometric designs. Archaeologists have divided this series into four temporal designations and they have tracked changes in manufacture styles as ancestral Pueblo (Tewa) populations grew and then collapsed at the eve of Spanish contact in early 1500s. Some researchers have suggested that declines in population coincide with a general breakdown of the biscuit ware ceramic tradition and the deterioration of design work on pottery vessels, but these observations remain impressionistic. This poster presents initial results of a pottery design analysis of ceramics recovered from one site, Sapawe'ouinge, to test this proposition and investigate the nature of the decline if it did occur. The implications of the study are far reaching. If present, a decline in the quality of line work could serve as one proxy measure for other biological and social stresses associated with village movement and reorganization.

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Beibei Yang
Advisor: Carolyn Smith-Morris
Anthropology, Dedman College

CHINESE FOREMEN' MALARIA MANAGEMENT IN ZAMBIA

Malaria troubles a great number of Chinese migrants in sub-Saharan Africa. This research aims to investigate Chinese foremen's malaria management experience in Zambia. All of my foremen informants were recruited by state-owned Chinese construction companies and then, sent to work in remote construction sites in different parts of Zambia. The poor sanitation of living condition primarily contributes to this high prevalence rate of malaria among Chinese contract workers. For treatment, several large-scaled construction sites hire on-site doctors to care for Chinese contract workers. Foremen who have no access to on-site doctors face plenty of difficulties because they have to either travel long distance to go to Lusaka, the capital city, to seek help from Chinese clinics; or to practice self-care to give injections to the sick without being professionally trained. To conclude, their low socioeconomic status contributes to their poor living condition which breeds mosquitoes easily and situates them in a medical-resource-deficient environment as well.

Dustin Allen; Mu Huang; David Keller; Scott Davis
Advisor: Scott Davis
Applied Physiology & Wellness, Simmons School of Education

THE EFFECT OF MULTIPLE SCLEROSIS ON CAROTID BAROREFLEX CONTROL OF HEART RATE AND BLOOD PRESSURE

Multiple sclerosis (MS) is marked by conduction abnormalities within the central nervous system that leads to impaired blood pressure regulation. However, the impact of these abnormalities on dynamic blood pressure control, particularly the timing of the responsiveness (i.e., latency), has not been examined. We tested the hypothesis that carotid-cardiac and carotid-vasomotor latency would be altered in individuals with MS (n=5) compared to healthy controls (CON, n=5). Carotid baroreflex function was assessed using 5-sec trials of neck pressure (NP, +40 Torr, simulated hypotension) and neck suction (NS, -60 Torr, simulated hypertension). Latencies (i.e., time-to-peak responses) were determined for both carotid-cardiac (peak HR responses) and carotid-vasomotor (peak MAP responses) by summing the R-R intervals from the onset of the respective stimuli to the R wave of the peak response. Carotid-cardiac latency was not different between for either NP (MS: 3.7±1.3, CON: 3.7±1.3 sec; p=0.97) or NS (MS: 1.6±1.1, CON: 1.9±0.8 sec; p=0.62). In addition, the carotid-vasomotor latency to NP (MS: 5.7±1.7, CON: 5.6±1.4; p=0.90), and NS (MS: 4.7±2.3, CON: 6.8±0.6; p=0.08) were not different. It appears MS does not markedly alter the timing of peak carotid-cardiac and carotid-vasomotor responses.

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Fran Brewer; Courtney Follit; Christopher Wheelis; Pia Vogel; John Wise
Advisor: Pia Vogel
Biological Sciences, Dedman College

INHIBITION OF ENERGY TRANSDUCTION IN P-GLYCOPROTEIN

Cancer chemotherapy failures often involve the over-expression of ABC-transporters like the MDR1 P-glycoprotein (P-gp). These transporters normally protect the cell by pumping toxins and xenobiotics across the membrane. Selection for cells over-expressing P-gp during chemotherapy, however, results in populations that are drug resistant. Recently, we used massively parallel in silico drug docking to identify molecules predicted to interact with higher affinity at the energy transducing structures of P-gp than at the drug transporting structures. In vitro assays verified that the compounds inhibited verapamil-stimulated ATP hydrolysis and only marginally stimulated basal ATP hydrolysis activities. This indicates that these compounds do not interact with drug binding domains. The effects of the identified compounds on ATP binding was then studied using spin-labelled ATP analogs and ESR spectroscopy. Results showed that some of the identified compounds decreased ATP binding stoichiometry to P-gp while others decreased ATP binding affinities. These studies further showed that inhibition by the compounds was reversible. The investigations suggest that the discovered P-gp inhibitors may make good drug leads. Experiments using ESR spectroscopy and site-specific spin-labelling of the are currently underway that may shed further light on the molecular mechanism of inhibition.

Compounds capable of inhibiting the function of P-glycoprotein and other closely related ABC transporters would be clinically useful in restoring efficacy to therapeutic drugs for treatment of diseases that have become multidrug resistant. Currently no such treatments are available. This work resulted in discovery and patent of four drug-like compounds that are capable of potently inhibiting P-gp and are candidates for downstream drug development and rational drug design.

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Courtney Follit; Amila Nanayakkara; Collette Marchesseault; Fran Brewer; John Wise; Pia Vogel
Advisor: Pia Vogel
Biological Sciences, Dedman College

REVERSAL OF MULTIDRUG RESISTANCE BY NOVEL INHIBITORS OF HUMAN P-GLYCOPROTEIN IN CELL CULTURE

Multidrug resistance (MDR) and chemotherapy failure are often due to overexpression of members of the ABC-transporter superfamily of proteins like MDR1 P-glycoprotein (Pgp). These membrane transporters protect cells from the accumulation of harmful toxins by using ATP hydrolysis to move a broad range of compounds across the plasma membrane. In MDR, however, the administration of chemotherapeutics selects for cancerous cells which overexpress Pgp thereby creating a population of cancer cells resistant to many types of chemotherapeutics. Using targeted molecular dynamic simulations and massively parallel drug docking studies, we have identified several novel compounds that inhibit transport by P-gp by targeting the ATP binding domains. Biochemical and biophysical studies have shown that these inhibitors do indeed bind to the nucleotide bind-

ing domains of P-gp and inhibit ATP hydrolysis. In the studies reported here, we have been able to re-sensitize MDR prostate and ovarian cancer cell lines to multiple chemotherapeutics when treated with the novel compounds. The compounds reverse MDR and restore sensitivities comparable to non-MDR parental cell lines. Limited toxicity was observed when non-cancerous cells were treated with the P-gp inhibitors alone. The results suggest that these novel P-gp inhibitors may serve as good drug leads for treating MDR and chemotherapy failure.

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Mu Huang; Nathan Morris; Ollie Jay; Scott L. Davis
Advisor: Scott Davis
Applied Physiology & Wellness, Simmons School of Education

THERMOREGULATORY DYSFUNCTION IN MULTIPLE SCLEROSIS PATIENTS DURING MODERATE EXERCISE IN A THERMONEUTRAL ENVIRONMENT

Impairments in sudomotor function during passive heat stress have been reported in multiple sclerosis (MS), a demyelinating disease of the CNS that disrupts autonomic function. However, little is known regarding exercise induced increases in core body temperature on thermoregulatory mechanisms in MS. Thus, the aim of this study was to test the hypothesis that thermoregulatory function is impaired in MS patients compared to healthy controls (CN) during moderate exercise. Thermoregulatory function in five patients diagnosed with relapsing-remitting MS and five mass-matched healthy controls were compared during a single bout of cycling exercise (fixed workload of 70 Watts) for 30-60 minutes in a climate-controlled room (25°C, 30% RH). Sweating thermosensitivity (MS: 0.56±0.15 vs CN: 0.81±0.13, p=0.04) was significantly lower while a delay in sweating onset time (MS: 14.8±10.0 min vs CN: 5.6±1.6 min, p=0.07) approached significance in MS patients compared to controls. These altered mechanisms of body temperature regulation likely contributed to a greater observed change in core body temperature measured rectally (MS: 0.84±0.34 °C vs CN: 0.37±0.27 °C, p=0.04) in patients with MS. This observed thermoregulatory dysfunction in MS patients may intensify disease symptoms limiting exercise tolerance. Supported by Kuzell Institute and National MS Society Grant RG4043A1/1.

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Tetiana Hutchison; Megan Romeo; Aditi Malu; Rebecca Brady; Janice Kim; Averi White; Catherine Hazen; Rachel Gardner; Mary Hancock; Rao Neha; Nguyen Olivia; Chu Jessica; Robert Harrod
Advisor: Robert Harrod
Biological Sciences, Dedman College

CHARACTERIZATION OF THE ROLES OF TIGAR AND PARKIN IN PREVENTING ONCOGENE-INDUCED MITOCHONDRIAL DAMAGE DURING RETROVIRAL CARCINOGENESIS

The human T-cell leukemia virus type-1 (HTLV-1) transforms CD4+ T-lymphocytes and causes adult T-cell leukemia/lymphoma (ATL), an often-fatal hematological malignancy that is resistant to most anticancer treatments. The HTLV-1 proviral genome encodes at least seven nonstructural/regulatory proteins (Tax, Rex, p8I, p12I, p13II, p30II, Hbz). The latency maintenance factor, p30ll, suppresses viral gene expression and promotes proviral replication through cooperation with the c-Myc oncoprotein. Previous studies have shown that p30ll enhances c-MYC-dependent transactivation and oncogenic potential by stabilizing recruitment of the TIP60 acetyltransferase to p30ll/c-MYC nuclear complexes. TIP60 is a transcriptional cofactor for both c-Myc and p53. Our lab has found that the induction of the Tp53-induced glycolysis and apoptosis regulator (TIGAR) by HTLV-1 p30II prevents the accumulation of c-Myc-induced reactive oxygen species and inhibits oncogene-associated cellular senescence and apoptosis. We hypothesize that p30ll may activate antioxidant-signaling pathways to induce mitochondrial targeting of TIGAR and the Parkin ubiquitin ligase to prevent oxidative mitochondrial damage associated with aberrant oncogene-activation in HTLV-1-infected T-cells. These studies reveal a pivotal role for the p30ll protein in promoting c-myc oncogene-activation during retroviral carcinogenesis.

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Nithya Mary Joseph
Advisor: Johannes Bauer
Biological Sciences, Dedman College

MECHANISM OF TAKEOUT-DEPENDENT LONGEVITY IN D. MELANOGASTER

Overexpression of takeout specifically in the adult fat body extends longevity by ~40%. Flies overexpressing takeout show severe defects in male mating behavior and female egg laying (Chamseddin, Khan et al. 2012). In Manduca sexta, takeout has over 24% identity and 54% similarity to the Juvenile Hormone binding protein(Sarov-Blat, So et al. 2000). When treated with

methoprene (JH analog), the longevity and mating phenotypes observed in takeout overexpressing flies were reversed(Chamseddin, Khan et al. 2012). This might suggest that takeout extends lifespan by decreasing JH signaling. As takeout overexpressing male flies have reduced courtship behavior, it might be possible that takeout is able to regulate signaling pathways that are important for specific social behaviors. In animals, social behaviors are regulated through pheromones. Interestingly, in flies pheromone profile changes with corpora allata (site of JH production) knockout(Bilen, Atallah et al. 2013). This might indicate that JH plays a significant role in pheromone production. I hypothesize that takeout exerts its effect through modulation of Juvenile Hormone signaling, which in turn modulates pheromone production. Altered pheromone production may in turn change male mating and female fertility phenotypes. This will then ultimately lead to lifespan extension.

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Aditi Malu; Tetiana Hutchison; Robert Harrod
Advisor: Robert Harrod
Biological Sciences, Dedman College

DIFFERENTIAL REGULATION OF P53-DEPENDENT APOPTOSIS BY CELLULAR FACTORS AND MODULATION BY THE HTLV-1 TRANSACTIVATOR PROTEIN TAX

The human T cell leukemia virus type-1 (HTLV-1) infects and immortalizes CD4+ T-cells and causes adult T-cell leukemia/lymphoma (ATL), an aggressive lymphoproliferative malignancy usually associated with poor clinical outcomes. The HTLV-1 provirus encodes several regulatory and accessory factors, including the transactivator protein Tax. Tax is considered to be the major oncoprotein of HTLV-1 and regulates the expression of viral and cellular genes through its interactions with host transcriptional and signalling components. In addition to its central role in T-cell immortalization and transformation, Tax also induces cellular senescence and apoptosis. In particular, the p300/CBP-binding domain of Tax, spanning amino acid residues 85-109, induces apoptosis by titrating the transcriptional coactivator, p300. Importantly, the molecular mechanism(s) by which Tax-p300 interactions cause apoptosis remain to be determined. We hypothesize that HTLV-1 Tax-p300 interactions may inhibit p53-K372-acetylation and lead to K372-methylation by Set-7/9 and subsequent preferential acetylation of lysine K120 by TIP60, associated with the induction of apoptosis. My project will test whether Tax-p300 molecular interactions affect posttranslational modifications of p53, and identify cellular cofactors that differentially regulate the expression of pro-apoptotic genes through p53-K120-acetylation.

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Mindy McClean;[UG] Gang Chen; Fran Brewer
Advisor: Pia Vogel
Biological Sciences, Dedman College

ASSEMBLY AND APPLICATION OF PHOSPHOLIPID NANODISCS FOR THE STUDY OF P-GLYCOPROTEIN

As many as 40% of recurring cancers often develop multidrug resistance (MDR) to chemotherapeutic treatment due to over-expression of P-glycoprotein (P-gp), a member of the ABC transporter protein family. Our research has focused on finding inhibitors of P-gp that are capable of re-sensitizing MDR cancers to therapy. In order to investigate the mechanism of action of the discovered inhibitors, we employ electron spin resonance spectroscopy and biochemical assays. Due to the inherent instability of these mammalian membrane proteins, many of these analyses are challenging. We therefore are establishing nanodisc technology to incorporate and stabilize purified P-gp for our drug finding and mechanistic studies. Nanodiscs are phospholipid bilayers contained within a membrane scaffold protein and mimic native membrane conditions. Initial studies indicated that a cysteine-less mutant of the mouse MDR3 P-gp could be incorporated into nanodiscs and showed enhanced catalytic activity and stability. We are currently establishing nanodiscs as a uniform platform from which different mutants of P-pg can be closely studied and characterized. Nanodiscs may also enable us to utilize human MDR1 P-gp in drug finding studies. This particular protein has been shown to be too unstable in micelle solution to be successfully used in these experiments.

James McCormick
Advisor: John Wise
Biological Sciences, Dedman College

TRANSPORT OF ALZHEIMER'S ASSOCIATED AMYLOID-B THROUGH MEMBRANES CATALYZED BY P-GLYCOPROTEIN

The broad range of substrates that can be transported by ABCB1 class of plasma membrane transporters has been well established. Of these, MDR1 P-glycoprotein transporter (P-gp) is the most common and best studied. While best known for it's ability to confer general multidrug resistance to a population of cancer cells and for preventing pharmaceutical products from crossing the blood brain barrier (BBB), P-gp action has recently been implicated in Alzheimer's disease (AD). One of the clearance pathways of amyloid-β, thought to be a causative agent in neurodegeneration and symptom onset, is through P-gp across the BBB. In the present study a dynamic P-gp model is used to allow the docking of amyloid-β and an unrelated large molecule as a control and simulation of the catalytic cycles through four different crystallographic conformations of related proteins using targeted molecular dynamics simulations (TMD). Despite movement of amyloid-β was not targeted by TMD, transport through the membrane by human P-gp was observed during the putative catalytic cycles. Successful transport of amyloid-β in the "open to the cytoplasm" conformation through the membrane and being released at the extracellular space has been observed.

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Olena Odnokoz; Kyle Nakatsuka, Austin McGinnis, Jacqueline Nguyen, Vinita Mundluru, Vladimir Klichko, Judith Benes, Marziyeh Badinloo, William Orr, Svetlana Radyuk
Advisor: Svetlana Radyuk
Biological Sciences, Dedman College

THE ROLE OF MITOCHONDRIAL PEROXIREDOXINS IN THE PHYSIOLOGY OF DROSOPHILA MELANOGASTER

ROS are no longer viewed as just a toxic by-product of mitochondrial respiration. It was found that ROS could act as messenger molecules required for proper redox signaling and normal cell functioning. The disregulation of redox signaling can lead to the development of aging and the promotion of age-associated diseases. In prior studies we showed that under-expression of both Drosophila mitochondrial peroxiredoxins (dPrx3 and dPrx5), which play a prominent role in hydrogen peroxide-mediated signaling, causes severe shortening of lifespan, disruption of thiol homeostasis and significant induction of tissue-specific apoptosis. In this study we found that under-expression of both dPrx3 and dPrx5, which is correlated with pro-oxidizing redox state, has significant effect on fly physiology parameters including sleep-wake behavior, intestinal barrier function, temperature-sensitive paralysis, production of antimicrobial peptides, and metabolic processes. To identify specific pathways by which under-expression of both dPrx3 and dPrx5 is responsible for observed changes in double mutant flies we have performed total transcriptome analysis of double mutant flies vs control flies. The RNA sequencing analysis together with Gene ontology (GO) and Functional clustering will help to identify pathways sensitive to dPrx3 and dPrx5 depletion and thus provide candidates for causal inferences.

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Ketetha Olengue;[UG] James W. McCormick, Pia D. Vogel and John G. Wise
Advisor: John Wise
Biological Sciences, Dedman College

COMBINATORIAL IN SILICO DRUG-LEAD OPTIMIZATION FOR TARGETED INHIBITORS OF P-GLYCOPROTEIN

P-glycoprotein (P-gp) is an ATP-powered efflux pump of the plasma membrane that is responsible for removing toxins from cells. While this is beneficial in normal cells, P-gp overexpression is often responsible for the failure of chemotherapies in cancer and HIV treatments. Because P-gp transports many different drugs, multidrug resistances (MDR) to many unrelated therapeutics is often a consequence of P-gp overexpression. Inhibitors of P-gp that might reverse MDR often fail because they are pumped out of the cell. We identified 3 inhibitors that target the nucleotide binding domains of P-gp, avoid the drug binding domains, and reverse MDR in cancer cell lines. A big problem in optimizing any drug-lead is that the number of possible chemical variations of the lead always out-number those that can be synthesized and tested. We present here a novel computational approach that generates many thousands of compounds related to a drug-lead structure, analyzes them for interaction with the target protein, and rates them for improvements in target binding potential. We have applied this approach to inhibitors of P-gp that reverse multidrug resistances in cancer and report on the application of these variants to high perfor-

mance computational drug docking experiments with P-gp. These methods aimed at expediting the optimization of drug leads may be generalizable to different systems.

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Zahra Bassampour; David Son
Advisor: DAVID SON
Chemistry, Dedman College

SELECTIVE REACTIONS OF ETHANOLAMINE AND 2-(METHYLAMINO)ETHANOL FOR DEGRADABLE EPOXY AND DENDRIMER SYNTHESIS

The selective reactions of ethanolamine and 2-(methylamino)ethanol with chloroalkylsilanes and acrylates were studied. Ethanolamine and 2-(methylamino)ethanol are inexpensive, commercially available compounds, and can participate in different reactions through either their amine or hydroxyl terminal points. The selective syntheses of Me4-nSi(OCH2CH2NH2)n , n = 1-3 and Me4-nSi(OCH2CH2NHMe)n, n = 1-4 by the reaction of MenSiCl4-n , n = 0-3, with ethanolamine and 2-(methylamino)ethanol and in some cases transetherification of alkyloxysilanes were attempted. The resulting amine-terminated compounds were used to make degradable epoxy networks. Furthermore, HOCH2CH2N(CH2CH2COOCH2CH=CH2)2 was synthesized from a selective reaction of ethanolamine and allyl acrylate. The resulting hydroxyl-terminated compound was used for the synthesis of small dendrimer precursors. The details of the selective reactions and the epoxy and dendrimer syntheses will be discussed.

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Jian Cao; R. Lopez; J. M. Thacker; J. Y. Moon; C. Jiang; S. N. S. Morris, e J. H. Bauer; P. Tao; R. P. Mason and A. R. Lippert
Advisor: Lippert Alex
Chemistry, Dedman College

CHEMILUMINESCENT PROBES FOR IMAGING H2S IN LIVING ANIMALS

Hydrogen suIfide (H2S) is an endogenous mediator of human health and disease, but precise measurement in living cells and animals remains a considerable challenge. We report the total chemical synthesis and characterization of three 1,2-dioxetane chemiluminescent reaction-based H2S probes, CHS-1, CHS-2, and CHS-3. Upon treatment with H2S at physiological pH, these probes display instantaneous light emission that is sustained for over an hour with high selectivity against other reactive sulfur, oxygen, and nitrogen species. Analysis of the phenol/phenolate equilibrium and atomic charges has provided a generally applicable predictive model to design improved chemiluminescent probes. The utility of these chemiluminescent reagents was demonstrated by applying CHS-3 to detect cellularly generated H2S using a multi-well plate reader and to image H2S in living mice using CCD camera technology.

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Hongzhang Han; Nicolay Tsarevsky
Advisor: Nicolay Tsarevsky
Chemistry, Dedman College

AZIDE CONTAINING LINEAR/HYPERBRANCHED POLYMER PREPARED VIA EXCHANGE REACTION AT HYPERVALENT IODINE CENTER IN ONE-STEP SYNTHESIS

Advanced materials with diverse functionalities always attract intensive interests for science researchers. One simple access to functional moieties is through Copper-Catalyzed Azide-Alkyne Cycloaddition (CuAAC) “click” chemistry for its reaction efficiency and variety of functional groups. Introducing azido group into molecules however requires excess process which limits the broad applications in industry. Sodium azide is a common azide salt with several advantages in economic cost, storage and transportation as well as toxicity concerns, which makes it used as a common azido group source. However, the nucleophilic substitution reaction used to modify polymeric materials also requires multiple steps and has limitation by most of organic solvents as well. Recently our group developed a novel one-step method synthesizing azide containing hyperbranched polymer utilizing hypervalent iodine compound (DAIB) and sodium azide as both initiator and azide source at a broad temperature range. High azide radical concentration prevents the produce of hyperbranched polymer from gelation even at high cross-linker ratio to monomer. This new method provides a one-step efficient synthesis of linear/hyperbranched polymeric materials with great potential applications. Acknowledgement. This research was supported by the Petroleum Research Fund of the ACS (PRF# 51030-DNI7).

Alan Humason; Dieter Cremer
Advisor: Dieter Cremer
Chemistry, Dedman College

WHAT IS THE LONGEST CARBON-CARBON BOND EVER OBSERVED IN CHEMISTRY?

The chemical bond is a concept rather than an observable quantity, and as such the distance between directly interacting atoms can only poorly describe whether there exists bonding or not. One needs a well-defined model of the chemical bond, preferentially based on measured quantities, to answer the question for the longest bond ever observed. Covalent bonds between neighboring C atoms can be lengthened as a consequence of i) steric repulsion between bulky substituents, ii) electron deficient bonding, iii) occupation of antibonding orbitals, iv) decoupling of spin pairs leading to open shell singlet states (pancake bonds.) Alternately, weakly interacting C atoms can be stabilized v) by clamping them together with the help of short bridges, vi) by electrostatic attraction between charged C atoms, vii) by dispersion interactions between substituents or viii) a complex combination of these effects. In each case, the existence of CC bond is verified by analyzing electron and energy density in the interatomic region. Using accurate quantum chemical calculations we demonstrate that a covalent electron pair CC bond can be lengthened by 13% whereas an electron-deficient CC bond leads to distances up to 2 angstroms. However, CC distances between 2 and 3.5 angstroms describe stabilizing through-space CC interactions rather than covalent CC bonding.

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Jameela Lokhandwala; Hilary Hopkins; Brian D Zoltowski
Advisor: Brian Zoltowski
Chemistry, Dedman College

STRUCTURAL CHARACTERIZATION OF FUNGAL PHOTORECEPTOR-ENVOY

Organisms contain elaborate mechanisms to sense and adapt to environmental stimuli. In particular, circadian clocks sense external cues to coordinate metabolism, growth, and sexual development to the diurnal light cycle. In organisms such as plants, fungi and animals, these clocks consist of complex networks of feedback loops integrated into a central circadian oscillator. In the filamentous fungi Hypocrea jecorina (anamorph T. reesei) cellulase gene expression, carbon catabolite repression, sulfur metabolism and adaptive stress responses are all under control of blue-light. A Light-Oxygen-Voltage (LOV) domain containing photoreceptor, ENVOY (ENV1) acts as a central node to integrate multiple input pathways into transcriptional machinery. This is achieved by two primary mechanisms: 1) As a direct photoreceptor, ENV1 acts in conjunction with another LOV domain containing photoreceptor Blue-Light-Receptor-1 (BLR1) to regulate clock controlled gene transcription by the BLR1/BLR2 complex. 2) ENV1 acts in a light-dependent and light-independent mechanism to regulate cellulase gene expression, stress responses and sexual development.Interestingly, although the core circadian machinery in T. reesei is conserved with N. crassa,(VVD=ENV1, Blr1=WC1, Blr2=WC2), they differ on the level of fundamental chemistry and signaling mechanisms.

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David McLeod; Nicolay Tsarevsky
Advisor: Nick Tsarevsky
Chemistry, Dedman College

SYNTHESIS AND POST-POLYMERIZATION MODIFICATION OF WELL-DEFINED EPOXIDE-FUNCTIONALIZED STYRENIC POLYMERS

Polymers that are functionalized with reactive moieties, such as activated esters, epoxides, alkyl halides, etc., can be modified with low molecular weight compounds to produce a plethora of useful functional materials. The modification of epoxide containing polymers with amines and phenols is common in the literature, but there are no reports on the modification of such polymers with non-phenolic alcohols. Using glycidyl butyrate, which is similar to the commercially available monomer glycidyl methacrylate (GMA), and styrene oxide as model compounds, it was determined that the carbon tetrabromide catalyzed modification of the phenyloxirane moiety with alcohols was significantly more efficient than that of the glycidyl moiety. The epoxide functionalized styrenic monomer 4-vinylphenyloxirane (4VPO) was therefore efficiently synthesized and then polymerized utilizing low copper catalyst concentration atom transfer radical polymerization (ATRP) and reversible addition fragmentation chain transfer (RAFT) polymerization techniques to form well-defined linear and star-shaped homopolymers and block copolymers. The epoxide groups of the linear poly(4VPO) homopolymers were then reacted with a library of alcohols and phenols, some of which contained reactive functionalities such as azide, alkyne, allyl, etc., using carbon tetrabromide as a catalyst.

Sara Merrikhihaghi
Advisor: Alexander Lippert
Chemistry, Dedman College

FLUORESCENT PROBES TO STUDY NITROXYL

Nitroxyl (HNO) has been investigated in the past two decades due to its possible important biological effects. Therefore, very reliable techniques are required to study its physiological and pathological roles. Fluorescent probes are one of the key methods to detect HNO. However, lack of various methods to detect HNO in vivo guided researchers to synthesize more selective, and cell trappable probes. Our lab has recently focused on design, synthesis, and in vivo testing of HNO probes.

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Joon Yong Moon[UG] Peng Tao
Advisor: Peng Tao
Chemistry, Dedman College

COMPUTATIONAL INVESTIGATION OF POTENTIAL ENERGY SURFACES OF NITRIC OXIDE AUTOXIDATION INTERMEDIATES: N_2O_4 AND N_2O_3

Nitric oxide (NO), a highly reactive species, is a ubiquitous endogenous cell-signaling molecule. Despite extensive research effort, understanding the cell signaling mechanism of NO still remains a challenge. Here, we carried out quantum chemistry calculations to investigate the potential energy surfaces comprising many isomers of two intermediates from nitric oxide autoxidation: N_2O_3 and N_2O_4. Benchmark calculations of several density functionals, including B3LYP, M06, M06-2X, PBE1PBE, and ωB97XD, were carried out using symmetrical N_2O_4 dissociation pathway. The B3LYP functional produced the results that are the closest to the multi-reference results (J. Am. Chem. Soc., 2012, 134, 12970–12978), and was used to carry out all the calculations in this research. Multiple isomers of N_2O_4 were characterized at B3LYP/aug-cc-pVTZ level of theory. The reaction pathways connecting these isomers were also calculated using intrinsic reaction coordinate (IRC) method. The potential energy surface of N_2O_3 was also characterized in a similar way. Several relatively stable intermediates on the potential energy surfaces of both N_2O_4 and N_2O_3 are identified that may play important roles in NO cell signaling process.

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Vytor Oliveira; Elfi Kraka; Dieter Cremer
Advisor: Elfi Kraka
Chemistry, Dedman College

HALOGEN BONDING IN CHEMISTRY: A SYSTEMATIC STUDY OF ITS NATURE AND STRENGTH.

Halogen bonding is the non-covalent interaction between a halogen atom (Lewis acid) and a molecule containing heteroatoms such as O, N, S, etc. (Lewis base). Halogen bond interactions have attracted broad interest because of their importance in medicinal chemistry, biochemistry, crystal engineering, and self-assembly materials. Although halogen bonding was detected more than 40 years ago a quantitative description of the nature and strength of this interaction is still missing. In this work, a systematic study of the strength and nature of halogen bonding was carried out for 90 complexes formed by dihalogens, hetero-halogens and halocarbons interacting with heteroatom containing molecules. As appropriate tools to assess the existence and strength of halogen bonding, the local stretching force constant ka, the electron density ρ(r), and the energy density H(r) were used. It is found that halogen bonding strongly depends on the polarizability of the atoms involved and on the amount of covalent bonding character as reflected by the degree of two-electron delocalization from a lone pair orbital of a heteroatom into the σ* orbital of the bond involving the halogen. Based on these findings a reliable recipe on how to choose the partners of halogen bonding to meet the strength requirements desirable in a new compound is presented.

Ashutosh Pudasaini
Advisor: Brian Zoltowski
Chemistry, Dedman College

TUNING OF BLUE LIGHT PHOTORECEPTOR ZEITLUPE BY ALTERING THE ACTIVE SITE ENVIRONMENT

Blue light sensitive photoreceptors of the Zeitlupe (ZTL), Flavin-Kelch-Fbox-1 (FKF1), and LOV-Kelch-Protein-2 (LKP2) family are known to be integral for regulation of circadian rhythm in plants. These proteins have a core LOV (Light, Oxygen, Voltage) domain which is bound to FMN/FAD cofactor. The active site cysteine forms a C4a-adduct with the flavin molecule upon blue light excitation causing a conformational change, which is referred to as "light state". Previously we had developed a simple LOV-photoreceptor model to investigate the role of these clock photoreceptor proteins. Protein sequence alignment reveal several key resides that have potential effects in tuning of these LOV-photoreceptors. Here we will discuss the effects of residue substitutions and implication on the photochemistry/function of ZTL-LOV in much detail.

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Miguel Quimbar;[UG] Katie Krenek; Alexander Lippert
Advisor: Alexander Lippert
Chemistry, Dedman College

SMARTPHONE-BASED CHEMILUMINESCENCE POINT-OF-CARE IMAGING DEVICE

Asthma is the most common chronic disease affecting children in our world today. Asthma cannot be cured so it is imperative that patients monitor and treat their asthma or risk worsening symptoms that in extreme cases can result in severe injury or death. Asthma usually develops during early childhood, but can sometimes manifest itself in patients well into adulthood and has been increasingly reported in the elderly. In light of the increasing number of new asthma patients, the need for a device to detect asthma early grows stronger. I am developing a novel smartphone-based point-of-care imaging system that uses chemiluminescent probes to detect and quantify asthma-indicating biomarkers present in exhaled breath. To asses a patient, a doctor would only need to acquire an exhaled breath sample and perform a 30 second assay before receiving the results. This system will aid doctors in the process of monitoring their patients' asthma by providing a reliable method of directly and quickly measuring oxidative stress in patients. This system could be used to quickly and cheaply check patients' lung condition, but it would be an invaluable tool in monitoring the wellbeing of current asthma patients. I will present results showing the viability of this system and my current results using the system using stock solutions.

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Dani Setiawan; Elfi Kraka; Dieter Cremer
Advisor: Dieter Cremer
Chemistry, Dedman College

PNICOGEN BONDING: A NEW TYPE OF CHEMICAL INTERACTIONS IMPORTANT FOR MATERIAL SCIENCE

Noncovalent interactions between pnicogen atoms were first reported in the 70ies on the basis of the NMR spectra of carborane-phosphino derivatives. It took almost 30 years to demonstrate that through-space phosporus-phosporus interactions can be as strong as hydrogen bonds. In the current study, it is proved that one can use vibrational spectroscopy to study the strength of the pnicogen-pnicogen interactions utilizing the local pnicogen,pnicogen (E, E') stretching vibrations. Vibrational modes probe the electronic structure and the bond strength of a molecule or a molecular complex. The local stretching force constants obtained from decoupled vibrational modes provide a direct measure of the strength of the corresponding bond and the bending force constants a measure for bond-bond interactions based on hybridization, electrostatic, and polarization effects. Based on accurately calculated local stretching force constants, the mechanism of pnicogen bonding, ways of strengthening the E, E' interactions, and the reliable detection of E,E' bonding with the help of Tetrahetrz spectroscopy will be discussed. The importance of pnicogen bonding for material sciences will be outlined.

Thomas Sexton; Thomas More Sexton; Elfi Kraka; Dieter Cremer
Advisor: Dieter Cremer
Chemistry, Dedman College

UNRAVELING THE SECRETS OF CHEMICAL REACTIONS

Traditionally, the mechanisms of homogeneous catalysis reactions are studied by searching for potential intermediates and determining the energetics of the reaction in form of activation barrier and reaction energy. In this study, a modern computational approach to the mechanistic problem is taken by following the reaction complex from the van der Waals region through the reaction valley to the transition state and then down through the exit valley towards the products. This path and the surrounding valley are examined by the Unified Reaction Valley Approach (URVA). In this way, it is possible to decode the complex reaction dynamics and the concomitant electronic structure changes of a catalyzed reaction via the analysis of specific features of the reaction valley. The principles of the URVA analysis are shown for the prototype Diels-Alder reaction of 1,3-butadiene and ethene. Additional results in Diels-Alder cycloaddition reactions of methyl acrylate with 1,3-butadiene catalyzed by Lewis acids are presented, as well as ongoing work in iron-catalyzed hydrogenation of carbonyl groups. Based on these studies, a new concept is put forth for applying the URVA analysis in homogeneous catalysis: distortions seen on the path immediately before and after the transition state hint towards electronic structure changes needed to stabilize that transition state.

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Yashas Singri;[UG] Ashutosh Pudasaini; Katherine Powers
Advisor: Brian Zoltowski
Chemistry, Dedman College

INVESTIGATION OF PHOTOCHEMICAL PROPERTIES OF BLUE LIGHT PHOTORECEPTOR ZEITLUPE (ZTL) FROM ORYZA SATIVA (RICE)

Arabidopsis thaliana is commonly used as a genetic model organism to study photoreceptors involved in regulation of the plant circadian clock. Several photoreceptors of the Flavin-Kelch-Fbox-1 (FKF1), Zeitlupe (ZTL) and LOV-Kelch-protien-2 (LKP2) family are studied in this genetic model. Unfortunately, such photoreceptor models are limited to the understanding of A. thaliana functions. Characterization of the photoreceptor ZTL in Oryza sativa (rice) has allowed us to understand its structural and kinetic properties. Our results indicate that mechanisms identified in A. thaliana may not be generally applicable to all plant species.

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Zhaoxu Wang
Advisor: Nicolay Tsarevsky
Chemistry, Dedman College

SYNTHESIS OF HIGHLY BRANCHED POLYMERS WITH PERIPHERAL VIOLOGENS

Highly branched polymers with peripheral viologens were designed to increase the lifetime of reduced form of viologen in solar cell so reduce the charge recombinations which lower the cell efficiency. The precursor polymer, highly branched polymers with alkyl bromide as peripheral groups, were synthesized by one-pot polymerization of styrene as main monomer, ethylene glycol dimethacrylate as branching agent and carbon tetrabromide as chain transfer agent. The peripheral alkyl bromide groups were then used to alkylate 4, 4’-dipyridyl from one end. The other end of 4, 4’-dipyridyl was capped by propyl/butyl bromide in the next step. Polymers with different weight ratios of viologens, which were expected to have different phase behavior in the solar cell, were synthesized by manipulating the alkylation condition such as solvent, temperature and reaction time.

Shannon Woodruff; Nicolay Tsarevsky
Advisor: Nicolay Tsarevsky
Chemistry, Dedman College

SYNTHESIS, CHAIN EXTENSION, AND POST-POLYMERIZATION MODIFICATION OF HIGHLY FUNCTIONAL BRANCHED POLYMERS

The interest for highly branched polymers stems from their potential in applications involving drug delivery, imaging, and reactive coatings, among others. Several methods are typically employed to prepare such polymers, but one that has attracted recent attention due to its ease of experimental setup is the copolymerization of mono- and multivinyl monomers in the presence of a chain transfer agent, which effectively limits the number of crosslinker units incorporated per growing chain, and thus delaying gelation. In this study, CBr4 was employed as the chain transfer agent. The obtained polymers with multiple alkyl bromide end groups, were used as macroinitiators for atom transfer radical polymerization. Furthermore, the use of monomers with reactive functional groups (glycidyl methacrylate) provides a synthetic route to a universal precursor of a number of functional materials, e.g., highly functional water-soluble cationic polymers.

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William Caylor
Advisor: Santanu Roy
Economics, Dedman College

TEMPTATION AND SELF-CONTROL IN A MARKET FOR DURABLE GOODS

Consumers may purchase durable goods on the basis of short-term "temptation," as well as their long-term interests. I adapt Gul and Pesendorfer's (2001) representation of self-control preferences to a market for durable goods. Consumers' temptation will ameliorate a monopoly seller's own time-inconsistency problem, and strengthen the seller's incentive to improve the quality of the good. However temptation decreases total surplus in the market.

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Andres Giraldo; Jesus Canas
Advisor: Omer Ozak
Economics, Dedman College

CAUSALITY RELATIONS BETWEEN INTERNATIONAL TRADE AND GROWTH WITHIN NAFTA

The causality relation between international trade and growth has been studied widely in the literature but only taking into account individual countries. The idea in this paper is to test the direction of the causality between international trade and growth but within a trade bloc as NAFTA. We extend the traditional empirical strategy to use both total production and bilateral trade considering only the real value of specific exports as a measured of trade, to account for the contribution of bilateral trade on growth or vice versa. Although the empirical strategy is not novel, so is the inclusion of specific trade instead of either total exports or imports. Due to the limitation of data, the hypothesis of exports leading growth or growth leading trade are contrasted only considering two countries instead of the whole bloc. Analyzing Mexico and Canada we find that there is evidence to ensure that Mexico has been benefited of trade with Canada but the opposite is not true. For US and Canada we find that there is no evidence of long run relationship among variables. Lastly for US and Mexico we find that exports in both countries are Granger caused by the other three variables, while US GDP is Granger caused for the other variables. However, this is counterintuitive, since US does not exhibit dependency on trade.

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Gregory Johnson
Advisor: Daniel Millimet
Economics, Dedman College

HIRING WAGES AND THE STIGMA OF LONG-TERM UNEMPLOYMENT: A TREATMENT EFFECT STOCHASTIC FRONTIER MODEL WITH ENDOGENOUS SELECTION

I investigate the effect of long-term non-employment on reemployment wages. This paper proposes two main channels for an effect on wages, one through the depreciation of human capital due to non-employment, and the other due to a loss of negotiating power due to the stigma of long-term non-employment. To accomplish this I employ a treatment effect stochastic frontier model with endogenous selection. This model will control for the endogeneity of long-term unemployment using

state variances in unemployment insurance benefits, while also separating out the effects on wages via worker productivity vs. the extraction of efficiency wages via bargaining power. I use date from the Survey of Program Participation, a four year longitudinal survey of US residents from 2008-2012. The survey covers the Great Recession, a period with high levels of unemployment and a large number of the long-term unemployed. Findings are preliminary but suggest long-term non-employment significantly lowers reemployment wages.

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Mariam Kharaishvili
Advisor: Nathan Balke
Economics, Dedman College

MONETARY POLICY WITH A LARGE BALANCE SHEET

The Federal Reserve has declared that it will maintain the large balance sheet and pay market interest rate on reserves. However, it is still hard to say how long this new regime lasts. The Fed is not committed to paying market interest rate on reserves and the size of the balance sheet can be considered to be a new monetary policy tool on its own. This paper constructs a simple deterministic general equilibrium model to analyze if a large balance sheet is a new equilibrium. I allow for negative interest rates and study how they contribute to going back to a normal regime, where central bank has a small amount of reserves and pays no interest on it.

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Jing Li; Tim Salmon
Advisor: Tim Salmon
Economics, Dedman College

TEAMWORK OR FREE RIDING: AN EXPERIMENTAL STUDY OF THE EFFECT OF COMMUNICATION ON COMPLEX DECISION MAKING

It is often found by both psychologists and economists that several heads are better than one in solving problems in the sense that groups who can discuss how to make a decision do better than individuals. However, when facing a complex decision problem such as choosing a health insurance plan, where decision-makers have to collect information and evaluate a large set of options on multiple dimensions, it is not clear that having the option of communicating with others will lead to better decisions for various reasons. One reason is that they may have an incentive to count on others who face the same problem instead of evaluating options on their own. If everyone in a group tries to free ride and reduce effort, they may end up making worse or even less informed decisions than individuals who have to decide alone. In a laboratory experiment, we study how communication may affect information acquisition and decision quality. We find that free riding and other possible negative consequences of communication are not found. We instead find that subjects actually cooperate and solve the inherent social dilemma problem in data collection. Therefore, in decision problems similar to the one studied in this paper, allowing for the option of communicating with others may not impair decision quality.

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Punarjit Roychowdhury
Advisor: Daniel Millimet
Economics, Dedman College

VISIBLE INEQUALITY, STATUS COMPETITION AND CONSPICUOUS CONSUMPTION: EVIDENCE FROM INDIA

In a world where individuals care about social status as determined by the rank in the distribution of conspicuous consumption among peers, a fall in the level of visible inequality, by intensifying the degree of status competition, is likely to cause individuals to spend more on conspicuous goods. I examine this hypothesis using nationally representative micro data from India. I find that a decrease in the level of visible inequality, ceteris paribus, causes conspicuous consumption of households to increase significantly. This increase in conspicuous spending not only represents consumption distortion, but is also wasteful as it results in no improvement in one's social status due to parallel action of others. From a policy perspective, this suggests that traditional policies targeted to reduce economic inequality may have serious unintended consequences. Rather a more effective approach might be to combine such policies with social policies that represses one's desire to compete in status.

Ren Zhang
Advisor: Nathan Balke
Economics, Dedman College

NEWS SHOCK AND THE EFFECTS OF MONETARY POLICY

Monetary shock is normally identified by taking Cholesky decomposition to the covariance matrix in the VAR framework. Recent papers (e.g. Carlstrom, Fuerst and Paustin (2009, JME)) find that the Cholesky monetary shock tends to be confounded with the technology process. This paper responds to the criticism by developing a new identification strategy where the monetary shock is orthogonal to the technology process. Under this new identification scheme, I find that, on the contrary to the mainstream theory, the unanticipated monetary shock exerts much less effects on both the output and the price. However, the systematic monetary policy does play an important role in amplifying the effects of the news component of the technology process. Moreover, it is demonstrated that the traditional Cholesky monetary shock tends to be confounded with the news shock. This explains why the contractionary Cholesky monetary shock usually induces a persistent output response and a short run inflation response. Lastly, a set of standard New Keynesian DSGE models are explored in their performance in replicating the novel VAR findings. The theoretical models illustrate that fiscal policy should be taken into the consideration while analyzing the effects of monetary policy.

This paper has several policy implications: Firstly, previous research exaggerates the effects of unanticipated monetary policy. This paper suggests that historical experience actually does not support the idea that central bank should make monetary policy by surprising the public. Instead, in the past century, they seldom makes unanticipated monetary policy. Secondly, this paper emphasize the importance for the central bank to react to agent's expectation about the future economic development. Lastly but not least importantly, this paper emphasize the coordination between the fiscal policy and monetary policy which is becoming a hot point in both macroeconomic policy and theory.

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Rachel Campbell; John Wagner
Advisor: John Wagner
Geology/Earth Science, Dedman College

STRATIGRAPHIC ARCHITECTURE AND RESERVOIR CHARACTERISTICS OF SLUMPED DISTRIBUTARY MOUTH BAR DEPOSITS, CRETACEOUS FERRON SANDSTONE, UTAH: AN ANALYSIS OF SEDIMENTARY FABRIC AND FACIES UTILIZING OUTCROP AND SUBSURFACE DATA

Deltaic systems form complicated multilateral and multilevel hydrocarbon reservoir systems due to the amalgamation and heterogeneity of their sandstone deposits. Sediment failures derived from gravitational instabilities are: (1) common features at the delta front; (2) structurally dynamic events that cause a reorganization of facies; (3) result in heterogeneous/compartmentalized reservoirs; and (4) act as internal barriers to hydrocarbon migration, extraction, and production. This study will provide characterization of delta-front sediment failures from an outcrop evaluation of rotated slumped distributary mouth bar deposits exposed in the Ferron Sandstone (east-central Utah). Additionally, a comparison of a subsurface example of slumped reservoir intervals from ExxonMobil's GC-18 and GC-6 fields, offshore GOM, will be utilized to relate outcrop concepts to subsurface production and seismic responses. The field outcrop dataset includes: (1) 10 measured sections; (2) architectural panels/sedimentological descriptions; (3) stratigraphic framework and relationship to updip growth faults; and (4) 5 whole cores from the outcrop with sedimentary fabric descriptions. The subsurface dataset includes GC-18/6 production data, well logs, and seismic examples.

Understanding the types of processes and associated deposits that occur at the delta front due to gravitational sediment instabilities have an economic impact on the extraction and producibility of these reservoirs and are applicable from a geohazard perspective as events of mass sediment movement occur in the Gulf of Mexico in modern times.

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Ryan Christianson
Advisor: Maria Beatrice Magnani
Geology/Earth Science, Dedman College

3D SEISMIC OCEANOCGRAPHY IN THE SOUTHERN CARIBBEAN SEA

The seismic reflection method is capable of imaging oceanic thermohaline structures as variations in density and acoustic velocity. This methodology is used here to map the finestructure of the Caribbean Current in the southeast Caribbean using

legacy seismic reflection data. In this study we use a seismic dataset consisting of a 215 km-long N-S transect that extends from the northern coast of Venezuela into the Venezuelan Basin. Data were acquired twice over the timespan of four days for seismic reflection (MCS profile) and wide-angle refraction crustal imaging purposes (OBS profile), therefore allowing for a serendipitous coincident imaging of the thermohaline structure of the Caribbean Sea. Because of the timing and geometry of acquisition, this dataset offers the additional opportunity to examine the temporal evolution of the oceanic currents internal structure. Data analysis reveals remarkably clear reflectors to a depth of ~ 1000 m. Reflectivity can be traced throughout the entire 215 km MCS and OBS lines, and is characterized by several high amplitude reflectors. Structures observed along the time-migrated profiles are preliminarily interpreted as evidence of a seasonal upwelling system in the southern Caribbean Sea. Time-lapse difference models indicate that the majority of the mixing between water masses occurs at shallow depths (~ 300 m).

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Yanjun Hao; Kirk McIntosh; Maria Beatrice Magnani
Advisor: Maria Beatrice Magnani
Geology/Earth Science, Dedman College

QUATERNARY DEFORMATION ACROSS THE PROTEROZOIC ALABAMA-OKLAHOMA TRANSFORM IMAGED BY HIGH-RESOLUTION SEISMIC REFLECTION DATA

Three high-resolution marine seismic reflection profiles acquired along the Mississippi River image significant faults crossing in proximity of the inferred Alabama-Oklahoma Transform (AOT), southern margin of the Laurentia continent. The northern profile images two faults striking northwest that offset Cretaceous through Eocene Cane River reflectors, deforming likely Quaternary reflector in the upper 20-30 m. The central profile images a down-to-the-north normal fault interpreted as the northern edge fault of the Monroe Uplift, a Late Cretaceous uplift associated with igneous intrusions. The southernmost profile shows a down-to-the-south normal fault, which offsets Cretaceous and Paleocene-Eocene Wilcox Group reflectors by ~125 m and ~32 m respectively. Tilted reflectors beneath and probably in the Quaternary unit suggest very recent activity of the fault. The spatial coincidence of the imaged faults with the AOT suggests a reactivation of this late Proterozoic structure in the present stress field. The seismic data suggest that the AOT might a deformation zone spanning as wide as ~100 km. It persists as a weak zone in the lithosphere capable of accommodating the reactivation of Triassic-Jurassic syn-rift basement structures, focusing the emplacement of Late Cretaceous igneous intrusions, and controlling the location of subsequent deformation.

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Xie Hu; Zhong Lu
Advisor: Zhong Lu
Geology/Earth Science, Dedman College

LANDSLIDE DEFORMATION MONITORING USING INTERFEROMETRIC SYNTHETIC APERTURE RADAR (INSAR): AN APPLICATION TO RED BLUFF LANDSLIDE, WASHINGTON

Landslides are slope failures in response to the increased ratio of destabilizing shear stress to resisting shear strength. However, the mechanisms of landslides are still poorly understood due to geological and cartographic limitations. Synthetic Aperture Radar (SAR), with the features of all-weather accessibility and large-scale coverage, has shown its capacity of measuring cm/mm-level deformation in various geodynamic settings. Red Bluff Landslides (RBL), WA makes up the 35.5 km2 Cascade Landslides Complex along Columbia River. RBL has been reactivated in recent years, threatening the inhabitants and also Bonneville Dam nearby. I applied ALOS PALSAR data from 2007 to 2011 and estimated the deformation velocity by stacking SAR interferograms. The most deforming target showed a subsiding rate of ~60 mm/yr along the line-of-sight direction. I validated landslide movements using independent satellite observations from adjacent and overlapping tracks. I also decomposed time-series deformation signals into long-term and seasonal components, and compared with precipitation records. Application of interferometric SAR over a large landslide-prone region will help to identify spatial extents of active landslides and understand the triggering factors. Ultimately, my study will improve hazard mitigation and minimize the impacts of landslide hazards to life and property.

Landslides lead to over $1 billion damages and 25-50 causalities each year in U.S., and they are mainly distributed in coastal and mountainous areas in the northwest U.S. Landslide hazards can occur any time of year, and typically occur from slopes being overloaded or undercut by rain runoff, snowmelt, fault reactivation, deforestation or even construction. Landslide stability monitoring is important in construction engineering, such as road, dam and building construction. Landslides can also affect individual homeowners, real estate business, as well as the insurance companies. Knowing the location, extent, and state of instability of landslides is critical in deciding the constructing techniques and site locations of infrastructures.

Conventional landslide monitoring is subject to ground-based sensors, e.g., Global Positioning System (GPS) and inclinometers; they, however, are costly in daily maintenance and request a number of sensors to construct the monitoring network. As an advanced remote sensing tool, Synthetic Aperture Radar (SAR), with the features of all-weather accessibility and large-scale coverage, has shown its capacity of measuring cm- to mm-level deformation in various geodynamic settings. My study will quantify the slide deformation using spaceborne SAR data to improve hazard mitigation and minimize the impacts of landslide hazards to life and property.

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SeongJu Jeong
Advisor: Brian Stump
Geology/Earth Science, Dedman College

SEISMIC DISCRIMINATION OF EXPLOSIONS FROM EARTHQUAKES USING TWO-DIMENSIONAL GRIDS OF P/LG SPECTRAL RATIOS WITH APPLICATION TO THE SANGWON AREA, NORTH KOREA

This study presents an improvement of seismic event discrimination between explosions and earthquakes. The study area is in the vicinity of Sangwon, North Korea. The seismic data from three seismo-acoustic array stations, BRDAR, CHNAR, and KSGAR, were used. Before analysis, the P/Lg ratios associated with the two source populations were optimized using two strategies, i.e., removing the magnitude trend and finding the optimal frequency range. When comparing events of different magnitude, discriminant ability decreases due to the effect of source size-corner frequency on amplitude. This study applied source corrections to reduce the magnitude trend of the P/Lg ratio. The optimal frequency range was determined in two-dimensional (2D) grids of P/Lg spectral ratios based on the criterion of Mahalanobis distance between two groups. The optimal frequency ranges were calculated as P(1-15 Hz)/Lg(2-16 Hz), P(7-12 Hz)/Lg(8-13 Hz), and P(2-10 Hz)/Lg(5-13 Hz) for CHANR, KSGAR, and BRDAR arrays. The corresponding Mahalanobis distances were computed as 5.79, 3.51 and 2.39. A Compound Linear Discriminant Function (CLDF) has been developed to improve the discrimination results of each array. Application of the CLDF increased the discrimination resolution with a Mahalanobis distance of 6.27. The results show that all the events are correctly discriminated.

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Kevin Kwong; Heather DeShon; Clifford Thurber; Joachim Saul
Advisor: Heather DeShon
Geology/Earth Science, Dedman College

TELESEISMIC DOUBLE-DIFFERENCE RELOCATION OF THE 2012 INDIAN OCEAN INTRAPLATE EARTHQUAKE SEQUENCE

The complex and diffuse intraplate deformation within the Indo-Australian plate enables the presence of left-lateral strike-slip earthquakes on predominately NNE-SSW trending fracture zones in the northeastern Indian-Ocean. On April 11, 2012, two unusually large strike-slip earthquakes occurred in this region that resulted in an Mw 8.7 mainshock and an Mw 8.2 aftershock. Back-projection results and aftershock locations reveal that the mainshock rupture occurred on a network of conjugate faults. The two great earthquakes have deep centroid depths (~40 - 50 km) that imply a deep rupture down to the upper mantle. We present improved relative relocations of the mainshock and aftershock hypocenters in order to constrain the relationship of the aftershock seismicity to the coseismic slip area and to better characterize the geometry of the intraplate faults. The revised set of hypocenters is calculated by teleseismic double-difference relocation (teleTomoDD) using catalog and cross-correlation derived differential times of P, pP, pwP and S phases and a realistic 3-D velocity model developed for the Sunda subduction system. Improved clustering of epicenters is observed and is compared to short-period back-projection images to illuminate and infer fault planes.

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Jewel Lipps;[UG] Bonnie Jacobs; Shannon Hart
Advisor: Bonnie Jacobs
Geology/Earth Science, Dedman College

TREKKING THROUGH THE TREES: FOREST SUCCESSION AT THE TRINITY RIVER AUDUBON CENTER

The Trinity River Audubon Center in Dallas, TX (TRAC) was established as an ecological restoration effort. From the 1960s to 1990s, the site was a large-scale illegal landfill operation in an old gravel mine. More than 15 hectares of urban bottomland hardwood forest are now protected and publicly accessible since TRAC's opening on the remediated land in 2008. This study assessed forest composition and successional stages to inform conservation strategies and education at TRAC. Six

forest stands were delineated based upon existing fragmentation using aerial photography, and were surveyed by the random plot method. Published bottomland forest succession models were consulted as standards with which to compare species importance values in the study area. Stands exhibit mid, transitioning to late, and late successional stages. None of the study areas is yet in transition to old growth stage. For all stand data combined, sugarberry, ash, and pecan trees had the highest importance values. Overall, the urban riparian forest area accessible through TRAC can be characterized as mid-succession transitioning to the subclimax sugarberry-elm-ash association. TRAC's conservation strategy should account for expected changes in forest composition and species dominance, particularly along trails. Results will be developed into a tree ID guide for TRAC visitors to learn about riparian forests.

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Mason MacPhail; Brian Stump; Rong-Mao Zhou
Advisor: Brian Stump
Geology/Earth Science, Dedman College

SEISMIC SOURCE CHARACTERIZATION OF SMALL-SCALE CONTAINED EXPLOSIONS UTILIZING NEAR SOURCE EMPIRICAL DATA

The Source Phenomenology Experiment (SPE) was a series of nine contained, single-fired chemical explosions. Ground motion data from the SPE will be analyzed in this study to assess the uniqueness of the source representation of these explosions and its ability to resolve yield and depth of burial (DOB). The Gf for 16 stations were calculated using a one dimensional velocity model developed from the SPE focusing on observations in the 37-680 m range. The compensated linear vector dipole and explosion components of the new Gf are compared to quantify the possible effects of DOB and Vs on the source representation. For the forward model, Gf with variable DOB and Vs are convolved with the Mueller-Murphy isotropic source function with artificial and actual azimuths to produce synthetic seismograms for assessing possible tradeoffs. Noise is then added to the synthetics in an attempt to fully recover the seismic moment tensor using singular value decomposition. Inversions involving both these synthetic seismograms as well as actual data inversions from the SPE will be calculated, evaluating distance and azimuthal coverage of seismic stations on seismic moment tensor recovery. These procedures will help to guide the new analysis of the observational data to understand the practical resolution of physical phenomenology accompanying underground sources.

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Harrison Oldham; Heather DeShon
Advisor: Heather DeShon
Geology/Earth Science, Dedman College

NOISE ANALYSIS OF THE NORTHERN MISSISSIPPI EMBAYMENT

NELE is an experiment designed to examine tectonic processes and lithospheric structure in the northern Mississippi embayment. The seismic experiment consists of four consecutive six-month deployments (September 2011 – October 2013) of broadband stations deployed to densify the TA grid and a single two-year deployment (July 2013 – June 2015) of 51 broadband seismometers along three linear profiles with an average station spacing of 20 km. Like the TA, the six-month stations were sampled at 40 Hz while the two-year stations are sampled at 100 Hz. To examine station quality and noise levels at each station, we have calculated probability density functions of power spectral densities (PDFPSDs) on all three components and compared to theoretical noise models. We use these calculations to examine how the noise profile changes across the embayment as a function of sediment thickness, sensor type, and installation technique. Preliminary observations on the 98 TA and 11 six-month NELE stations show that inside the embayment noise levels at periods between 0.3 - 1.0 seconds (1 - 3 Hz) exceed the theoretical high noise model, and that many stations inside the embayment show a bifurcated signal at the same periods. Potential causes for the bifurcation, such as anthropogenic noise, local earthquakes, sediment variation and reverberations, and sensor/installation effects, will be discussed.

Benjamin Phrampus; Matthew Hornbach
Advisor: Matthew Hornbach
Geology/Earth Science, Dedman College

US EAST COAST PASSIVE MARGIN HYDRATE, HEAT FLOW, AND THERMAL HISTORY: IMPLICATIONS FOR HYDROCARBON PRODUCTION AND BASAL HEAT FLOW MODELS

Newly acquired multi-channel seismic (MCS) data collected on the southeastern United States passive margin combined with legacy MCS data shows a wide distribution of gas hydrate overlying both oceanic and continental crust. A variety of hydrate features are present across the US east coast including: gas plumes, pull up due to salt bodies, and advective regimes. Using this wide distribution of hydrate, we are able to determine conductive heat flow estimates along the continental margin where there is a lack of conventional heat flow measurements. The resulting heat flow map reveals relatively uniform heat flow (~38 mW/m^2) across the East Coast Magnetic Anomaly (ECMA), the proposed location for the rift between North America and Africa during the early Jurassic, with increasing heat flow landward and seaward away from the ECMA. Using a heat flow model that accounts for sedimentation, heat flow variations due to cooling oceanic crust, and variable sediment properties in space and time, we reconstruct the thermal history of the Carolina and Baltimore Canyon Trough from the start of rifting (195 Ma) to the present day. The results provide information on the location of potential hydrocarbon production and constrain basal heat flow and hydrothermal circulation models for the aging oceanic crust.

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Vanshan Wright
Advisor: Matthew Hornbach
Geology/Earth Science, Dedman College

ASSESSING GEOHAZARDS NEAR KINGSTON, JAMAICA: EARTHQUAKES, TSUNAMIS, SLOPE FAILURE AND LIQUEFACTION EVENTS

The 1907 (Mw 6.5) Jamaica earthquake killed ~1000 people and damaged ~85 % of buildings in Kingston, yet no study has successfully identified the fault that generated this quake. Here, we use seismic images and sediment cores to suggest that activity along two previously unmapped normal faults may be responsible for the earthquake. The two faults, trending N53W and N50E, converge within the NNE section of the Kingston Harbor and were last active during the Miocene and Holocene epoch respectively. The faults' convergence zone (FCZ) is distinguished by folds within the hanging wall of the basement as well by the presence of late Holocene aged mass wasting deposits that overlay post-rift depositional sequences. The deposits are coterminous with the 1907 earthquake (± 20 yrs). This, together with reports of a nearby tsunami that accompanied the 1907 quake, indicate that the quake may have occurred along the more recently active harbor fault or along nearby faults within the Wag Water inverted rift system of Eastern Jamaica. Late Holocene activity along the either fault system suggests that faults within eastern Jamaica may be accommodating portions of slip along the Enriquillo-Plantain Garden Fault zone (EPGFZ). If this is the case, then studies indicate that elastic strain build up along the EPGFZ is sufficient to generate a Mw 7.3 earthquake within the next few decades.

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Claudia Castro-Castro
Advisor: Alejandro Aceves
Mathematics, Dedman College

RATIONAL ROGUE WAVE SOLUTION OF THE INTEGRABLE MASSIVE THIRRING MODEL

We consider the coupled mode equations (CMEs) modeling ocean waves in deep water for a periodic bottom. We investigate the construction of rational rogue wave solution of a particular case of the CMEs, the massive Thirring model (MTM) in the integrable case, by means of the Darboux dressing method. We show numerical results to verify the extreme nature of rogue waves.

Young Ok Choi
Advisor: Johannes Tausch
Mathematics, Dedman College

THE GALERKIN BOUNDARY ELEMENT METHOD FOR TREE-DIMENSIONAL TRANSIENT STOKES FLOW

We develop the Galerkin discretization for boundary integral formulations of three-dimensional transient Stokes flow. We show that the Stokeslet and stresslet can be expressed in terms of incomplete gamma function. The representation is helpful for finding the time integrals of the matrix coefficients of the discretized linear system. Because of the difficulties associated with the complicated fundamental solution and handling the time convolution efficiently, boundary element methods transient Stokes flow were mostly limited to the steady-state or two dimensional cases. Using HPC (high performance computing) extends the steady-state or two dimensional problems to three-dimensional transient Stokes flow and the parallel program speeds up calculations and stores data for large problems on multiple computers. We tested the discretization scheme on a direct integral formulation with a known analytical solution and present numerical results. We show strong and weak scaling to see the parallel algorithm is efficiently designed in order to achieve improved performance.

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Rachel Crusius;[UG] Jessica Otah; Brandilyn Stigler
Advisor: Brandilyn Stigler
Mathematics, Dedman College

CLASSIFYING REGULATORY INTERACTIONS IN GENE NETWORKS

Gene regulatory networks are responsible for controlling many cellular processes. An important problem in systems biology is to infer the structure of the network from experimental data. While many inference methods can capture correlations between genes in a network, predicting the direction of interaction (causation) is much more difficult. We sought to develop a method to infer the directionality of interactions from correlative analyses. Time-series gene expression data from a developmental network in C. elegans were used in this study. We performed a scatter-plot analysis on two publicly available data sets and found that the interactions between the mediating gene pal-1 and its known targets were nearly all nonlinear and negatively correlated. In order to identify a potential mechanism for the unexpected nonlinearity, we also analyzed the data against time which revealed changes in correlation in time. These results allowed us to classify groups of genes according to similar interaction behavior. Taken together these results provide some insights about the class of model that would best represent the network of interest: in this case nonlinear models would be most appropriate. Furthermore, changes in correlation suggest that the interaction behavior in this network is not constant and perhaps requires an adaptive model to capture the time-dependent dynamics.

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Edward Downes
Advisor: Alejandro Aceves
Mathematics, Dedman College

NUMERICAL STUDIES OF RAMAN SCATTERING IN LIGHT FILAMENTS

The study of filamentation and the processes associated with it is currently a very active area of research in the nonlinear optics community. The formation of a light filament allows self-guided propagation of high intensity laser light over long distances. Within a filament one of the interactions that can occur is stimulated Raman scattering, whereby a emitted photon has differing energy to an absorbed photon. This shift in the wavelength of light can be characterized as the Raman-shift of the particular medium. Through work with our collaborators at University of New Mexico, we have derived a set of couple ordinary differential equations and partial differential equations to model the interactions associated with stimulated coherent Stokes and Antistokes scattering. The model is based on coupling the quantum mechanics density matrix for the medium, and the Maxwell's equations for the electric field. The Numerical simulations will be modeling an Ultraviolet laser pump entering a prepared nitrogen medium in the "excited" stage. The numerical methods used will include finite difference methods and the use of an explicit Runge-Kutta method with absorbing boundary conditions.

Fritz Juhnke; Thomas Hagstrom
Advisor: Thomas Hagstrom
Mathematics, Dedman College

A DISCONTINUOUS GALERKIN DISCRETIZATION OF A DOUBLE ABSORBING BOUNDARY

Simulating waves in an unbounded domain is a problem with, as yet, no completely satisfactory solution. Even the premier methods for artificially truncating the domain, such as a Perfectly Matched Layer (PML) or high-order Absorbing Boundary Condition (ABC), produce spurious reflections of outgoing waves. The Double Absorbing Boundary (DAB) is a relatively new alternative that aims to be easier to implement than ABCs, and have better a priori error bounds than PMLs. In this paper, we examine a DAB in one dimension, making radiation of waves non-trivial by simulating the Klein-Gordon equation. We use a recently-invented discontinuous Galerkin discretization for wave equations in second order form. The boundary conditions are imposed by fluxes chosen to preserve a half-space energy.

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Mahnprit Jutley; Vladimir Ajaev
Advisor: Vladimir Ajaev
Mathematics, Dedman College

THE EFFECT OF CHARGE REGULATION ON THE STABILITY OF ELECTROLYTE FILMS ON A STRUCTURED SURFACE

The effect of charge regulation on the stability of electrolyte films on a structured surface is studied in the framework of the Debye-Huckel approximation. By considering a small deformation to the surface of the film, the effect of charge regulation on film height, electric potential, pressure, and surface charge can be seen by perturbation analysis of the solution found by discrete Fourier expansions of the perturbed variables. The stability of the film through Floquet is theory is also discussed.

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John LaGrone; Thomas Hagstrom
Advisor: Thomas Hagstrom
Mathematics, Dedman College

DOUBLE ABSORBING BOUNDARIES FOR FINITE DIFFERENCE TIME DOMAIN ELECTROMAGNETICS

An important issue in the simulation of electromagnetic effects is the ability to truncate unbounded domains into regions of interest that can be simulated efficiently and accurately for long times. In order to do this, accurate artificial boundary conditions are required. In the context of finite difference time domain (FDTD) solvers, this typically takes the form of a perfectly matched layer (PML). While PMLs have proven to be effective, their performance is closely tied to the selection of parameters that can often only be found through experimentation. Instead, we use a Double Absorbing Boundary (DAB) constructed by forming a thin non-reflecting layer on which we apply the complete radiation boundary conditions (CRBC) on two parallel boundaries. A primary advantage of this DAB formulation is that there is an a priori error estimate and method for selecting optimized parameters. The performance of the method is demonstrated with numerical experiments.

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Jessica Schoenfeld; Alejandro Aceves
Advisor: Alejandro Aceves
Mathematics, Dedman College

MODULATION THEORY IN PT-SYMMETRIC CHAIN OF COUPLED VAN DER POL OSCILLATORS IN THE LONGWAVE LIMIT

An infinite chain of parity-time (PT) symmetric dimers is introduced, which consists of pairs of non-linearly coupled van der Pol (VDP) oscillators with both gain and loss. For small values of the gain/loss term, the continuum approximation of the discrete system is taken and a weakly nonlinear theory is developed for select values of the wave number. The resulting amplitude equations are conservative, which establishes that the given chain of dimers is a conservative system for small values of the gain/loss term. The goal of this research will be to numerically determine the critical value of the symmetric non-conservative perturbation of our otherwise conservative system. This shows symmetry breaking behavior in the gain/loss term, and thus, proves the existence of PT-symmetric breaking phenomenon in the PT dimer chain.

Jean Sexton
Advisor: Daniel Reynolds
Mathematics, Dedman College

EFFICIENT TIME INTEGRATION METHODS FOR MULTIRATE ODE SYSTEMS

This work is in the context of numerical methods for integrating multirate ordinary differential equations. A new framework for multirate methods is proposed which leverages Generalized Additive Runge-Kutta theory. Some new methods in this proposed framework are presented, along with some numerical results

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Thomas Sheffield; Benno Rumpf
Advisor: Benno Rumpf
Mathematics, Dedman College

WAVE COLLAPSES IN THE FOCUSING MMT EQUATION

The MMT equation is important in the field of wave turbulence. It has been shown numerically that very high-amplitude structures form in the focusing version of the damped, driven MMT equation in a finite time. We attempt to explain why collapses only occur when the driving strength surpasses a particular threshold and where the value of the threshold comes from. This is done using numerical and analytical techniques.

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Zheng Wang
Advisor: Yunkai Zhou
Mathematics, Dedman College

FILTERED DAVIDSON-TYPE METHODS FOR LARGE-SCALE EIGEN-RELATED PROBLEMS

We consider two closely related eigen-based problems on large sparse matrices: the standard symmetric eigenvalue problem (SEP) and the partial singular value decomposition (PSVD), particularly when a large number of dominant eigenpairs or singular triplets need to be computed. Solving these problems are central to a wide range of applications, such as many graph-based algorithms for data mining and Latent Semantic Indexing for information retrieval. Our research focuses on developing efficient algorithms to solve these problems. Our algorithms are built under a Davidson-type framework with filtering techniques for accelerating the convergence. These filtered Davidson-type methods are comparable to the existing state-of-art algorithms in terms of CPU time cost with a much lower memory usage.

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Matthew Bruemmer[UG]
Advisor: Stephen Sekula
Physics, Dedman College

STUDIES ON THE REDUCTION OF RADON PLATEOUT ON COPPER USING ELECTRIC FIELDS

This study aims to investigate the ability of electric fields to reduce the capability of radon progenies to stick to copper surfaces in various environments to help understand background sources in experiments that search for dark matter. Production of background sources from gamma particles, neutrons, and alpha particles can mimic desired signals of certain dark matter results in experimental research. Reduction of these backgrounds is crucial to the continuing success and advancement of a physicist's ability to understand rare events that relate to dark matter studies along with other rare event experiments. Radon-222 is a main contributor of background noise being involved in the experiment when detector material or shielding material is stored for periods of time. To understand how electric fields in storage environments can help reduce the Rn-222 plateout, we propose to contaminate copper samples protected by an electric field with radioactive sources and then take measurements with the XIA UltraLo 1800 alpha particle counter. Experimental set-up includes a pressure cooker where the copper will be stored and exposed to a source of Rn-220, which will serve as a proxy for Rn-222 to shorten the lifetime of the experiment. The copper will be held by a custom shelving unit made out of 3D-printed plastic for limiting exposure from outside sources other than the Rn-220 source.

Eric Godat; D.B. Clark; F.I. Olness
Advisor: Fredrick Olness
Physics, Dedman College

MANEPARSE: PDF READER AND INTERFACE MATHEMATICA PACKAGE

Parton Distribution Functions (PDFs) are essential components to making predictions at hadron colliders. These PDFs are determined by fitting several parameters to data from a number of experiments. PDFs are universal inputs for hadronic interactions, however, due to differences in fitting procedures between collaborations, variations in PDFs can arise. We have written a custom Mathematica package capable of reading several different collaboration's proprietary formats. This software gives the user the ability to perform calculations involving PDFs within the Mathematica framework and compare results from different PDF collaborations. Physics calculations made using the tools available in the package will be demonstrated along with some additional applications and future improvements.

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Nicole Hartman[UG]
Advisor: Stephen Sekula
Physics, Dedman College

UNCOVERING THE SOLAR FOOTPRINT: TRACKING THE SUN WITH NEUTRINOS

The solar model postulates that the sun produces its energy through fusion reactions producing not only photons, but also neutrinos. These solar neutrinos constitute a background for dark matter experiments. Measuring the neutrinos incident from the sun requires tracking their flight direction. In a detector, the incident neutrino could interact with an atom via the weak force to eject an electron. We were curious what the direction of the ejected electron can tell us about the flight direction of the original neutrino. I wrote a Monte Carlo program to find the angle between the flight direction of the original neutrino and the ejected electron. Independent studies suggested that this angle should be within 30O of the original flight direction, and I found that the angle between the flight directions of the ejected electron and the Incident neutrino was within 30O roughly 65% of the time, incorporating two standard deviations of the data. Therefore, designing such a detector to measure the electrons direction can yield information about the neutrinos original flight direction needed for background measurements for dark matter experiments.

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Daniel Jardin
Advisor: Jodi Cooley
Physics, Dedman College

DETECTOR RESOLUTION FOR SUPERCDMS

SuperCDMS (cryogenic dark matter search) is an experiment designed to directly detect dark matter particles using germanium crystal detectors cooled to ~45 mK. The detectors measure both phonon and ionization energy deposited by incident particles. Using known energy peaks including activation lines in the germanium and a Ba-133 calibration source, the resolution of these detectors can be measured as a function of energy. Initial results using data taken between March 2012 and July 2013 show that the resolution decreases as energy increases. I report on the details of this result as well as future plans for this study.

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Hang Qiu
Advisor: Jodi Cooley
Physics, Dedman College

IDENTIFYING DATASETS AFFECTED BY ELECTRONIC NOISE IN SUPERCDMS

SuperCDMS is a direct dark matter search experiment located in the Soudan Underground Laboratory in northern Minnesota. Germanium detectors are used to collect charge and phonon signals in order to discriminate between dark matter particles and background particles that can mimic the dark matter signature. There is a probability for the electronic systems that are used to read out these charge and phonon signals to experience variations due to noise. This introduces a negative effect on the data quality. We examine the distribution of chi-square values for individual pulses in order to derive selection criteria to eliminate this bad data. This poster shows the results on this topic.

Matthew Stein
Advisor: Jingbo Ye
Physics, Dedman College

AUTOMATED TESTING SYSTEM OF THE LOCLDV2 AND LOCS2 ASICS FOR LHC EXPERIMENTS

Presented here is the automated testing system that will verify the optical data transmission ASICs (LOCs2 and LOC1d1V2) for the High-Luminosity Large Hadron Collider (HL-LHC) experiments. Both ASICs are fabricated in a commercial 0.25-mm Silicon-on-Sapphire (SoS) CMOS technology and operate at a data rate up to 8 Gbps per channel. They are packaged using a QFN-100 package. A total of 10,000 chips will be tested by the automated testing system which will consist of a robotic stage, camera, test board, and LabView controlled testing equipment. The entire process is orchestrated by original software which controls each step, including an image capture of each chip, serial number capture via optical character recognition, and robotic arm movement. All of the information and test results are stored in a database on the master computer. The verified chips will be sent to CERN for installation, and the rest will be used for alternative purposes.

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Biao Wang
Advisor: Tom Coan
Physics, Dedman College

MEASURING NEUTRINO MAGNETIC MOMENT IN NOVA NEAR DETECTOR

There are predictions from theory that theDirac neutrinos has a tiny magneticmoment value that wound not exceed 10e-14uB whileMajorana neutrino has amagneticmoment at the order of 10e-10uB to 10e-12uB . The later assumption can be observed in our NOvA experiment. Thus, a precise measurement of neutrino magnetic measurement becomes a window to new physics and indicate a keen evidence that can confirm either neutrino is a Dirac particle or Majorana particle.

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Keping Xie
Advisor: Roberto Vega
Physics, Dedman College

CUSTODIAL SYMMETRY, CP VIOLATION AND LEPTOGENESIS IN GEORGI-MACHACEK HIGGS MODEL

We investigate the custodial symmetry in the Higgs sector of the Georgi-Machacek (GM) model, and the possible CP violation resulting from the spontaneous symmetry breaking. We consider the possibility that the GM model may provide a mechanism for leptogenesis. Under the custodial SU(2)_V symmetry in the GM model, there are 5-plet, 3-plet, and singlet Higgs bosons in addition to the standard model (SM) like Higgs. We visit the relation between the custodial transformation and CP violation in this model. The extra Higgs triplet present in this model also allows for a lepton asymmetry generated through the type-2 Seesaw Mechanism. A future goal is to extend this study to a supersymmetric extension of the GM.

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Rose Ashraf; George Holden
Advisor: George Holden
Psychology, Dedman College

SELF-REPORTS AND DIRECT OBSERVATIONS: DO MOTHERS KNOW HOW OFTEN THEY YELL?

It is imperative to understand discrepancies in parents' reports of their behaviors, intentional or otherwise, to develop interventions that create long-lasting change. This study examines whether mothers' self-reports of how often they yell at their child and attitude toward yelling is associated with observed behavior. It is predicted that self-reports will not be significantly associated with observed yelling. Mothers (N=33) wore audio-recorders for 4-6 evenings while at home. Yelling, or verbal negative (VN), is operationalized as a comment with increased volume, aggravated tone, and/or negatively valenced content. The Parental Responses to Child Misbehaviors (PRCM; Holden et al., 1992) and Attitudes toward Yelling (ATY; α=.92) questionnaires were utilized. The correlation between ATY and self-reported VNs approached significance at Time 1 (r[31]= .37, p= .071) and was significant at Time 2 (r[31= .44, p= .026). Self-reported VNs at Time 2 was significantly correlated with observed VNs (rs = .47, p= .006), whereas self-reported VNs at Time 1 was not. ATY was not significantly correlated with observed VNs. In sum, self-reported frequency and attitude were correlated, but only self-reported VNs at Time 2 were correlated with observed VNs. These results indicate that while self-report measures are associated with each other, they may not reflect parents' actual behaviors.

Grace Boyers; Kendelle Tekstar; Denise Crawford; Michelle G. Craske; Alicia E. Meuret
Advisor: Alicia Meuret
Psychology, Dedman College

THE SMU-UCLA TREATMENT FOR AFFECTIVE DISORDERS (TAD) STUDY – METHODOLOGY AND PRELIMINARY RESULTS

Context: The National Institute of Mental Health Research Domain Criteria Initiative (RDoC) calls for a biologically-valid framework for the understanding mental disorders. The bottom-up approach is aimed at targeting dysregulations that lead to extreme levels of affect, as compared to the traditional diagnosis-based top-down approach. Objective: The Treatment for Affective Disorders (TAD) is the first psychological RDoC-type intervention aimed at targeting deficits in the Negative Valence Systems (Fear, Anxiety, Loss) and Positive Valence Systems (Reward learning, Reward valuation). Method: Individuals with clinical levels of anxiety, depression, or stress are randomly assigned to receive 15 sessions of a treatment aimed at reducing threat sensitivity (Negative Affect Treatment, or NAT) or aimed at increasing positive emotions (Positive Affect Treatment; PAT). Results: Preliminary results from a mixed model analysis (N=20, 11 female; mean age=33.9) show significant decrease over time in depressive and anxious symptoms ($b=-.74$, $p<.001$). Conclusions: The pilot data provide preliminary support for the efficacy of TAD in significantly reducing fear and reward deficits.

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Katie Bridges;[UG] Lorelei Simpson Rowe
Advisor: Lorelei Simpson Rowe
Psychology, Dedman College

VICTIM AND PERPETRATOR STATUS AND PERCEIVED BLAME FOR RAPE

Many victims of sexual violence are blamed for being assaulted (Drehle, 2014), despite contrary evidence. Gender biases and rape myth acceptance predict victim blaming, but little research has addressed perceived status of the perpetrator and victim, an important factor since status is often reported in sexual assault cases. We predicted participants would excuse high over low status perpetrator and blame low over high status victim. We asked 215 undergraduate students to read descriptions of two hypothetical college students and a scenario between them, in which the male sexually assaults the female. The descriptions were manipulated to describe high vs. low status students in a 2×2 design. Participants were randomly assigned to 1 of 4 conditions. Participants rated the guilt of the students in the scenario and completed an Implicit Association Task to assess perceptions of guilt. Contrary to hypothesis, status was not associated with participants' explicit ranking of a female's guilt, but the male was rated guiltier in the male-high status/female-low status condition. Participants' implicit associations revealed least blame to the male in the male-low status/female-low condition. These results suggest that participants were unwilling to explicitly blame the female for being assaulted, but implicitly excused the male for his behavior if male and female were of low status.

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Courtney Cox;[UG] Jenna Ellison; Michael Ovalle; Chrystyna Kouros
Advisor: Chrystyna Kouros
Psychology, Dedman College

ACCURACY AND ASSUMED SIMILARITY IN COUPLES' PERCEPTIONS OF SEXUAL ATTRACTION IN THE RELATIONSHIP

Being able to communicate their attraction for each other is important for close relationships (Kenny & Acitelli, 2001); however, we know little about whether couples can accurately perceive their partner's attraction to them. The present study examined the extent to which couples are accurate or biased at predicting their partner's attraction to them. Participants included 47 couples (85% married) recruited from the DFW area. Wives were 40.6 years old (SD=7.57) and husbands were 43.13 years old (SD=8.13). Couples completed questionnaires in the lab about their relationship satisfaction, sexual attraction to their partner, how much they felt their partner was attracted to them, and areas of disagreement. Using the Actor Partner Interdependence Model (APIM), we tested the extent to which couples' ratings of their partners' attraction to them were based on assumed similarity (a form of bias in which one assumes the other's attraction is the same as theirs) or accurate (matched their partner's rating). We also tested marital satisfaction and degree to which sex/intimacy was an area of conflict as moderators. Initial results showed that both wives' ($b=.72$, $p<.01$) and husbands' ($b=.67$, $p<.01$) assumed similarity paths were significant, whereas the accuracy paths were not significant. This poster will present the results of the APIM model and results from the moderator analyses.

Denise Crawford;[UG] Grace Boyers; Kendelle Tekstar; Michelle Craske; Alicia E. Meuret
Advisor: Alicia E. Meuret
Psychology, Dedman College

THE SMU-UCLA TREATMENT FOR AFFECTIVE DISORDERS (TAD) STUDY – CLINICAL CHARACTERISTICS AND CORRELATES

The National Institute of Mental Health Research Domain Criteria Initiative (RDoC) calls for a biologically-valid framework for the understanding of mental disorders. The bottom-up approach is aimed at targeting dysregulations that lead to extreme levels of affect, as compared to the traditional diagnosis-based top-down approach. The Treatment for Affective Disorders (TAD) is the first psychological RDoC-type intervention aimed at targeting deficits in the Negative Valence Systems (Fear, Anxiety, Loss) and Positive Valence Systems (Reward learning, Reward valuation). Individuals with clinical levels of anxiety, depression, or stress are randomly assigned to receive 15 sessions of a treatment aimed at reducing threat sensitivity (Negative Affect Treatment, or NAT) or aimed at increasing positive emotions (Positive Affect Treatment; PAT). Preliminary results of 28 patients meeting entry criteria for clinical levels of depression, anxiety, or stress will be presented. These include characteristics and correlates of demographic and clinical characteristics (gender, race, ethnicity, clinical severity and symptoms, and psychiatric diagnoses). Implications for treatment will be discussed.

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Deanna C. Denman; Austin S. Baldwin
Advisor: Austin Baldwin
Psychology, Dedman College

THE EFFECT OF IMPLICIT AND EXPLICIT ATTITUDES ON PHYSICAL ACTIVITY: UNDERSTANDING FAILURES TO EXERCISE

Background: At the time of an exercise decision, automatic and deliberative processes may influence decision-making resulting in impulsive decisions not to exercise (Hofmann, Friese, & Wiers, 2008). To date, the relative influence of automatic and deliberative processes on these decisions is unknown. We examined the effects of implicit and explicit attitudes determine their relative influence on failures to engage in previously planned exercise. Method: Participants (n=84), physically inactive community members, completed a 5-week exercise study using heart rate or affective response to exercise to guide intensity. Baseline implicit and explicit attitudes toward exercise were measured. The subsequent week, participants reported daily exercise and missed workouts. We used logistic and Poisson regression models to test implicit and explicit attitudes as concurrent predictors of missed workouts. Results: Explicit attitudes were significant predictors of the number of missed workouts (β= -.270, SE=.104, p= .01), and implicit attitudes were not (β= -.082, SE=.116, p= .484). Implications: Decisions not to engage in intended physical activity may be influenced more strongly by deliberative processes. Further development of dual-process models of decision-making is warranted to understand the influence of automatic and deliberative processes on decisions not to exercise.

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Jenna Ellison; Chrystyna Kouros
Advisor: Chrystyna Kouros
Psychology, Dedman College

COPING AS A MODERATOR OF THE RELATION BETWEEN PHYSIOLOGICAL REACTIVITY AND MARITAL CONFLICT BEHAVIORS

Spouses use a variety of behaviors during marital disagreements, some of which are considered positive and others negative. One factor that might predict differences in how couples handle conflict is how they respond to stress. Compas and colleagues (2001) differentiated between two categories of responses to stress: involuntary (e.g., physiological arousal) and voluntary (e.g., coping) responses. Although previous research has examined physiological arousal during marital interactions, little research has examined how involuntary responses and coping are related to the behaviors couples use during interactions. The current study examined whether couples' responses to stress predict marital conflict behavior. Couples engaged in a 7-min interaction task which was coded for specific conflict behaviors, and participants' pre-ejection period, a measure of physiological arousal, was assessed during the task. Partners also completed the Responses to Stress Questionnaire. For husbands, higher levels of physiological arousal predicted more negative conflict behaviors, and this relation was exacerbated when they used low levels of engaged coping strategies. For wives, trend level interactions showed higher levels of physiological arousal predicted fewer positive, and more negative, conflict behaviors, and these relations were exacerbated when they used disengaged coping strategies.

Lindy Fields; Nyaz Didehbani; John Hart; Munro Cullum
Advisor: Alan Brown
Psychology, Dedman College

A NEW MEASURE OF PROCESSING SPEED IN RETIRED NFL PLAYERS WITH A HISTORY OF CONCUSSION

Processing speed tasks involving visual scanning, psychomotor speed, and digit-symbol substitution are sensitive measures commonly used to assess cognitive impairment in traumatic brain injury and other disorders. A recently developed measure of processing speed, the Texas Assessment of Processing Speed (TAPS), is a free measure that takes only one minute to complete (Grosch & Cullum, 2012). TAPS has been shown to correlate strongly with the Coding subtest of the Wechsler Adult Intelligence Scale - Fourth Edition (WAIS-IV), an exisitng measure of processing speed, in various samples. The present investigation examined the relationship between TAPS and Coding within a sample of non-impaired retired NFL players with a history of concussion. We found that TAPS correlates strongly with Coding scores in our sample. We also found that TAPS may measure somewhat different aspects of processing speed than Coding. Although TAPS shows promising results, further investigation with other validated tests and larger samples is needed.

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Juliet Kroll; Chelsey Werchen; Kylie Barfield
Advisor: Thomas Ritz
Psychology, Dedman College

THE EFFECT OF DIETARY NITRATE SUPPLEMENT ON EXHALED NITRIC OXIDE

Background: Nitric oxide (NO) is a molecule that plays an important role in the airways' innate immune response, and the fraction of exhaled nitric oxide (FeNO) has been utilize to capture airway nitric oxide in health and respiratory disease. Deficits in NO are linked to loss of bronchoprotective effects in airway challenges and predicted symptoms of respiratory infection. While dietary nitrate supplements are marketed to enhance exercise performance, no studies have examined the impact of dietary nitrate on airway nitric oxide. Purpose: We examined the effect of the dietary nitrate supplement beet root juice on FeNO in healthy individuals. We hypothesized that one dose of dietary nitrate supplement will significantly increase FeNO. Method: The sample consisted of SMU students and faculty without any lung disease history (n = 25). Participants visited the lab for two sessions, in one they we administered one dose of beetroot juice (70ml) following baseline FeNO measurement, with additional measurements 45 and 90 min afterwards. Identical procedures were followed on a control day. Results: There was a large and significant increase in FeNO (ppb) over time on the experiment day only. Conclusions: Consumption of dietary nitrate supplement elevates airway nitric oxide. Subsequent research needs to explore its potential to prevent airway infections.

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Michael Ovalle; Jenna Ellison; Kelli Sargent; Courtney Cox; Chrystyna Kouros; Judy Garber
Advisor: Chrystyna Kouros
Psychology, Dedman College

CHILDREN'S PERCEPTIONS OF THEIR FAMILY ENVIRONMENT: MARITAL QUALITY AND PARENT-CHILD RELATIONSHIP QUALITY AS UNIQUE PREDICTORS

The current study investigates the relation between various familial relationships and children's subsequent perceptions of their family environment. We hypothesize that, controlling for initial perception of the family environment at T1, the quality of the mother-child relationship and the quality of the marital relationship will each uniquely predict children's perceptions of their family environment at T2. Participants were 240 mothers and children: 185 mothers had a history of a mood disorder (high-risk) and 55 did not (low-risk). At T1, children reported on maternal acceptance, mother-child conflict, and father-child conflict, and on family relationship quality at T1 and T2. At T1, mothers reported on the mother-child conflict and the quality of their marital relationship. A latent variable for children's perceptions of the family environment at T1 and T2 will be created using family relationship quality subscales. A latent variable representing the quality of the mother-child relationship will be created using child-reported maternal acceptance, and mother's and children's reports of mother-child conflict. We will test a model in which marital relationship quality, mother-child relationship quality, and father-child conflict at T1 predicts children's perceptions of the family environment at T2, controlling for family environment at T2 and maternal depression history.

Megha Pulianda; Megha Pulianda; Lorelei Simpson Rowe
Advisor: Lorelei Simpson-Rowe
Counseling, Simmons School of Education

STANDING UP: BARRIERS TO ASSERTIVELY RESISTING UNWANTED SEXUAL ADVANCES

Sexual assault is a common problem faced by American women. One in five women are raped at some point in their lifetime and even more experience less severe forms of assault. Rape is associated with deleterious effects, including drug and alcohol use, physical injury, and increased risk of mental health problems. The present study explored the impact of childhood maltreatment, prior sexual victimization, and perceived barriers to assertiveness on intent to engage in assertive resistance. It was hypothesized that 1) Childhood maltreatment and prior sexual victimization will be associated with greater perceived barriers to assertiveness and reduced intent to engage in assertive resistance, and 2) Perceived barriers to assertiveness will mediate the association between childhood maltreatment and prior sexual victimization with intent to engage in assertive resistance. Regardless of the nature of prior victimization, perceived barriers to assertiveness were associated with lowered intent to engage in assertive resistance. As hypothesized, barriers to assertive resistance mediated the association between childhood victimization and intent to engage in assertive resistance. This research is consistent with other work suggesting that helping women to challenge perceived barriers to resistance may help them to engage in assertive resistance when faced with unwanted sexual advances.

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Margarita Sala; Julie Kangas; Austin Baldwin
Advisor: Austin Baldwin
Psychology, Dedman College

ASSOCIATIONS WITH AFFECTIVE RESPONSE DURING EXERCISE: COMPARING IMPLICIT AND AFFECTIVE ATTITUDES AND BEHAVIORAL INTENTIONS

Theory suggests that implicit and affective attitudes are influenced by affect during an experience; whereas behavioral intentions are influenced by deliberative processes (Evans, 2008; Strack & Deutsch, 2004). Therefore, we tested the hypothesis that implicit and affective attitudes toward exercise would be more strongly associated with affective responses during exercise than exercise intentions. Healthy young adults (N=50; mean age=20.2 years) completed a physical activity Implicit Association Test (Conroy et al. 2010), followed by a baseline questionnaire that included measures of affective attitudes (e.g. describing exercising regularly as pleasant/unpleasant), affective associations (e.g. feeling joy when thinking about exercising), and exercise intentions (e.g. intention to exercise in the next month). Afterwards, participants exercised for 20 minutes on a treadmill at a moderate intensity. During the exercise, participants' rated their core affect using the Feeling Scale (FS) (i.e., "How do you feel right now?) at baseline, during their exercise, and post-exercise. Consistent with our hypothesis, affective attitudes (r=0.46), affective associations (r=0.48), and implicit attitudes (r=0.20) were more strongly associated with the average of FS responses during exercise than exercise intentions (r=0.11). Measurement and clinical implications will be discussed.

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Margaret Smith; George Holden
Advisor: George Holden
Psychology, Dedman College

HOME BEHAVIORAL OBSERVATIONS AND NEGATIVE PARENTAL EMOTIONS

Parent's negative emotions can lead to increased aggression and, consequently, negatively impacts children (e.g., Sieh, Visser-Meily, & Meijer, 2013). This study explored the relations between anger, depression, corporal punishment (CP, spanking), and yelling through self-report and behavioral observations. We predicted a positive correlation between reports of anger and depression and observed CP and verbal negatives. Thirty-three mothers wore an audio recorder for 4 or 6 nights. Research assistants coded for the frequency of verbal negatives and CP. Parents completed various measures assessing emotion. The total Beck's Depressive Inventory (BDI) score and verbal negatives were significantly correlated, $r(31) = .53$, $p < .01$, as was Multi-dimensional Anger Inventory (MAI) and CP, $r(13) = .33$, $p = .05$. Although total MAI score, verbal negatives, and CP were not significantly correlated, the anger arousal subscale of the MAI correlated with verbal negatives and CP, $rs(31) = .40$ & $.37$, respectively $ps < .05$. Moderators will also be examined. Parents with depressive symptoms frequently yelled; however, they did not engage in CP. In contrast, mothers who angered frequently resorted to yelling and using CP more often. These data help to identify two types of behaviors to target when intervening with parents who frequently experience negative emotions.

Rui Tang; Mike Chmielewski
Advisor: Mike Chmielewski
Psychology, Dedman College

EXAMINING THE RELATIONSHIP BETWEEN OPENNESS AND SCHIZOTYPY

There is considerable debate regarding the association between Openness to Experience/Intellect (OE/I) and Schizotypal Personality Disorder (STPD) symptoms. Although two meta-analyses have documented non-significant to small associations between these two constructs (Samuel & Widiger, 2008; Sausman & Page, 2004); others have argued, based on theory, that they should be related and that the association may not be straightforward (Kwapil, Barrantes-Vidal & Silvia, 2008; Ross, Lutz & Bailley, 2002). Recently, researchers have found variance relevant to STPD was buried within the NEO-PI R, one of the most widely used OE/I measures (Chmielewski et al., 2014), supporting this possibility. It is therefore important to determine if similar variance is hidden within other widely used OE/I measures. The current study examines this issue in two widely used OE/I measures; the Big Five Inventory (BFI) and Goldberg's marks; in 2 student (N = 556, 549) and 1 community (N = 681) samples.Our results failed to replicate the findings with the NEO-PI R. Thus, it seems that the schizotypal variance buried within the NEO PI-R is not present in the other widely used OE/I measures.Future research is warranted to examine whether this variance with the NEO-PI R can be replicated in other samples or with other measures.

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Nicole Vu; Ernest Jouriles; Renee McDonald; George Holden
Advisor: Ernest Jouriles
Psychology, Dedman College

CORPORAL PUNISHMENT AND CHILD ADJUSTMENT PROBLEMS: DOES IT MATTER IF ONE OR BOTH PARENTS ARE USING IT?

Corporal punishment (CP) is a robust predictor of children's adjustment problems. Yet, many children exposed to CP do not exhibit adjustment difficulties. Theory suggests that knowledge of which caregivers are using CP may help determine when CP leads to child problems. Specifically, differences in the use of CP by mothers and fathers may be important, and children in families in which CP is used by both parents may be at risk for developing adjustment problems. In this study, we evaluate how differences in the parental dyads' use of CP might contribute to children's adjustment problems. Participants were 371 children and their parents. Parents completed measures of CP. Parents and children completed measures of children's adjustment problems. Parents' reports of CP were used to form three groups of families: 1) families in which there was no CP (CP0); 2) families in which only one parent used CP (CP1); and 3) families in which both parents used CP (CP2). Results indicated group differences on externalizing problems and internalizing problems. Results further revealed that children in the CP2 group had more externalizing and internalizing problems than children in both the CP0 and the CP1 groups. These findings indicate that a nuanced examination of CP across caregivers can contribute to a better understanding of the link between CP and child adjustment problems.

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Chelsey Werchan; Ashton Steele; Thomas Ritz
Advisor: Thomas Ritz
Psychology, Dedman College

CONTROL OVER TRIGGERS THAT EXACERBATE COPD: DOES IT HELP PATIENT'S QUALITY OF LIFE?

Chronic Obstructive Pulmonary Disease (COPD) is a progressive disease characterized by chronic airflow limitation and is a leading cause of mortality worldwide. Use of the COPD Assessment Test (CAT) is recommended to easily assess a patient's overall symptoms and impact of their disease. We have recently developed a comprehensive assessment of exacerbation triggers (CETI) in this population, including perceptions of controllability of such triggers. The present study examined the relation between perceived controllability of exacerbation triggers in patients with COPD and overall quality of life. Participants were recruited to complete surveys of the CETI, demographic information, disease specific information, and the CAT. Participants found triggers related to dust, air pollution, smoking, and physical activity to be the most easily controlled, whereas those related to psychological factors, climate, infection, respiratory symptoms and sleep to be more difficult to control. Hierarchical regression analyses indicated that perceived controllability of exacerbation triggers accounted for a significant amount of variance in health status, beyond that accounted for by other variables. Greater perceived controllability of triggers was associated with lower CAT scores, indicating higher overall quality of life and less impact of the disease on functioning.

Jiani Zhu;[UG] Michael Chmielewski; Michael Bagby
Advisor: Michael Chmielewski
Psychology, Dedman College

A DIRECT COMPARISON OF THE MMPI-2 AND MMPI-2-RF VALIDITY SCALES IN DETECTING MALINGERING IN A PATIENT SAMPLE

The current study was designed to directly compare the ability of the Minnesota Multiphasic Personality Inventory – 2 (MMPI-2; Butcher, Graham, Ben-Porath, Tellegen, & Dahl- Strom, 2001) validity scales and those from the Minnesota Multiphasic Personality Inventory – 2 Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008) to detect malingering. We used a large patient sample that had a potential incentive to malinger with the Miller Forensic Assessment of Symptoms Test (M-FAST; Miller, 2001) as the external criterion to determine malingering status. The final sample consisted of 742 claimants, who were administered the MMPI-2/RF and the M-FAST during their assessments. The results indicated that the MMPI-2 and the MMPI-2-RF validity scales are both valid for predicting malingering. MMPI-2-RF validity scales outperformed the MMPI-2 validity scales in detecting malingering. Validity scales of the restructured form provided incremental validity above and beyond the MMPI-2 validity scales in predicting the M-FAST scores. Keywords: MMPI-2, MMPI-2-RF, validity scales, malingering, overreporting,

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Lie (Nathan) Li; Xinlei (Sherry) Wang
Advisor: Xinlei (Sherry) Wang
Statistical Science, Dedman College

META-ANALYSIS OF GENE SET ENRICHMENT STUDIES UTILIZING ISOFORM-SPECIFIC EXPRESSION

Gene set enrichment analysis (GSEA) has been applied to identify gene sets enriched by biologically “interesting” genes in many individual transcriptome studies. One limitation is that individual studies often have insufficient sample sizes to achieve reliable conclusions. With increasing data having been collected from various studies, several meta-analysis methods of gene set enrichment studies have been developed for analyzing gene-level expression. However, recent studies have indicated that analysis of isoform-level expression may lead to improved results over the analysis of gene-level expression. We propose meta-analysis methods to combine gene set information and isoform expression data from multiple RNA-seq studies, to enhance the efficiency of identifying enriched gene sets. Unlike existing meta-analysis methods that all use summary statistics, our approaches are model based, which integrate ideas from fixed-effect and random-effects methods. Besides, our methods can be applied to both discrete and continuous phenotypes including survival outcomes. Simulation and real data analysis will be conducted to compare the statistical power of our methods with existing methods.

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Bingchen Liu
Advisor: Lynne Stokes
Statistical Science, Dedman College

RANKED SET SAMPLE ESTIMATORS OF MEAN AND VARIANCE FOR DISCRETE POPULATIONS

Statisticians use ranked set sampling in estimating population mean, variance, population distribution function and other characteristics of interests under different kinds of ranked set sampling designs. But most of the work that has been done are under the assumption that the underlying distribution is continuous. The difficulty of implementing ranked set sampling when the underlying distribution is discrete is how to deal with the ties. Two units drawn from a discrete distribution has a positive probability to be equal, unlike in continuous distribution where the probability is zero. However, in ranked set sampling, a ranker is not allowed to declare ties even when the ranker is sure two units are tied or unable to tell them apart. A ranker can always randomly pick one among the units that are believed to be tied and proceed the ranked set sampling process in the same manner as the continuous case. But the ties in a sample also gives the statistician some extra information, therefore, a clever way of using the tie information for count data is a very practical and also unavoidable topic in ranked set sampling. In this poster, we are going to present several estimators of mean and variance that use the ties in the ranked set sample. Comparisons of these estimators and regular estimators are conducted and visualized results will be presented.

Amy Nussbaum
Advisor: Cornelis Potgieter
Statistical Science, Dedman College

CROSS-VALIDATION APPLIED TO SELECTION OF LONGITUDINAL LATENT-VARIABLE MODELS

A statistical model can be thought of as a mathematical description of the behavior of a system. In many instances, one can find several competing models to describe the same system. When this is the case, model selection is an essential step in data analysis. Cross-validation is a particularly useful approach to model selection. Here, a sample of data is split into two subsamples. The first (called the calibration set) is used to estimate model parameters, while the second (called the validation set) is used to measure the model fit. We will explore both the benefits and drawbacks of cross-validation methods as applied to longitudinal latent-variable data, with a specific application to personality assessments.

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Sudharshan Samaratunga
Advisor: Cornelis Potgieter
Statistical Science, Dedman College

A NEW METHOD FOR ESTIMATING THE INDEX PARAMETER OF A STABLE DISTRIBUTION

In practice, we often come across data sets that exhibit heavy tails and/or skewness. These properties can be modeled using stable distributions. In such situations estimating the index parameter of a stable distribution, which is a measure of tail heaviness, becomes quite important. There are several methods for estimating the index parameter of stable distributions. These include maximum likelihood and methods based on the sample characteristic function or sample quantiles. In this study we proposed a new method to estimate the index parameter of a stable distribution based on a location-scale family representation of stable distribution. Although the maximum likelihood method is computationally expensive, we consider it as the benchmark to compare the performance of the proposed estimator. Initial results from a simulation study have shown that the new estimator compares favorably to existing methods when using mean squared error as criterion.

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Charles South; Andy Clarage
Advisor: Jing Cao
Statistical Science, Dedman College

ADVANCED STATISTICAL METHODOLOGY FOR DAILY FANTASY BASKETBALL PREDICTION

Fantasy sports, particularly those known have as daily games where a new team is selected each day, is a rapidly growing industry with revenues in excess of $50 million annually. For those who can effectively predict player performance and construct a winning team there is significant profit potential. This project focuses on both the prediction of player performance and the construction of a team using statistical methodology with specific regard to daily fantasy basketball. To predict player performance, 3 separate models will be implemented and compared with fantasy points scored being the response variable. The first model serves as a baseline model and uses a 10 game moving average of fantasy points scored and a defense's fantasy points allowed as the lone explanatory variables. The other two models work with an expanded variable set that includes both a player's countable statistics and statistics associated with the player's opposing defense. The models used with the expanded data set are a principal component approach and a lasso variable selection approach. Regarding the formation of fantasy team, permutations of players are examined based on our projections with the goal of forming a team with the highest projected score. In order to assess the model, daily fantasy games will be entered throughout February and the success rate of each model will be examined.

Should the model prove to be an effective means of constructing daily fantasy basketball teams, there is clear potential for future daily fantasy games. In a sport such as basketball, where each team plays 82 games and the season lasts over 150 days, we can operate under the law of large numbers, which essentially states that with a large enough sample size (all games throughout the season) if our model is able win more than it loses, there is a high likelihood it will be profitable over the span of an entire season. Similar applications exist in other daily fantasy sports, in which teams must be formed daily with a model updated to reflect the most recent player performances. In addition to fantasy sports, the predictive modelling techniques used have applications in numerous fields such as economics, finance, and health care.

Yixun Xing
Advisor: Wayne Woodward
Statistical Science, Dedman College

BOOTSTRAP TESTING FOR FRACTIONAL INTEGRATION AND GEGENBAUER LONG-MEMORY TIME SERIES MODELS

The autocorrelation of long memory processes decays much slower than that of short memory processes, e.g. AR. Fractional integration (FI) and Gegenbauer are basic models that show long memory behavior. The modified rescaled range statistics (R/S type statistics) were used by Giraitis, et al. (2002) to produce tests for long memory based on realizations from FI and Gegenbauer models. The method performed fairly well for FI processes (i.e. when the system frequency f=0), but for f>0 the results were very poor. We investigate a bootstrap procedure for testing for long memory at f=0 based on the R/S statistic, and simulation results show improvement in size and power for realization lengths 100, 300, 500, and 1000 compared with tests used by Giraitis, et al. (2002) which were based on the asymptotic distribution of the R/S type statistics. Also, for the case f=0 , Geweke and Porter-Hudak (GPH) (1983) designed a periodogram-based regression method for long-memory parameter estimation. We extend their methods to estimate the long memory parameters of the Gegenbauer models at various system frequencies. Bootstrap tests for long memory at frequencies other than f=0 based on GPH estimates, provided results much better than those of Giraitis, et al. (2002) for values of the system frequency f that were greater than 0.

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Yandan Yang; Tony H.K. Ng; Narayanaswamy Balakrishnan
Advisor: Tony Ng
Statistical Science, Dedman College

A STOCHASTIC EXPECTATION-MAXIMIZATION ALGORITHM FOR THE ANALYSIS OF SYSTEM LIFETIME DATA WITH KNOWN SIGNATURE

Statistical estimation of the model parameters of component lifetime distribution based on system lifetime data with known system structure is discussed here. We propose the use of stochastic expectation-maximization (SEM) algorithm to obtain the maximum likelihood estimates of parameters based on complete and censored system lifetimes. Different ways to implement the SEM algorithm are also studied. We have shown that the proposed methods are feasible and easy to implement for various families of component lifetime distributions. The methodologies are then illustrated with two popular lifetime models -- the Weibull and Birnbaum-Saunders distributions. Monte Carlo simulation is used to compare the performance of the proposed methods with the corresponding estimation by direct maximization. An illustrative example is finally presented with some concluding remarks.

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Bandar Almur
Advisor: Andrew Quicksall
Civil and Environmental Engineering, Lyle School of Engineering

SPATIAL AND TEMPORAL DISTRIBUTION OF TOXIC METALS IN THE COASTAL SEDIMENTS OF JEDDAH, SAUDI ARABIA

Four marine sediment cores collected from the Red Sea in the coastal area of Jeddah, Saudi Arabia. Heavy metals will be measured to investigate their spatial and temporal distribution pattern, enrichment and the processes that regulate them. In the preliminary study, concentrations of cadmium represented very high levels in most studied cores (average of 3.26 µg.g-1) compared to the background value (0.3 µg.g-1). The sources of cadmium in the studied areas are mainly anthropogenic through the impact of oil refinery wastes, untreated sewage effluents, and cement plants. Concentrations of lead in the studied sediment profiles showed high values in all cores (68.23 to 108.86 µg.g-1). This is attributed to several sources such as shipping activities, discharge of sewage effluents as well as the atmospheric deposition of lead. The present study is the first attempt to study the spatial and temporal distribution of heavy metals in collected core sediments in Jeddah. The results of this study could be used as a contribution to the knowledge and rational management of these regions in the future and would serve as a baseline against which future anthropogenic effects can be assessed.

laelsadat Badakhshaneian; Andrew Quicksall
Advisor: Andrew Quicksall
Civil and Environmental Engineering, Lyle School of Engineering

CHARACTERIZATION OF SYNTHETIC HEMATITE NANO PARTICLES AS A FUNCTION OF SIZE & AGE USING A MULTI-TECHNIQUE APPROACH

This research shows an ongoing work focused on the structure and physiochemical properties of various synthesized nano scale iron oxide minerals as a function of particle size and age. Surface structure, physiochemical properties, and characterization of the hemathites all vary with surface area normalized particle size and age. Alteration of nano-scale ferric oxide surfaces occurs over environmentally relevant timescales with impact on environmental processes. . All samples characterizing with SEM-EDS, XRD, TEM, Uv-visual spectroscopy ,DLS / DLS Zeta seizer ,TGA, STA, and BET.

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Gwen Carris[UG]
Advisor: Brett Story
Civil and Environmental Engineering, Lyle School of Engineering

STRESS ANALYSIS OF CITY OF DALLAS TRAFFIC SIGNAL STRUCTURES

Today, aging infrastructure is at the forefront of issues in civil engineering. Amidst aging bridges and buildings, the aging traffic signal structure is also a threat to public safety. About 80% of the 1,493 traffic signal structures in the City of Dallas are over 25 years old, which is the industry standard for the useful life of a traffic signal. Several high profile failures have recently occurred during wind storms. Traffic signal structures experience fatigue from stress cycles caused by wind and gravity loads. After an undetermined number of stress cycles, failure occurs at the base of the pole or connection of the mast arm and pole. The cost of replacing a traffic signal structure is about $130,000. The City of Dallas is currently evaluating which traffic signal structures to replace. An analytical computer model using SAP2000 and an experimental prototype of City of Dallas Type II traffic signal structure was created to simulate the stress cycles experienced by such traffic signal structures. Based on this research, the impacts of age and wind load on the likelihood of failure of a traffic signal structure will be better understood so that a replacement schedule for City of Dallas traffic signal structures can be created.

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Hope Hagar; Andrew Quicksall
Advisor: Andrew Quicksall
Civil and Environmental Engineering, Lyle School of Engineering

URANIUM STABILIZATION BY HYDROXYAPATITE

A superfund site in the United States utilized a holding basin from the 1950s-1980s for waste sludge from the manufacturing of depleted uranium (DU) armory, which has contaminated the surrounding groundwater. Of the options to remediate the site, one potential solution is to install a reactive barrier of the mineral hydroxyapatite, sourced from fish bones and teeth. It has been shown to be effective in removing metals from solution and forming stable precipitants but has yet to be shown effective for in situ remediation of uranium. To test the effectiveness in removing DU from the groundwater at this site, hydroxyapatite-packed field columns were deployed. Canisters containing columns were submerged in groundwater monitoring wells to test passive flow conditions, and groundwater was actively pumped through replicate columns mounted in a monitoring facility above ground to simulate longer periods of groundwater flow. The solid material from these columns was harvested and analyzed at SMU through multiple solid phase analysis techniques. The evidence from aqueous analyses at the site and solid and bench-scale analyses at SMU show that Apatite II removes nearly 100% of the dissolved DU passing through the columns, forming the highly stable uranyl phosphate mineral chernikovite. These results strongly suggest that hydroxyapatite could be an ideal solution to remediate the site.

Yasha Haji Zeinali
Advisor: Brett Story
Civil and Environmental Engineering, Lyle School of Engineering

BRIDGE IMPAIRMENT DETECTION USING ARTIFICIAL NEURAL NETWORK

Structural systems are prone to damage and deterioration during their service life. In many situations, damage is not visually detectable. In these cases, it is necessary to investigate structural behavior to detect such damage. One of the techniques for monitoring a structure is to measure its responses (e.g. eigenmodes, frequencies, or static displacement) and assess the structure existence damage based on measured responses. These methods of investigation can be described as inverse analysis problems. However, measured structural responses are normally very noisy and sometimes incomplete. Additionally, finding an exact and explicit solution may be very complex. Neural networks are very suitable for this type of problem. They are capable of modeling input-output functional relations, even when mathematically explicit formulas are unavailable. Moreover, some specific neural network architectures are desirable for approximation problems with noisy input data. This poster presents two neural network approaches (iterative solution and one-step solution) to solve a representative structural impairment inverse problem.

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Kenneth Hamilton; Andrew N. Quicksall
Advisor: Andrew Quicksall
Civil and Environmental Engineering, Lyle School of Engineering

GROUND CONTAMINANTS AND THEIR SPATIAL DISTRIBUTION IN SELECTED AREAS OF AFRICA'S GREAT LAKE REGION

Refugee camps provide emergency primary care to groups of people fleeing conflict. Primary care consists of access to drinking water, free of bacterial contamination. Under dire circumstances, it is necessary and recommended for water quality assessments to focus on bacterial disinfection and overlook chemical contamination. However, many refugee camps are now experiencing longer retention times of their refugee populations. This is especially the case in the Nakivale camp in Uganda and in camps and villages in Bugesera district in Rwanda. Nakivale is rapidly approaching its fourth generation of inhabitants. Chemical contamination can become a significant issue when a population is exposed for an extended period of time. Here, groundwater sampled from Nakivale refugee camp, Uganda and the Bugesera district, Rwanda is thoroughly analyzed for chemical constituents then mapped to determine spatial references. The goal of this study is to determine potential chemical contaminants and spatially reference them to identify patterns. Further development of the project will see the addition of spatially recorded public heath metrics through collaboration with local and regional NGOs. Multivariable, spatially-resolved statistical analysis will yield correlation of water quality and other community health parameters.

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Hossein Hashemi
Advisor: Khaled Abdelghany
Civil and Environmental Engineering, Lyle School of Engineering

AN INTEGRATED METHODOLOGY FOR ONLINE CALIBRATION OF REAL-TIME TRAFFIC NETWORK MANAGEMENT SYSTEMS

This paper presents an integrated methodology for online calibration of real-time traffic network simulation models. The methodology integrates a time-dependent demand adjustment module and a link-based traffic flow propagation model calibration module. These modules use available real-time traffic observations to minimize inconsistency between the model estimation results and real-world observations. The modules are integrated into a real-time traffic network management system that was developed for the US-75 corridor in Dallas, Texas. The results illustrate that the online calibration methodology is effective in enhancing the model's consistency in the different operational conditions.

Shehab Hassan
Advisor: Usama El Shamy
Civil and Environmental Engineering, Lyle School of Engineering

SEISMIC RESPONSE OF GRANULAR SLOPES USING DEM SIMULATIONS

Slope stability analysis is one of the important topics when designing earth structures in geotechnical engineering. There are two types of slopes, man-made slopes (e.g., road embankments, earth dams, etc.) and natural slopes. Earthquakes often cause failure of slopes that were originally stable under static conditions. In this study, the discrete element method (DEM) is utilized to examine the seismic response of dry granular slopes. Computational simulations were performed to investigate the slope response to idealized sinusoidal motions with different amplitudes and frequencies. The essential characteristics of wave propagation including motion amplification and resonance were observed from the computational results. The simulations were able to capture the permanent deformation along the depth of the slope. It was concluded that soil nonlinearity plays a major role in seismic response of slopes. Shaking-induced softening of the soil composing the slope may shift its natural frequency to values very close to the frequency of the dynamic motion, leading to a near-resonance condition in which the slope experiences severe deformation.

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Mahdi Heidarizad
Advisor: Sivinc Sengor
Civil and Environmental Engineering, Lyle School of Engineering

SYNTHESIS OF GRAPHENE OXIDE/MAGNESIUM OXIDE NANOPARTICLES AND ITS APPLICATION FOR WATER AND WASTEWATER TREATMENT

There are different methods for removal of pollutants in water and wastewater. Adsorption is one of the easiest and cheapest removal processes. Graphene, one of the most fascinating advanced carbon-based materials is a promising material to be used for this purpose, as it has extraordinary characteristics such as large theoretical surface area, good chemical stability, high transparency, giant electron mobility, high thermal conductivity and remarkable elasticity. Graphene Oxide (GO), oxidized derivative of graphene, contains epoxide, hydroxyl, and carboxyl groups. These functional groups are causing GO to become hydrophilic, negatively charged, and to be easily dispersed in aqueous solutions. Hence, GO can be a great candidate to remove different types of pollutions pollutants from water or wastewater. However, separation of GO from the water is an issue after treatment. Therefore, several catalyst materials have been developed and examined in the recent decades to be combined with GO to overcome this problem. It has been recently reported that magnesium oxide (MgO) nanoparticles have a high destructive adsorption and catalytic potential in degradation of several groups of water and wastewater contaminants including synthetic dyes, phenol, and formaldehyde, thus being a potential hybrid material for GO.

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Taylor Henry; Mark Fontenot
Advisor: Mark Fontenot
Civil and Environmental Engineering, Lyle School of Engineering

EPISTEMIC CURIOSITY IN ENGINEERING EDUCATION

Epistemic curiosity is the desire to obtain new knowledge expected to stimulate positive feelings of intellectual interest or reduce undesirable states of informational deprivation. Research suggests levels of epistemic curiosity are positively related to learning goal orientation and comfort in ambiguity. These characteristics are desirable for preparing engineering students for difficult course work, to become life-long learners, and to innovate in their careers. A lack of emphasis on curiosity in the classroom may be limiting the development of engineering students. To confirm the relationship between epistemic curiosity and these constructs, a sample of SMU undergraduate students will be given surveys to measure levels of epistemic curiosity, goal orientation, and comfort in ambiguity. Differences in curiosity level will also be explored by demographic and school data (year of study, academic discipline, etc.).

Roshni Kalyanasundaram; Sevinc Sengor
Advisor: Sevinc Sengor
Civil and Environmental Engineering, Lyle School of Engineering

BIOGENIC URANINITE PRECIPITATION UNDER DIFFERENT ENVIRONMENTAL CONDITIONS: A REACTION MODELLING APPROACH

Bioreduction of U(VI) to U(IV) is a promising approach to immobilize uranium in subsurface environments. The impact of different environmental conditions on the formation of U(IV) nanoparticles by a sulfate reducing bacteria (SRB), Desulfovibrio desulfuricans G20 was experimentally investigated. The reduction of soluble U(VI) to insoluble U(IV) was quantitatively investigated under growth and non-growth conditions in bicarbonate or PIPES buffered environments. The experimental results showed that the reduced U(IV) aggregates were more aggregated under non growth conditions compared to the growth conditions. In this study, multicomponent geochemical simulations were carried out using the geochemical code, PHREEQC, to evaluate the thermodynamic and kinetic constraints impacting the U(VI) reduction and its subsequent precipitation as U(IV), under the same experimental conditions. The impact of different electron donors (lactate and pyruvate) and electron acceptors (sulfate, thiosulfate and fumarate) on the precipitated U(IV) nanoparticles were simulated. The modeling results revealed that the impact of U(IV) size fractionation was more controlled by the electron acceptors than donors. This research would be useful in assessing the size and the mobility of the U(IV) in uranium contaminated subsurface environments which would provide insight to the U(VI) bioremediation efforts.

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Safa Mahjoub; Andrew Quicksall; Usama El Shamy
Advisor: Andrew Quicksall
Civil and Environmental Engineering, Lyle School of Engineering

APATITE BIOGROUTING: THE PRECIPITATION OF CALCIUM PHOSPHATE FOR THE IMPROVEMENT OF SOIL STRENGTH

Microbial geotechnology aims to improve the mechanical properties of soil for construction or environmental purposes. Its application in ground reinforcement, biogrouting, consists of particle binding to increase shear strength. The goal of this study is to explore the precipitation of new materials prone to alter the mechanical properties of soils. Calcium phosphate minerals are a good potential choice as calcium and phosphate are naturally abundant in most pore waters and bioprecipitation of such compounds is thermodynamically stable across a large pH range. Here, we mimicked biological processes that would induce the precipitation of these new cements by performing chemical precipitation reactions of calcium phosphate. We investigated the kinetics in solution of apatite and its crystallinity by aging the sediment. We also studied the effects of fluoride, zinc and carbonate substitution in apatite on kinetics and crystallinity. Further, we explored the effect of temperature and drying methods on sand cementation. Finally, shear stress tests were performed on both untreated and treated sand to see the eventual effect of grouting on the shear strength of sand. Preliminary results suggest calcium phosphate is a favorable biogrouting material for sediment stabilization and is further enhanced by the addition of dopents. Further directions are discussed.

According to the United States Census Bureau, the United States population counts 316.2 million and is growing at an annual rate of 0.7%. On the other hand, the American Society of Civil Engineers estimates that a US$3.6 trillion investment in civil infrastructure is necessary. The rehabilitation and expansion of civil infrastructure is required to meet this ever-growing societal need and is directly limited by the availability of competent soils upon which they can be constructed. Over the last century, various methods of treating soil with a grout have been developed, and today they are used widely in geotechnical projects. Traditional soil stabilization methods such as dunes, slopes and planting trees can become unstable or are subject to erosion and not suitable for treating large volumes. The new branch of microbial geotechnology using biogrouting as a new soil improvement method based on microbiologically induced precipitation of sediments, has advantages of low investment and maintenance costs. It also offers benefits to environment and aesthetics.

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Mohammed Alannsary
Advisor: Jeff Tian
Computer Science and Engineering, Lyle School of Engineering

ADOPTING ODC TO SAAS (SOFTWARE AS A SERVICE) IN THE CLOUD

One of the major contributors to software quality improvement is defect analysis. Current work in this area does not consider multi-tenancy or isolation, which makes it inappropriate to implement on a SaaS (Software as a Service). In my work I propose a defect analysis model by adopting the ODC (Orthogonal Defect Classification) concept to SaaS.

Locating, analyzing, and resolving defects is considered a major contributor to improving software quality. The longer the defect goes undiscovered the more it will cause harm. One of the well-known and documented methods of defect analysis is the ODC concept, which has done a good job for in process defect feedback to the development team. Such feedback is essential for defect elimination and resolution. Currently defect analysis for SaaS is in an early stage. There has not been a clear defect analysis model designed specifically for SaaS. Despite the differences between SaaS and traditional software. In my work I propose a new method for defect analysis that will help in providing in process feedback to the SaaS development team. Such feedback will help in eliminating and resolving defects, and on the long run will improve the reliability of the SaaS. The defect analysis method will be based on adopting the ODC concept to a SaaS running in the Cloud. Using the SaaS ODC is also beneficial to SaaS providers since it will improve the overall quality of the SaaS.

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Bilal Alqudah
Advisor: Suku Nair
Computer Science and Engineering, Lyle School of Engineering

EHR SECURITY AND PRIVACY

In healthcare industry and EHR management systems, patients are still in many implementations excluded from controlling their own data. The cost of modifying current systems prevents many healthcare providers from adding such features especially for legacy systems. Technology wise, adding patients to access controlling systems managed by hospitals are not an easy decision because of the modifications systems need to provide that service. On the other hand, patients' contribution into protecting their own data and controlling what to show when a record viewed by a doctor or a nurse for example enhance patient's privacy protection. This research presents a framework that providing services for A-risk assessment and risk evaluation. B- metered information exchange policy between hospitals based on risk assessment results and policies exchanged. C- fine-granularity access controlling system. The framework is built on top of a legacy access controlling system (RBAC) and formatted XML health record files (HL7) . The technique is based on fine-granularity access controlling policy where access rights can be granted based on data type or category rather than object or file. It provides the ability to control access to the files outside its environment as well since it uses data encryption rather than access control tables.

The implementation for the proposed methodology does not apply only in medical environment, it can be used anywhere else where access controlling is needed with the minimum amount of key redistribution. the proposed framework provides services like policy sharing, evaluating remote policies without disclosing contents and matching remote policies.

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Sudheer Chelluboina
Advisor: Dr.Michael Hahsler
Computer Science and Engineering, Lyle School of Engineering

A NOVEL APPROACH FOR PARTITIONING THE TRAJECTORIES USING EXPANDING BOUNDING RECTANGLE

In this paper, we present a novel technique for partitioning the trajectories. Outlier Detection a major task in data mining. Here we are dealing with outlier detection for trajectory data. Comparatively not much work has done in this area. Several trajectory outlier detection algorithms has been proposed such as partition and detect framework which uses the formal partitioning method MDL(minimum description length). In the first phase we use expanding bounding rectangle for partition. In the second phase we are going to propose a detection method to find the outliers which will be our future work. Our main goal is to propose a partition-detection framework to find trajectory outliers. Our algorithm is evaluated by conducting experiments which use simulated data of trucks.

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Zizhen Chen
Advisor: David Matula
Computer Science and Engineering, Lyle School of Engineering

DETERMINING BACKBONES IN WIRELESS SENSOR NETWORKS

The field of wireless sensor networks (WSN's) is a rising technology which employs spatially distributed autonomous sensors to monitor physical conditions like sound, temperature, humidity and so on. We use a random geometric graph concept in computer science to model WSN's by placing a random set of points either in a planar region or over the surface of the globe.

Our goal is to determine disjoint subsets of the sensors that each can serve as a backbone for monitoring the whole region. The presentation will show an interactive graphical demo of creating WSN's and three processes (ordering, coloring and relay coloring) which are efficiently used to determine well-connected backbones to achieve the goal. Our results are efficiently scalable from hundreds to tens of thousands of sensors. We typically are able to employ about 90% of the sensors in disjoint connected backbones where each one covers on average about 99% of the region. For each backbone, we have dynamic data collected and an interactive control feature to explore numerous options.

Area monitoring is the main application of Wireless Sensor Networks. Area monitoring can be used in military application, Health care monitoring (like body monitoring) and so on.

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Jake Drew; Michael Hahsler
Advisor: Michael Hahsler
Computer Science and Engineering, Lyle School of Engineering

PRACTICAL APPLICATIONS OF LOCALITY SENSITIVE HASHING

Working with large amounts of unstructured data (e.g., text documents) has become important for many business, engineering and scientific applications. The purpose of this article is to demonstrate how the practical Data Scientist can implement a Locality Sensitive Hashing system from start to finish in order to drastically reduce the time required to perform a similarity search in high dimensional space (e.g., created by the terms in the vector space model for documents). Locality Sensitive Hashing dramatically reduces the amount of data required for storage and comparison by applying probabilistic dimensionality reduction.

Strand is a highly parallel system and method for the learning and classification of gene sequence data into any number of associated gene sequence taxonomy categories using variable length k-mer words, MapReduce style processing, and locality sensitive hashing. strand.jakemdrew.com

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David Houngninou
Advisor: Mitchell Thornton
Computer Science and Engineering, Lyle School of Engineering

SIMULATION AND IMPLICATION USING A TRANSFER FUNCTION MODEL FOR SWITCHING LOGIC

Transfer functions are mathematical models representing the input/output behavior of a system and are widely used in many areas of engineering including system theory and signal analysis. This research implements a framework for the derivation of transfer function models for digital networks. The transfer functions are defined over vector spaces rather than using a traditional switching theory model. We represent a digital logic network as a transfer function in the form of a matrix that linearly transforms the input stimulus to a corresponding output response represented as a vector. The transfer function can be used for common design tasks such as simulation and implication. We use an efficient data structure known as a binary decision diagram to represent the transfer function matrices. Experimental results indicate that the new transfer function theory is competitive with commercial state-of-the-art design software.

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Jordan Kayse;[UG] Sravana Kancharla
Advisor: Jennifer Dworak
Computer Science and Engineering, Lyle School of Engineering

POWER ANALYSIS ATTACK EVALUATION OF DESIGN FOR TESTABILITY HARDWARE

The IEEE 1149.1 JTAG(Joint Test Action Group) standard, describes circuitry associated with testing circuit boards. However, the JTAG standard was inefficient for embedded instrument access. A new standard, IEEE 1687(Internal JTAG) has been developed to allow better access to embedded instruments, configuration circuits, and data inside chips during testing. Although 1687 provides an improved platform for companies to test their circuitry, it can be used as a backdoor to gain unauthorized access to these instruments. Our research is to develop security measures for 1687. One method currently involves using a variety of locking segment insertion bits (LSIBS), which when unlocked using appropriate keys; provide access to the instruments. As the number of keys increases, the time needed to use brute force increases exponentially. Thus, attackers may try to use side channels, such as differential power analysis to extract the keys. A power analysis attack would involve

monitoring changes in instantaneous power as different bits are entered through a scan chain. The resultant switching activity is analyzed to predict the keys. The purpose of this research is to evaluate the effectiveness of the security when power analysis attacks are used. After gathering sufficient data, if power analysis attacks are found to be effective, we aim to develop a method to prevent these attacks.

The IEEE Standard 1687 has become an official standard and will be used by many companies in the industry. Because of this, the standard needs to be safe against attacks. Currently, we are working with ASSET InterTech, a company in Richardson, TX to further develop locking SIBS that are secure. IEEE members are also considering creating a new standard that will specifically handle DFT (Design-for-Test) security. As attackers come up with new methods to access circuitry it is important that these methods are found and defenses are put in place to prevent these attacks.

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Joshua Rendon
Advisor: Mitch Thornton
Computer Science and Engineering, Lyle School of Engineering

USING THE HPC AND STATISTICAL METHODS FOR HASH FUNCTION ANALYSIS

Hash functions have many important applications including fast access to large datasets in a technique known as hashing. For hasing to be effective, it is crucial that a mathematical relationship, known as a hash function, be bijective or nearly bijective. Because the domain and range space of modern hash functions is extremely large, it is impractical to search the entire space and to store even 1% of the hash function domain and range points. These points are referred to as (key, hash) pairs. This project utilizes the High Performance Computing cluster at SMU to generate trillions of (key, hash) values and to perform statistical analysis on the samples without actually saving or storing them. The contribution of this research is that a methodology is developed that allows for statistical analysis of candidate hash functions while avoiding the need for the storage and processing of large datasets.

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Hadil Shaiba; Michael Hahsler
Advisor: Michael Hahsler
Computer Science and Engineering, Lyle School of Engineering

EVALUATION OF STANDARD CLASSIFIERS USING FEATURE SELECTION FOR PREDICTING TROPICAL CYCLONE RAPID INTENSIFICATION EVENTS

A Tropical Cyclone (TC) is a natural disaster that appears over tropical oceans and can turn into a deadly hurricane when it makes landfall. Predicting the track of a TC has shown great improvements, unlike Predicting its intensity. One issue is the existence of rapid intensification (RI) events which are defined as sudden intensity increases of 30 knots or more within 24 hours. Predicting RI is put in the National Hurricane Center (NHC) top forecast priority. RI events are rare and are not clearly understood. We try to investigate the use of several machine learning methods for predicting RI events. The TC historical dataset comes from the Statistical Hurricane Intensity Prediction Scheme (SHIPS) model that includes information about the state of the storm. Our goal is to choose the most relevant predictors. A backward feature selection (BFS) method was applied for the following classifiers: support vector machine (SVM), logistic regression (LR), naïve-Bayes (NB), and CART tree. A subset of the predictors with the least error was selected. Several ensemble learning techniques where examined. The results were compared to the NHC operational Rapid Intensification Index (RII) model. They show that LR, RF, SVM, and bagging perform better that the RII model when using the brier skill score. When using the area under the curve, all models show better performance than RII model.

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Xi Shen
Advisor: Jennifer Dworak
Computer Science and Engineering, Lyle School of Engineering

HARNESSING AN FPGA FOR BUILT-IN SELF-TEST IN A 3D DIE STACK

A 3D stacked integrated circuit consists of multiple bare die stacked on top of each other and connected by Through-Silicon Vias (TSVs). TSVs allow a much smaller distance between dies (approximately 30 microns) than wires between chips on a board, leading to better performance and less power-consumption. One of the main problems preventing the large scale manufacturing of 3D integrated circuits is the difficulty in testing these dies after assembling the stack, and obtaining high yields.

However, a 3D stack also provides new ability to apply tests. If a novel die architecture containing programmable logic is included in the stack, it may be harnessed to bypass input and output pins of components of other die. We propose the use of an FPGA (Field programmable gate array, high-performance programmable logic) die to test other layers of the stack with compressed test patterns to accelerate the procedure and reduce power usage.

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Micah Thornton;[UG] Fanchen Zhang
Advisor: Jennifer Dworak
Computer Science and Engineering, Lyle School of Engineering

IMPROVING THE RELIABILITY OF INTEGRATED CIRCUITS THROUGH EFFICIENT MANUFACTURING TEST THROUGH INTELLIGENT TARGETING OF CELL-AWARE TYPE FAULTS.

Integrated circuits must be tested after manufacturing so that defective chips do not make their way into the supply chain. Unfortunately, the resources available for test are very limited, and thus the test sets applied must be both highly effective and highly efficient. Traditional test sets do not target defects that may occur within logic gates, so cell-aware-faults that model defects within gates have been proposed by other researchers as additional targets for test. Unfortunately, test sets that detect such faults may be too long to reasonably apply. In this research, we have been investigating why certain cell-aware-type faults are resistant to detection with traditional test sets. Once such faults are identified, an intelligent subset of the resistant faults can be selected to help optimize the user experience by focusing on those defects that are most likely to cause failures while still keeping test costs low.

Testing the functionality of a fabricated design will always have a vast commercial importance because every company is required to test its products. Doing exhaustive testing on every chip for all possible faults is impossible because the list of possible faults grows exponentially with the size of the circuit. Naturally, research is constantly being done to obtain test sets that are effective for detecting defects at low cost. In this research we discuss another way to identify the list of faults that are absolutely necessary to target by examining which cell-aware type faults missed by stuck-at fault ATPG are detected when certain conditions are met during sequential simulation. In other words we ask the question: “Is a fault likely to or capable of causing errors of during normal operation of a product?” Ideally, this research will help shrink the size of the fault list that must be targeted during test following design fabrication. Thus, it can save test time and resources. In addition, it will allow a more effective allocation of limited testing resources and enhance estimates of the quality of current test procedures. This research is funded by the Semiconductor Research Corporation (SRC), which consists of companies such as Freescale Semiconductor, IBM, AMD, and Mentor Graphics, among others.

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Marie Vasek
Advisor: Tyler Moore
Computer Science and Engineering, Lyle School of Engineering

THERE’S NO FREE LUNCH, EVEN USING BITCOIN: TRACKING THE POPULARITY AND PROFITS OF VIRTUAL CURRENCY SCAMS

We present the first empirical analysis of Bitcoin-based scams: operations established with fraudulent intent. By amalgamating reports gathered by voluntary vigilantes and tracked in online forums, we identify 192 scams and categorize them into four groups: Ponzi schemes, mining scams, scam wallets and fraudulent exchanges. In 21% of the cases, we also found the associated Bitcoin addresses, which enables us to track payments into and out of the scams. We find that at least $11 million has been contributed to the scams from 13,000 distinct victims. Furthermore, we present evidence that the most successful scams depend on large contributions from a very small number of victims. Finally, we discuss ways in which the scams could be countered.

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John Wadleigh; Jake Drew; Tyler Moore
Advisor: Tyler Moore
Computer Science and Engineering, Lyle School of Engineering

AUTOMATIC IDENTIFICATION AND ANALYSIS OF WEBSITES SELLING COUNTERFEIT GOODS

We are developing a system to categorize online retail websites as being scam web pages or legitimate stores. We have been looking at the correlation between search terms and the prevalence of dishonest retail pages. Likewise we have been looking

at how different brands differ in number of counterfeit stores and how different companies utilize DMCA requests.

This research deals with online shopping, a very common practice, and tries to identify dishonest sellers which less tech-savvy individuals might not be able to spot on their own. This could ultimately lead to our data being used for targeted take-downs of counterfeit sellers.

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Andrew Blanchard[UG]
Advisor: Delores Etter
Electrical Engineering, Lyle School of Engineering

QUALITY BINNING: CHARACTERIZATION OF THE MULTI-SPECTRAL IRIS DATABASE

Over the last four years, the main project of our biometrics lab has been the collection of a multi-spectral iris image database, and establishment of ground truth image segmentation data. We have collected hundreds of thousands of images. The data ranges over multiple collections from over 200 subjects across 13 wavelengths of illumination. Now, a major challenge for our lab is quality binning, which involves flagging images with blinks, blur, change in eye gaze, or any other factors that could affect research. Our goal is to have our data characterized and labeled such that a researcher can extract relevant subsets of the image database based on whatever criteria they deem relevant. Simple tags include, wavelength, subject ID and demographic information (ethnicity, eye color, gender, age). All of these are very clear-cut and easy to define accurately. Image quality binning however, can be very subjective, and therefore it is important to develop tools that ensure consistency. Consistent quality binning of images is necessary to prevent 'garbage in, garbage out' results for researchers.

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Pengfei Cui
Advisor: Joseph Camp
Electrical Engineering, Lyle School of Engineering

BBS: BAYESIAN BEAM SCHEDULE

Previous work focus on maximum the weighted sum rate for the system. However, when the channel capacity reach the peak, it is possible there is no traffic demand from the user. In such situation, the beam scheduling can not be taken by the clients. In this paper, we first propose a measurements driven probabilistic forecasting method to estimate the channel state with probability of each level. Then we we jointly consider the channel capacity and traffic demand from the clients to form a Bayesian game model solving the problem. With the in-field measurements driven simulation, we show our BBS (Bayesian Beam Schedule) framework gains over the average time schedule, max weighted sum rate in clients sanctification and power efficiency.

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Saeed Dehghan Manshadi
Advisor: Mohammad Khodayar
Electrical Engineering, Lyle School of Engineering

MICROGRIDS FOR ENHANCING THE POWER GRID RESILIENCE

The rising concerns over the reliability and quality of service in energy distribution networks promotes the concept of multiple energy carrier microgrids. Multiple energy carrier microgrids ensure the continuity of service to critical demands in energy infrastructure. Multiple energy carrier microgrids cannot tolerate excessive restoration times, as the recovery and restoration is not considered as a viable option for the mission critical facilities served by microgrids. A methodology proposed here to identify the vulnerable components and ensure the resilient operation of coordinated electricity and natural gas infrastructures considering multiple disruptions within the microgrid. The microgrid demands which consist of electricity and heat demands are served by the interdependent electricity and natural gas supplies. The preventive reinforcements is applied to increase the resilience of energy supply and decrease the operation cost. The proposed methodology is formulated as a bi-level optimization problem to address the secure operation of multiple energy carrier microgrids. Multiple case studies are presented to show the effectiveness of the presented methodology in improving the resilience of generation and demand scheduling against deliberate actions causing disruptions in the interdependent energy infrastructures in multiple energy carrier microgrids.

Deliberate interruptions do not occur frequently, but, when they do, they can be tragic. The recommended preventive reinforcement warrants the resilient operation of multiple energy carrier microgrids considering limited reinforcement budget and the desired level of resilience. This methodology could be employed by microgrid operators of critical facilities to ensure the resilient operation of multiple energy carrier microgrid against multiple disruption. The presented case studies illustrate the tremendous saving procured by employing the proposed preventive reinforcement in severe conditions.

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Rita Enami Pengda Huang
Advisor: Joseph Camp
Electrical Engineering, Lyle School of Engineering

MEASUREMENT-DRIVEN CHANNEL MODEL CLASSIFICATION ACROSS DIVERSE GEOGRAPHICAL REGIONS

A number of channel models have been developed based on extensive measurements from sophisticated hardware at select locations. However, such a methodology makes comparison across different environments extremely challenging. Hence, we seek to build a comprehensive view of wireless channels across diverse geographical locations. In this paper, we create a channel classification framework from crowdsourced data around the world to understand the degree to which small-scale fading occurs in a broad range of environments. Using an Android-driven data set consisting of millions of signal strength measurements, we characterize a normalized signal-strength histogram in a given area according to its closest Nakagami distribution, which has been shown flexible in representing a wide array of wireless environments. Then, we consider the KL-distance from the histogram to the distribution to validate our approach. Finally, we consider which environments have similar Nakagami characteristics through analysis of our crowdsourced data to reveal similar settings across geographically diverse regions.

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Shita Guo
Advisor: Ping Gui
Electrical Engineering, Lyle School of Engineering

A LOW-VOLTAGE LOW-POWER 28 GB/S RECEIVER IN 65 NM CMOS

A novel low-power low-jitter 28 Gb/s serial-link receiver that can work at an ultra low supply voltage of 0.6 V is proposed and implemented in a 65 nm CMOS process. The receiver includes a low-voltage equalizer and a low-voltage full-rate clock-data recovery (CDR). A two-tank transformer-feedback technique is proposed in the LC-tank VCO to improve the phase noise performance at low supply voltage. Forward-body biasing (FBB) technique is proposed in the low-voltage signal path to reduce the threshold voltage of the transistors, thus increasing the signal amplitude and achieving low BER. The measurement results show that the receiver can work under 0.6 V with 0.23ps/4.62ps (rms/pk-pk) of recovered clock jitter. The measured power consumption of the CDR and the receiver are 39.6 mW (1.58 mW/Gb/s) and 48.8 mW (1.95 mW/Gb/s), respectively. To our best knowledge, these are the best power efficiency among all the published high-speed CDRs and serial-link receivers.

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Mayur Hadpe
Advisor: Dr.Scott Kingsley
Electrical Engineering, Lyle School of Engineering

A SCALABLE CONTENT ADDRESSABLE NETWORK

In this paper we proposed an idea for content Addressable Network (CAN) as a distributed infrastructure that provides hash table-like functionality. The CAN is scalable, fault-tolerant and completely self-organizing, and we demonstrate its scalability, robustness and low-latency properties through simulation. Our goal was to reduce the time required to join any new peer in the system. At the end of the paper results of original and proposed method are compared.

Chung Cheng Ho
Advisor: Scott C. Douglas
Electrical Engineering, Lyle School of Engineering

AN ANGULAR SAMPLING THEOREM FOR THE FREQUENCY INTERPOLATION OF ANTENNA ARRAY CALIBRATION MEASUREMENTS

For high precision direction-finding using antenna arrays, a highly-accurate calibration data set is required. This paper focuses on the sampling requirements of such data sets to ensure an accurate direction-of-arrival estimate, in which interpolation across angle and frequency is assumed. Limited discussions of the required sampling grids to mitigate aliasing can be found in the literature, but a quantified procedure to avoid aliasing has not been presented. In this paper, we establish a link between calibration angle spacing and the maximum operation frequency of the antenna array to avoid aliasing when computing direction-of-arrival estimates. Numerical evaluations show the validity of our geometric aliasing model.

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Eric Johnson
Advisor: Joseph Camp
Electrical Engineering, Lyle School of Engineering

VALIDATING CELLULAR AP LOCATIONS WITH CROWD SOURCED MEASUREMENTS

In 2014, the number of data-connected smartphones worldwide climbed to an estimated 1.75 billion. This large-scale adoption combined with the sensing capabilities of these devices allows them to be a powerful data collection tool. We created and deployed a Wi-Fi sniffing application for Android called WiEye. By publishing WiEye through Google's Play Store, we have achieved over 60 thousand active users and obtained 200 million Wi-Fi and cellular measurements worldwide. To achieve the most use from our cellular measurements, we need to know the physical location of the cell towers providing service. Locations of cell towers in publicly available databases were derived from reverse triangulation of measurements gathered by the database's owner. These databases are not always accurate or up to date as demonstrated by the discrepancies between them. Taking into account measurement density, GPS accuracy, signal strength, and the number of users per cell tower, we create an algorithm for using our measurements in order to determine which location is most accurate.

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Xiaodong Kang
Advisor: Dinesh Rajan
Electrical Engineering, Lyle School of Engineering

A RAY-TRACING SIMULATOR FOR OUTDOOR WIRELESS COMMUNICATION

Due to the changing and much more complicated environment, it could be much harder to simulate outdoor wireless channels than indoor ones. In this project, we are developing a ray-tracing based simulator to predict the received signals for a given outdoor system. Ray-tracing is a approximation for the propagation of electromagnetic wave. The idea is to simplify the wave to rays, and then tracing the rays using basic optical theory to deal reflection and refraction. Other phenomenons like diffraction is also taken into consideration. More dynamic feathers will be discussed as well in this project. Now a simply demo has been complicated and a more consummate edition is on the way.

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Ting Li; Panos Papamichalis
Advisor: Panos Papamichalis
Electrical Engineering, Lyle School of Engineering

BLUR IDENTIFICATION IN DIGITAL IMAGE SUPER RESOLUTION

Digital Super-Resolution (DSR) is a signal processing approach which produces an image with higher resolution than the one collected from the digital imaging sensor. In the low resolution (LR) images formation process, the resolution is usually degraded by unknown blurring processes. As a result, the blur identification is crucial to the performance of Super-Resolution (SR). We propose a semi-blind Super-Resolution framework which can simultaneously estimate both the high resolution (HR) image and the blur kernel. Unlike other blur identification method, we consider the existence of sensor blur and denote it as non-blind part which is separated from the whole blur identification. We also considered blur identification under different super-resolution (SR) ratio, which is essentially a blur kernel resampling problem. Both Synthetic and real data experiments show the nice performance of the proposed method.

Hui Liu
Advisor: Dinesh Rajan
Electrical Engineering, Lyle School of Engineering

FIT: ON-THE-FLY, IN-SITU TRAINING FOR CONTEXT-AWARE RATE SELECTION

Existing rate adaptation protocols have advocated training to establish the relationship between channel conditions and the optimal modulation and coding scheme. However, wireless devices for outdoor and vehicular communications frequently enter environments they have not yet encountered and therefore, have insufficient training for rate adaptation decisions. In addition, protocols are often optimally tuned for indoor environments but, when taken outdoors, perform poorly. In both cases, the decision structure formed offline lacks the ability to acclimate to a new situation on the fly. The diverse and ever-changing environments of increasingly mobile wireless devices call for a rate adaption scheme that can quickly adjust accordingly to form a unique environment set established by the user. In this paper, we propose an on-the-fly, in-situ training (FIT) mechanism which addresses the challenges of making rate decisions with unpredictable fluctuation and lack of repeatability of real wireless channels. We design and conduct extensive experiments on emulated and in-field wireless channels to evaluate the in-situ training process, showing that the rate decision structure can be updated as channel conditions change using existing traffic flows.

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Eran Pisek; Dinesh Rajan; Joseph Cleveland
Advisor: Dinesh Rajan
Electrical Engineering, Lyle School of Engineering

PARALLEL CONCATENATED TRELLIS-BASED QC-LDPC CONVOLUTIONAL CODES ENABLING LOW POWER DECODERS

In this paper, we develop capacity-approaching Parallel Concatenated Trellis-based Quasi-Cyclic LDPC (namely PC-LDPC) convolutional codes as a special ensemble of Spatially-Coupled (SC) LDPC codes. These capacity-approaching PC-LDPC convolutional codes are encoded through Parallel Concatenated Trellis-based Quasi-Cyclic LDPC Recursive Systematic Convolutional (RSC) encoders (namely Z-RSC encoders) that are proposed in this paper. The proposed encoder maintains the fine input granularity in the order of the lifting factor of the underlying SC-LDPC code. We also developed the related TQC-LDPC Maximum A posteriori Probability (namely QC-MAP) decoder that efficiently decodes the PC-LDPC convolutional code. Performance and hardware implementation results show that the PC-LDPC convolutional codes with the QC-MAP decoder have 3× less complexity for a given Bit-Error-Rate (BER), Signal-to-Noise Ratio (SNR), and data rate than conventional QC-LDPC block codes and convolutional codes. Alternatively, the PC-LDPC convolutional code with the QC-MAP decoder has > 0.5 dB lower SNR for a given Bit-Error-Rate (BER), complexity, and data rate than conventional capacity-approaching QC-LDPC block codes and convolutional codes.

The low decoding complexity and the fine granularity makes it feasible for the proposed capacity-approaching PC-LDPC convolutional code and related trellis-based QC-MAP decoder to be efficiently implemented in ultra-high data rate next generation mobile systems.

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Indranil Sinharoy
Advisor: Marc Christensen
Electrical Engineering, Lyle School of Engineering

COMPUTATIONAL SCHEIMPFLUG IMAGING FOR IMPROVING THE DEPTH OF FIELD OF IRIS RECOGNITION SYSTEMS

Iris recognition is a promising biometric surveillance technology. However, the inability of an iris camera to operate across a large range severely restricts its use. For example, subjects are required to either stand at a fixed standoff distance or move slowly through a pre-defined narrow zone during the capture. Such restrictions pose sever challenges for scaling iris recognition systems which can be used with multiple subjects and in crowded areas. In this project we use a combination of scheimpflug photography with computational imaging to extend the imaging volume by multiple folds while using a single camera. Using scheimpflug imaging techniques the plane of sharp focus and the associated DOF can be oriented within a prescribed imaging volume. An optimal orientation of the DOF will be found that maximizes the ability to capture in-focus iris images from multiple subjects positioned within the volume. Computational imaging techniques will be used to address the space variance associated with scheimpflug imaging, and for further improving the spatial resolution of the camera. The

complexity of such a system is minimal as it will eliminate the need for multiple cameras and sophisticated tracking mechanism. This system can be scaled simply by using a system with higher magnification, which can be highly cost effective and efficient for monitoring in large crowded places.

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Ali Vafamehr
Advisor: Mohammad Khodayar
Electrical Engineering, Lyle School of Engineering

COORDINATED EXPANSION PLANNING OF DATA CENTERS IN ENERGY AND CYBER NETWORKS

The growing tendency toward cloud computing rises the number and capacity of the data centers in cyber and electricity networks. The energy consumption of these centers increases the demand in electricity network, which in turn raises the cost and carbon footprint of supplying these loads. Data centers serve the clients in cyber networks with diverse requirements including processing, data storage, web services and other IT applications. The customers in cyber networks are required to be served within reasonable waiting times corresponding to service level agreements (SLAs). Hence capacity planning and allocation of such servers not only depends on the demand served in the cyber networks and the respective latencies and traffic flow but also depends on the energy consumption, price of electricity, and reliability of supply in the electricity networks. This paper addressed the interdependency of energy and data network in capacity planning and allocation of the data centers in data and energy networks. The objective in this problem is to minimize the installation and operation cost of the data centers subjected to the constraints imposed by the power and cyber networks. The expansion-planning framework is extended to address the uncertainties in the demand in power and cyber networks.

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Jiachen Wang
Advisor: Carlos Davila
Electrical Engineering, Lyle School of Engineering

ULTRASONIC IMAGING WITH SPARSE ARRAYS

Most ultrasound imaging systems use an array of transducers to do 2-D and 3-D imaging of the human body. Here a new method is described that uses only two transducers. A single point transducer sends out spherical pulse wave that is back-scattered by a distribution of anisotropic scatterers. The signal received by a second transducer at time t0 can be modeled as the integral of the convolution between the transmitted pulse and p(t), the scatterer density along a parabola corresponding to equal time of travel from transmitter to receiver. By sending out a series of short, linearly independent pulses, it is demonstrated that the scatterer function p(t) can be recovered using only the received signals at time t0. A detailed derivation of the concept is given along with Matlab-based simulations.

This technology has potential value in the field of low-cost medical imaging as well as other applications in geophysical exploration, remote sensing, and communications.

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Tao Zhang; Filip Tavernier; Paulo Moreira; Ping Gui
Advisor: Ping Gui
Electrical Engineering, Lyle School of Engineering

DESIGN AND MEASUREMENT OF A 10 GB/S VCSEL DRIVER IC IN 130 NM CMOS

The poster will present the design and measurements of a 10 Gb/s VCSEL driver IC. Electrical and optical test results show the good performance in terms of jitter, power and reliability. The die size is 2 mm x 2 mm which is fully compatible to the QFN package of commercial products. Compared commercial products, the designed VCSEL driver IC greatly reduces the fabrication cost with commonly used 130 nm standard CMOS technology. Because of the innovative design, the IC is radiation-tolerant, so it is good candidate for high energy physics applications. Moreover, with a proposed pre-emphasis circuit, the VCSEL driver IC is able to compensate large channel losses and capacitive loads to achieve good performance.

Jay Demmler
Advisor: John Graham
EMIS, Lyle School of Engineering

MODELING STUDENT OUTCOMES IN DEVELOPMENTAL MATHEMATICS

Over 8 million students attend community colleges annually in the US. Of these students 60% will be required to take remedial math classes before they will be able to sit for credit level courses such as College Algebra. The success rates for students to complete these remedial courses and attain college level math credit is below 50%. By developing better predictive models of student outcomes colleges can provide better services and support and ultimately increase their students probability of success. Previous research in this area has been limited to gathering broad based statistics over large geographic areas such as states for a period of 6 or more years. Our statistical models delve much deeper into the data to include variables such as age, veteran status, and full time vs part time student status. The data is also being extracted from a much more defined range of students by examining outcomes at the county level of Dallas, Tarrant, and Collin County, providing for a more concise view that is more appropriate to the hyper local students that Community Colleges serve.

Developing predictive models, and then selling these models either as a for purchase software package or subscription web based product is a viable business model. There is no such product on the market today, and any research published has not been commercialized to date. Additional opportunity exists to license or sell the algorithms to existing Academic software companies such as BlackBoard.

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Yuanyuan Dong; Eli Olinick
Advisor: Eli Olinick
EMIS, Lyle School of Engineering

INTEGER PROGRAMMING MODELS FOR THE BACKHAUL VEHICLE ROUTING PROBLEM

We present a mixed integer program (MIP) optimization model for the backhaul vehicle routing problem whereby profit is maximized by accepting unscheduled deliveries during the time-limited backhaul trip to the vehicle's starting location. The MIP is inspired by a novel formulation of multicommodity flow that significantly reduces the size of the constraint matrix compared to a model based on the classical approach. We show that our model is a stronger formulation and present computational results using the two approaches.

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Zahra Gharibi
Advisor: Michael Hahsler
EMIS, Lyle School of Engineering

COST-EFFECTIVENESS ANALYSIS OF IMMUNOSUPPRESSION THERAPY IN PRIMARY DECEASED DONOR RENAL TRANSPLANTATION

The primary cure for patients with end stage renal disease (ESRD) is kidney transplantation.Post-transplant care plays a critical role in having successful transplant outcomes and lower graft loss. Physicians use anti-rejection medicines to avoid post-operative complications such as allograft renal acute rejection Considering the efficacy difference among various induction agents and the associated costs, it is critical to determine the comparative cost-effectiveness of each induction regimen to inform care. In this study we use cost-effectiveness analysis to compare the costs spent per unit of effect for alternative immunosuppression choices; alemtuzumab, thymoglobulin, IL2RB, and no induction from the Medicare's perspective. Our analysis could provide insights for decision makers on reviewing several existing strategies for induction in terms of costs, effects, and the cost-effectiveness.

Razan Kattoa
Advisor: Eli Olinick
EMIS, Lyle School of Engineering

INVENTORY COST REDUCTION WITH IMPROVED DEMAND FORECASTING USING THE TBISA DISTRIBUTION

Stock-outs frequently occur in retail businesses. Not only do stock-outs cause loss of sales, but they also result in a loss of customer loyalty, and yield inaccuracy in future demand estimation and forecasting since zero sales does not necessarily mean zero demand. Fox and Semple [2008] proposed a modified Birnbaum-Saunders (tBISA) probability distribution as a general approximation for the distribution of such censored demand, i.e. the count of transactions. They proposed that in addition to sales data, the time between purchases, also known as interarrival times, can be exploited to better estimate the distribution of demand. The objective of this research is to test whether modeling demand of individual items sold at a convenience store with the tBISA can lead to better demand forecasting and, therefore, lead to better inventory planning decisions. Sales data collected over a 55-week period from a major convenience store chain in the Dallas/Fort-Worth metroplex is used for the testing.

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Angelika Leskovskaya
Advisor: Richard Barr
EMIS, Lyle School of Engineering

GENERALIZED INTERVAL-FLOW NETWORKS: MODELS, APPLICATIONS, AND SOLUTION METHODS

Generalized interval-flow networks are a new extension of the classic generalized network formulation that adds a conditional lower bound constraint on the arcs. Practical applications of this modeling technique are presented along with efficient solution methods that exploit the underlying network structure.

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Ted Munger
Advisor: Richard Barr
EMIS, Lyle School of Engineering

A TALE OF TWO STATES: IDENTIFYING DRIVERS OF ECONOMIC GROWTH IN TEXAS AND CALIFORNIA WITH KVAM, A NEW VARIABLE REDUCTION METHODOLOGY

Recent news reports said that Texas was growing economically but California was not. Based on GSP, both were growing but Texas was growing faster on a per-capita basis. To understand what drives economic growth for each state, 50 years of annual state-level data was collected on 486 variables to build a regression model for each state and compare the dominant factors. To identify the dominant factors, the traditional statistical approach is Principal Component Analysis applied to stationary transformations of the data. This research uses a new alternative approach, k-Variable Adjudication Methodology (kVAM), a mixed-integer, nonlinear programming technique that optimizes classic statistical goodness-of-fit measures. The results revealed new insights into the underpinnings of economic growth (both short-term and long-term) in each state and provides valuable lessons for policy makers.

Amir Ahmed; Volkan Ötügen; Tindaro Ioppolo
Advisor: Volkan Ötügen
Mechanical Engineering, Lyle School of Engineering

HIGH-SPEED TRANSIENT SENSING USING DIELECTRIC MICRO-RESONATORS

In this poster, we demonstrate the use of whispering gallery mode (WGM) resonators for high-speed transient sensing. In the typical WGM sensor, the micro-resonator modes are interrogated by coupling light from a tunable laser through a single mode optical fiber. The laser is tuned over a narrow range by thermo-optic effect, and mode shifts in the transmission spectrum through the fiber are observed. For high-speed applications, thermal inertia of the optical system impedes the proper tuning of the laser, limiting the WGM sensor applications to slow varying phenomena. In order to use the sensors for high-speed transient applications, we tune the DFB laser using a harmonic rather than a ramp waveform and calibrate the laser response at various input frequencies and amplitudes using a Fabry-Perot interferometer. WGM shifts are tracked using a fast cross-correlation algorithm on the transmission spectra. We demonstrate dynamic force measurements up to 10 kHz using this approach. We also present a simple lumped-heat capacity thermal model to predict the laser response.

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Li Ai; Xinlin Gao
Advisor: Xinlin Gao
Mechanical Engineering, Lyle School of Engineering

ANALYTICAL AND NUMERICAL ANALYSIS FOR STAR-SHAPED RE-ENTRANT CELLULAR MATERIAL WITH NEGATIVE POISSON'S RATIO

Auxetic materials are defined as solids that possess negative Poisson's ratio (NPR), which will expand in lateral directions when stretched in the longitudinal direction, vice versa. Owing to this counterintuitive phenomena, these materials demonstrate unique and enhanced mechanical properties, such as superior indentation resistance, improved fracture toughness, and so on. In the current study, the three dimensional (3D) auxetic cellular materials were constructed from three basic star-shaped re-entrant structures, which can be packed infinitely in space. For the basic star-shaped re-entrant element, there are several geometrical parameters, such as the strut lengths, re-entrant angles and the cross-sectional area, which will affect and control the Poisson's ratio of auxetic materials. The numerical results obtaining from COMSOL simulation are compared with the analytical results derived from Castigliano's second theorem. It is found that with the increase of total re-entrant angles, analytical solutions present lower prediction results for effective Poisson's ratio than simulation results. Furthermore, with the increase of the radius of the strut cross section, the Poisson's ratio gradually approaches positive, which indicates that the smaller cross sectional area can provide auxetic materials with greater negative Poisson's ratio.

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Parisa Farahmand
Advisor: Radovan Kovacevic
Mechanical Engineering, Lyle School of Engineering

EXPERIMENTAL AND NUMERICAL STUDY ON LASER CLADDING OF METALLIC-MATRIX COMPOSITES

Laser cladding is a coating technology to deposit a layer of desired material on the components to protect them from heat and an erosive, corrosive, and abrasive environment. The Ni-WC from the metal matrix composite (MMC) coating cladded by HPDDL was selected due to its high resistance to erosive and corrosive environments. This coating is an ideal choice for the energy and oil and gas industries. In this study, laser cladding assisted by induction heating (LCAIC) was investigated in order to obtain a smooth and homogenous composite coating without cracks or porosity. A pyrometer and an infrared camera were used to on-line monitor the evolution of the molten pool under different processing parameters for LCAIC. In addition, the effects of synthesizing a nano-WC powder and the rare earth element (RE) La2O3 were studied in order to improve the slurry-erosion resistance. Finally, the performance of the Ni-60%WC MMC coatings with different thicknesses was examined. TheNi-60%WC coatings and modified coatings with nanocrystalline WC powder and the rare earth element (La2O3) were examined under highly-accelerated slurry-erosion testing.

The highly erosive and corrosive operating environments encountered during oil tracking, extraction, and down-hole drilling operations lead to high equipment wear rates. The coating of equipment with wear-resistant materials is essential to improve the longevity of the components.

Jafar Ghorbanian
Advisor: Ali Beskok
Mechanical Engineering, Lyle School of Engineering

BREAKDOWN OF CONTINUUM HYPOTHESIS IN NANO-SCALE CONFINED LIQUID FLOWS

Force-driven liquid argon flows in nano-scale conduits are simulated using non-equilibrium Molecular Dynamics (NEMD) to investigate the breakdown of continuum hypothesis due to scale and wall effects. Using NEMD simulations with systematic changes in the channel dimensions, we characterized the atomistic behavior of density and velocity distributions. Comparing these with the predictions from force-driven Poiseuille flow with constant density and viscosity enables us to detect the variations in apparent liquid viscosity, slip length and density in nano-scale confinements. We first quantify the viscosity of liquid argon using NEMD simulations in a periodic domain with no physical boundaries. In absence of walls, bulk viscosity can be maintained in domains as small as 4 molecular diameters (~1.2 nm), proving that deviations form continuum behavior is solely due to wall effects. NEMD simulations shows well-known density fluctuations in the near-wall region. For relatively large channels, the wall effects subside and liquid argon reaches constant density and bulk viscosity away from the walls, which results in constant slip-length. Such cases can be approximated using continuum descriptions with velocity slip. However smaller channels show drastic variations in liquid density, viscosity and slip amounts.

Measuring transport properties in nano-scale channels; Micro and Nano Electro Mechanical System; Understanding behavior of liquid flow in nano-environments such as separation and identification of biological and chemical species, drug delivery, and programmable catalysis.

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Julie Griffin
Advisor: Edmond Richer
Mechanical Engineering, Lyle School of Engineering

EXPLORING THE EFFECTS OF DIFFERENT DOSAGES OF SRS ON THE CERVICAL SPINE USING THE ULTRASOUND PROPAGATION VELOCITY

Vertebral metastases cause over 100,000 Americans to suffer from pain. While single-fraction Stereotactic Radiosurgery (SRS) has been proven as an effective treatment by distorting the DNA of the tumor cells, the surrounding bone tissue is possibly affected. The increased dosage in SRS treatment combined with the increase in late onset vertebral fractures calls the current treatment practices into question. In this study, fifteen Yucatan minipigs were administered one of three dosages (16 Gy, 20 Gy, or 24 Gy), along with one control animal, and were monitored for up to one year. Several sections of cervical vertebrae were obtained and stored in Ethanol. Using the ultrasound propagation velocity (UPV), a predictive of mechanical strength, as an indicator for changes in bone properties, the different UPVs of the second, fifth, and seventh cervical vertebrae for the fifteen animals are compared to each other and to the control animal. Patterns related to administered dosage, whether the vertebra was irradiated or not, and statistical significance difference in the UPV are explored.

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Amir Kiaee
Advisor: Jose Lage
Mechanical Engineering, Lyle School of Engineering

FORCED CONVECTION BY PARTICULATE FLOW

Convection is the most practical and efficient heat transfer mode in engineering. Existing strategies to augment convection have considered mainly geometric modifications of the flow channel and/or fluid modifications. The present study pertains to a new strategy that uses solid particles, flowing with the fluid, to sweep the boundary layers that form along the solid surfaces of a channel and that are responsive for hindering the convection process. The particles are unique insofar as they have dimension very close to the channel dimension; hence, they flow "snugly" with the fluid, in a piston-like fashion, inducing an almost uniform velocity profile in the fluid every time they pass through the channel. The sweeping of the boundary layer effect yields an increase in the heat transfer coefficient. Preliminary two-dimensional and transient results of fluid convection with discrete circular and rigid particles through a channel with isothermal top and bottom surfaces is presented. The focus is on the start-up of the flow, from rest, and the effect of the particles on the heat transfer between the channel surfaces and the flowing fluid. Results, highlighting the effects of varying the gap between particles and channel surfaces and the flow speed, indicate a large increase in the time-averaged heat transfer coefficient compared to the clear fluid (no particles) case.

Yongqiang Li; XiaogaiLi, Xin-lin Gao
Advisor: Xinlin Gao
Mechanical Engineering, Lyle School of Engineering

FINITE ELEMENT STUDY OF ADVANCED COMBAT HELMET (ACH) AGAINST BALLISTIC IMPACT: A VALIDATION AND PARAMETRIC STUDY

Modern protective materials for combat helmet provide enhanced protection against penetration from fragmentation and bullets. While the non-penetrating back face deformation (BFD) of the helmet can still lead to severe head injuries. A number of studies have developed numerical helmet model in the literature, however, the model are limited that BFD is not representative of a real-world events, more importantly, the dynamic deformation of the helmet shell have never been considered which might be a significant influence on the helmet performance. Thus, the purpose of the paper is (1) to develop an ACH helmet model and validate against experimental studies focusing not only on the maximum BFD, also the dynamic time-BFD by finite element method. Based on which will study the performance of ACH helmet in defeating the bullet penetration during ballistic impact, and (2) to study how the different material parameters affect the maximum BFD and the dynamic time-BFD. Artificial neural network (ANN) was adopted to find an optimized parameter set that best fit the experimental BFD curve. The detailed finite element model of the lateral, front and top side impacts of the full metal jacket (FMJ) were carried out using LS-DYNA. Compared with experimental data, the simulated BFD follows well with the experimental BFD, which validates the accuracy of numerical simulation.

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Mehdi Mazar; Atabaki Junjie Ma; Radovan Kovacevic
Advisor: Radovan Kovacevic
Mechanical Engineering, Lyle School of Engineering

ISSUES AND SOLUTIONS TO THE AUTOGENOUS-LASER WELDING OF THICK ALUMINUM ALLOY (AA 5083-H32)

The autogenous-laser welding was applied to join an aluminum alloy (AA 5083) in a thick butt-joint configuration. The influence of the welding parameters (welding speed, laser power, surface cleaning by cold plasma, chemical etchant solution and brushing, and shielding gas) were studied by the characterization techniques. A finite element numerical analysis was also developed to investigate the thermal history of the laser welding process. The welds were characterized by the profilometer, optical microscope, scanning electron microscope (SEM), energy dispersive spectroscopy (EDS), charged coupled device (CCD), spectroscopy analysis, and microhardness tester. The results showed that the welds prepared by the protection of the He at the lower speed (10 mm/sec.) could mitigate the porosity during the welding process. The numerical study demonstrated that the peak of the temperature was occurred in the fusion zone (FZ). The heat affected zone (HAZ) has shown grain growth, formation of Al6(Mn,Fe) and dendritic structure at the interface of the FZ and HAZ. The formation of the porosity was attributed to the entrapment of the shielding gas and collapse of the keyhole. It was demonstrated that maintaining the stability of the keyhole during the laser welding, surface quality, and appropriate protection by the He as the shielding gas could be the key to acquire a sound weld.

Defense, Automotive and Shipbuilding industries.

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Matt Saari; Adam Cohen; Paul Kreuger; Edmond Richer; Bryan Cox
Advisor: Edmond Richer
Mechanical Engineering, Lyle School of Engineering

ADDITIVE MANUFACTURING OF SOFT ROBOT COMPONENTS WITH EMBEDDED ACTUATION AND SENSING

Most 3-D printing technologies can only produce structures made from a single class of material (e.g., polymers or metals). We are developing a novel additive manufacturing technology to enable the simultaneous co-deposition--in a single machine--of at least two classes of materials, specifically dielectric structural materials and extremely low resistivity conductors. The goal is to fabricate functional, integrated electromechanical and electronic systems and robotic components comprising sensors, actuators, and interconnects. The research, sponsored by NSF under the National Robotics Initiative, is expected to have applications including robotics, UAVs, rapid in-theater fabrication of defense systems, wearable electronics, and advanced prosthetics. Several early demonstration devices such as a voice coil actuator and a linear variable differential transformer position sensor will be described. Anticipated applications include robotics, advanced prosthetics, wearable electronics, and defense electronics, and more.

Vahid Sadri
Advisor: Paul Krueger
Mechanical Engineering, Lyle School of Engineering

NUMERICAL STUDY OF FORMATION OF CONCENTRIC VORTEX RINGS

Concentric vortex–ring interactions created from transient jets ejected between concentric cylinders were studied numerically to determine the effects of cylinder gap ratio (ΔR/R) and jet stroke length-to-gap ratio (L/ΔR) on the evolution of the vorticity and the trajectories of the resulting vortex pair. The flow was simulated at a jet Reynolds number of 1,000 (based on DR and the jet velocity), L/ R in the range 1 10, and R/R in the range 0.05-0.25. The results showed that the position of the vortices relative to each other during the formation phase played a prominent role in the evolution of the trajectories of the vorticity centroids at the later time.

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James Warton; Yaoyu Ding
Advisor: Radovan Kovacevic
Mechanical Engineering, Lyle School of Engineering

ADDITIVE MANUFACTURING FOR MASS CUSTOMIZED ARCHITECTURAL STRUCTURES

State-of-the-art manufacturing centers available for additive processes are predominantly characterized by self-contained 3-axis and powder-supported systems. Several challenges have been identified with respect to the additive manufacturing of metal components using these systems. The development of a robotically controlled 8-axis system targets solutions and/or improvements for limitations related to build volume, production time, material waste, process integration, and graded composition. This poster describes the current state of RCAM's hybrid system and highlights areas of development in regard to software and systems integration, path planning, powder delivery, sensing and control, and material testing. An overall description of the manufacturing system, its advantages, and key research challenges are identified. Challenges regarding dimensional accuracy, and material density are highlighted with solutions presented based on a prototype for closed-loop control. The process monitoring approach presented incorporates a co-axially-mounted high-frame-rate CCD camera and infrared filters to isolate molten pool behavior. Image processing algorithms have been developed to analyze the recorded molten pool state and ultimately maintain uniform deposition rate and quality. This monitoring system is described in further detail and validation of its effectiveness presented.

The commercial objectives of this research target a wide range of industries. These objectives are centered on the production of larger net and near-net components with minimal post-production requirements. Motivation is focused on large, low volume and mass-customized parts which cannot be feasibly manufactured with additive manufacturing systems currently on the market.

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Gongye Zhang; Xin-Lin Gao;
Advisor: Xin-Lin Gao
Mechanical Engineering, Lyle School of Engineering

A NON-CLASSICAL KIRCHHOFF PLATE MODEL INCORPORATING MICROSTRUCTURE, SURFACE ENERGY AND FOUNDATION EFFECTS

A new non-classical Kirchhoff plate model is developed using a modified couple stress theory, a surface elasticity theory and a two-parameter elastic foundation model. A variational formulation based on Hamilton's principle is employed, which leads to the simultaneous determination of the equations of motion and the complete boundary conditions and provides a unified treatment of the microstructure, surface energy and foundation effects. To illustrate the new model, the static bending and free vibration problems of a simply supported rectangular plate are analytically solved by directly applying the general formulas derived. For the static bending problem, the numerical results reveal that the deflection of the simply supported plate with or without the elastic foundation predicted by the current model is smaller than that predicted by the classical model. For the free vibration problem, it is found that the natural frequency predicted by the new plate model with or without the elastic foundation is higher than that predicted by the classical plate model, and the difference is significant for very thin plates. These predicted trends of the size effect at the micron scale agree with those observed experimentally.

Molly Ellis; Michael Harris
Advisor: Michael Harris
Education Policy & Leadership, Simmons School of Education

EXPLORING INVOLUNTARY PRESIDENTIAL TURNOVER IN AMERICAN HIGHER EDUCATION

As a result of their prominence within colleges and universities, the turnover of presidents represents a needed area of work within higher education. In order to better explore the issue of involuntary presidential turnover, this study analyzed 256 institutions that participate in Division I athletics. We collected data on 927 presidential terms and 6,400 presidential years. Each university was researched to develop a database of presidential tenure and the cause for presidential transition over the past 25 years (1988-2013). We found that the tenure of presidents in our sample has remained substantially unchanged, but that the proportion of presidencies that end in an involuntary turnover has been much higher in recent years. Additionally, there is no single cause for the increasing number of involuntary transitions occurring in recent years. Although the nature of involuntary may have different causes, there is a clear trend with nearly half of all involuntary turnovers occurring since 2005. The results of our work suggest that the usual measure of the increasing complexity of the presidency inadequately illuminates the true challenges. Moreover, the study suggests the utility in using the number of presidencies ending with an involuntary turnover provides a better gauge of the challenges facing presidents.

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Paul Polanco; Jillian Conry; Vivianne Mogna; Madhuri Bhupathi
Advisor: Doris / Stephanie Baker / Al Otaiba
Teaching & Learning, Simmons School of Education

ELVA: ENGLISH LEARNER VOCABULARY ACQUISITION

The purpose of this project is to create and test an intelligent tutoring system that will increase the vocabulary knowledge, text comprehension and English language proficiency of Spanish-speaking English language learners (ELLs) in second grade. ELVA (English Learner Vocabulary Acquisition) is intended to provide teachers and students with highly effective and engaging tools that will increase ELL's comprehension of science and social studies texts. In addition, ELVA will assist students in meeting the vocabulary goals included in the Common Core State Standards and the Texas Essential Knowledge and Skills Standards. ELVA features natural spoken dialogues with a lifelike virtual tutor in which students explain the concepts presented in text. The project is currently in the development phase, in which passages and vocabulary activities are being created and tested with students, using evolving demos of the ELVA software.

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Danielle Tyree; Ken Springer; Danielle Tyree
Advisor: Ken Springer
Teaching & Learning, Simmons School of Education

FAMILIARITY BIAS IN CROSS-CULTURAL DIFFERENCES IN CREATIVITY

A cross-cultural study was conducted with U.S. and Chinese sophomores at four-year universities to compare familiarity effects of a creative task. Over two months, three administrations of a creative task, drawing an alien, were given to the students and rated in skill and creativity by three American and three Chinese judges. Four conditions were randomly assigned to classrooms: familiarity, task interpretation, collectivism, and task information. U.S. student drawings were rated as more creative than their Chinese counterparts. Neither task interpretation nor collectivism conditions impacted the creativity ratings of the drawings as compared with the familiarity condition for either groups. However for the task interpretation condition, Chinese student drawings were rated as significantly more creative than the familiarity condition while there were no condition effects for American students; furthermore, there was a significantly less difference in the creativity ratings for the two nationalities for this condition. This study provides evidence that differences in creativity may not be due to cultural tendencies nor would differences in creativity between American and Chinese be difficult to overcome.

Dawn Woods; Anne Garrison Wilhelm
Advisor: Anne Garrison Wilhelm
Teaching & Learning, Simmons School of Education

EXAMINING THE SELF-EFFICACY OF A NOVICE TEACHER

Beginning teachers face many challenges during their first years of teaching. In order to lessen the burden, many schools provide supports (i.e., mentoring, professional learning communities, etc.) to bridge the gap from pre-service learning to the enactment of practice. Using data collected from a sample of 73 novice teachers who are enrolled in coursework at a private university, this poster examines the self-efficacy of a beginning teacher and their attitudes towards teaching, as well as the supports that are available to them as they begin to enact their practice. Additionally, we continue to follow this sample of teachers over the course of the school year in order to collect data about how their self-efficacy and attitudes towards teaching change, as well as how their support systems develop during this time.

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Dallas Gingles
Advisor: Robin Lovin
Religious Studies, Dedman College

JUSTIFICATIONS AND JUDGMENTS: MICHAEL WALZER'S 'DIRTY HANDS' 40 YEARS LATER

Moral decision-making can, and often does, require the moral agent to decide and act without full justification for his or her action; this is especially true within the realm of politics. As the agent reasons about a situation, goods compete one with another such that the agent must choose to secure some goods at the expense of others. There are times when the conflict between goods seems to the agent so thoroughgoing that any act he or she undertakes will necessarily mean the doing of "evil"—but an evil that ought to be done. These are practical moral dilemmas, the reality of which is known as "the problem of dirty hands." Any adequate understanding of the moral/political life must account for this problem. In my paper, I will turn to Michael Walzer's original essay on "The Problem of Dirty Hands" to describe the nature of the problem. Expanding on Walzer's provisional conclusion, I will then argue, normatively, that any solution to the problem depends on developing a practice of judgment that is strong enough to synthesize the inner life of the political actor with the outer reality of the moral world, and can, concomitantly, hold the political actor accountable to that reality.

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Lauren Miskin
Advisor: Beth Newman
English, Dedman College

"WOMEN'S TASTE AND CONDITION": SHAWLS, EMPIRE, AND AUTHENTIC FEMININITY

Throughout the early- to mid-nineteenth-century, lady's shawls were globally popular accessories, and a woman's choice of a shawl was thought to articulate her class, aesthetic taste, and nationality. The most coveted shawls were authentic Kashmirs, which were often precious gifts from sons, husbands, and fathers returning from service in India. Like many imported luxury goods, Kashmir shawls were swiftly imitated by British manufacturers. In Paisley, Norwich, and Edinburgh, textile factories began producing knockoffs of these expensive, exotic accessories; this process of import substitution was so successful that the buta pattern found on many Kashmir shawls came to be known as "paisley," after the Scottish town where its counterfeits were first produced. This paper considers how the material history of Kashmir shawls (and their imitations) illuminates this feminine accessory's narrative importance in British novels as well as its value to Britain's imperial project. In particular, I examine how Elizabeth Gaskell's North and South (1855) and Wilkie Collins's Armadale (1866) offer explicit instruction in how a woman's shawl could be read to discern the wearer's true "taste and condition."

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Claudia Zapata
Advisor: Randall Griffin
Art History, Meadows School of the Arts

WALTER HORNE'S "TRIPLE EXECUTION" POSTCARDS: DEATH ON THE BORDER

The Mexican Revolution from 1910-1920 heralded a governmental, social and, economic shift. Photographers such as Walter H. Horne captured thousands of photographs and help defined the zeitgeist of the Mexican Revolution along the border of

U.S. and Mexico via the cities El Paso and Ciudad Juarez. Although there is an extensive history and discourse of Mexican photographers capturing the ever-changing makeup of the Revolution in Mexico, the focus of my research deconstructs images created specifically by Walter Horne and the cultural lens applied when he created his images. My contribution to this current literature used Horne's photographs, specifically the "Triple Execution Series", beyond simply historical documentation and examines the pattern that Horne used to portray the role of Mexico and Mexican identity in the picture postcard format. I argue that Horne's photographs reflect U.S. imperialist notions against Mexico and reiterate a propagandistic rhetoric of the new Mexican national identity as bandit-led villain via reductive captioning and lynching and corpse imagery. Examination of select photographs will facilitate Horne's creation of Mexican identity and the commercialization of not only death but a racially-specific type of death that encouraged a post-colonial essentialist reading of Mexico via American visual culture entrepreneurialism.

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Katie Bridges; Lorelei Simpson Rowe
Advisor: Lorelei Rowe
Psychology, Dedman College

VICTIM AND PERPETRATOR STATUS AND PERCEIVED BLAME FOR RAPE

Many victims of sexual violence are blamed for being assaulted (Drehle, 2014), despite contrary evidence. Gender biases and rape myth acceptance predict victim blaming, but little research has addressed perceived status of the perpetrator and victim, an important factor since status is often reported in sexual assault cases. We predicted participants would excuse high over low status perpetrator and blame low over high status victim. We asked 215 undergraduate students to read descriptions of two hypothetical college students and a scenario between them, in which the male sexually assaults the female. The descriptions were manipulated to describe high vs. low status students in a 2×2 design. Participants were randomly assigned to 1 of 4 conditions. Participants rated the guilt of the students in the scenario and completed an Implicit Association Task to assess perceptions of guilt. Contrary to hypothesis, status was not associated with participants' explicit ranking of a female's guilt, but the male was rated guiltier in the male-high status/female-low status condition. Participants' implicit associations revealed least blame to the male in the male-low status/female-low condition. These results suggest that participants were unwilling to explicitly blame the female for being assaulted, but implicitly excused the male for his behavior if male and female were of low status.

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Lauren Cushnie
Advisor: William Orr
Biological Sciences, Dedman College

SEARCHING FOR SPECIFIC ALLOSTERIC SITES ON THE HDAC3 MOLECULE TO DECREASE THE SIDE EFFECTS OF DRUGS USED TO TREAT PARKINSON'S DISEASE

Numerous side effects are associated with the current pharmaceutical drugs used to treat Parkinson's disease. Researchers are seeking to develop a new drug that specifically interacts with the particular proteins associated with Parkinson's disease, which should greatly reduce the number of side effects experienced by patients. My research consisted of computer simulations of the molecules of the studied proteins under various potential states to identify the sites specific to only that protein to facilitate the development of a more effective drug with less expected side effects. The mobility of the residues on the particular molecule studied were determined so that further research may be conducted in order to create a better drug to treat Parkinson's disease.

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Katherine Davis
Advisor: Owen Lynch
Teaching & Learning, Simmons School of Education

CULTURE OF MYSTICS

In the United States current academic trends are focusing on experiential education in conjunction with a renewed focus on the character qualities of generations Z&Y. My research project, Culture of Mystics explores a company that is internationally renowned for experiential education, character building and self-discovery in outdoor environments. Through my research, I am attempting to explain how programs like Outward Bound use their organizational platform to create a unique employee culture resulting in highly successful student outcomes. This employee culture can best be explained that instruc-

tors act as "mystics" as exemplified in Joseph Campbell's "The Hero's Journey." Through ethnography, shadowing, unstructured interviews, and using grounded theory methodology I will explore this unique, yet highly relevant sector of employee communication and identification. This exploration will hopefully lead to a greater understanding of experiential education and allow successful implementation in a multitude of environments.

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Miles Fisher; Ana Trueba; Erica Simon
Advisor: Thomas Ritz
Psychology, Dedman College

PARASYMPATHETIC ACTIVITY IN ASTHMATICS DURING PSYCHOSOCIAL STRESS

The existing literature on neuroendocrine activity during psychosocial stress is very substantial. However, very few studies exist that examine the sympathetic and parasympathetic branches of the autonomic nervous system during periods of psychosocial stress, and of the few that do exist, many contain methodological problems, mainly with the measurement of parasympathetic activity through respiratory sinus arrhythmia (RSA). RSA is a measurement of the naturally occurring variation in heart rate due to the breathing patterns of inhalation and exhalation. Previous studies have examined RSA without adjusting for respiratory pattern confounds. This study used a new method for adjusting RSA while accounting for these respiratory pattern confounds. The aim of this research was primarily to analyze the differences in adjusted RSA between asthmatics and healthy controls during a period of psychosocial stress. As was expected, both the asthmatic group and healthy control group showed attenuated RSA's, however, there not was a significant difference in the attenuation of RSA between the two groups. After witnessing the lack of abnormal parasympathetic activity seen in the asthmatic group, we have no reason to believe that a lack of parasympathetic activity exists in asthmatics during a period of psychosocial stress.

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Kristyn Jones
Advisor: Andrea Meltzer
Psychology, Dedman College

HUSBAND'S BODY PREFERENCES HUSBANDS' BODY PREFERENCES AND WIVES' BMI PREDICT MARITAL SATISFACTION

The purpose of this research project is to examine the implications of spouses' body-size partner preferences and their partners' actual body size for relationships satisfaction in committed, established relationships, like marriage. Specifically, this research explores the interactive effects of newlywed husbands' implicit partner body preference and their wives' actual BMI for husbands' marital satisfaction. By using an implicit measure, we are able to assess husbands' unbiased body-size preferences. We predict that husbands will report higher levels of marital satisfaction when their wives' BMI is congruent with their implicit body-size partner preferences than when their wives' BMI is incongruent with their implicit body-size partner preferences.

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Joon Yong Moon; Peng Tao
Advisor: Tao Peng
Chemistry, Dedman College

COMPUTATIONAL INVESTIGATION OF POTENTIAL ENERGY SURFACES OF NITRIC OXIDE AUTOXIDATION INTERMEDIATES: N_2O_4 AND N_2O_3

Nitric oxide (NO), a highly reactive species, is a ubiquitous endogenous cell-signaling molecule. Despite extensive research effort, understanding the cell signaling mechanism of NO still remains a challenge. Here, we carried out quantum chemistry calculations to investigate the potential energy surfaces comprising many isomers of two intermediates from nitric oxide autoxidation: N_2O_3 and N_2O_4. Benchmark calculations of several density functionals, including B3LYP, M06, M06-2X, PBE1PBE, and ωB97XD, were carried out using symmetrical N_2O_4 dissociation pathway. The B3LYP functional produced the results that are the closest to the multi-reference results (J. Am. Chem. Soc., 2012, 134, 12970–12978), and was used to carry out all the calculations in this research. Multiple isomers of N_2O_4 were characterized at B3LYP/aug-cc-pVTZ level of theory. The reaction pathways connecting these isomers were also calculated using intrinsic reaction coordinate (IRC) method. The potential energy surface of N_2O_3 was also characterized in a similar way. Several relatively stable intermediates on the potential energy surfaces of both N_2O_4 and N_2O_3 are identified that may play important roles in NO cell signaling process.

Mayisha Nakib; Matthew Bruemmer; Rob Calkins; Jodi Cooley; Stephen Sekula
Advisor: Jodi Cooley
Physics, Dedman College

RADON PLATEOUT STUDIES TO ILLUMINATE BACKGROUND LEVELS IN DARK MATTER EXPERIMENTS

The decay of radon in the air leads to long lived radioactive daughter products that produce significant backgrounds in dark matter and double beta decay experiments. These backgrounds can mimic the desired signals. The Laboratory for Ultra-Pure Material Isotope and Neutron Assessment (LUMINA) at Southern Methodist University uses one of the first five UltraLo 1800 production model alpha counters made by XIA LLC. The instrument has an electron drift chamber with a configurable 707 or 1800 cm2 inner counting region. The SMU team operating this device uses it to study activity rates from radon daughters that have plated-out onto material surfaces that are often used in the construction of low radioactivity experiments. We present results from studies involving four acrylic squares obtained from the MiniCLEAN direct dark matter search that have been exposed to a 222Rn source. We monitored the 210Pb plate-out over time to evaluate the effectiveness of various cleaning methods designed to remove the Rn daughters. I will also describe on-going studies involving radon plate-out onto copper in nitrogen purged environments.

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Kaitlyn Thomas
Advisor: Brett Story
Civil and Environmental Engineering, Lyle School of Engineering

FINITE ELEMENT MODELING OF LIGHTWEIGHT TIMBER TRUSS JOINTS UNDER MECHANICAL LOADING CONDITIONS

To investigate failure in lightweight timber truss construction systems, a timber truss joint subject to mechanical loads was modeled using multiple types of FEM software packages. With the aid of the computer modeling programs of SolidWorks, SAP2000, and ANSYS, the behavior of the materials in a simple timber truss joint under axial loading were closely examined. The SAP2000 model of the apparatus confirmed the numerical range of stresses in the ANSYS model, but SAP2000 is limited in its modeling capabilities, so it was used to check the accuracy of the ANSYS model's inputs. The results of the ANSYS simulations revealed bending mechanical behavior in the steel plates that encouraged buckling failure when the plates expand under thermal loading conditions. Also, the stress increase factor from the SAP2000 model to the ANSYS model of 1.587 reveals the stress concentration factors that are neglected in a simplified line model but captured by ANSYS. The modeling results suggested that one reason for failure in lightweight timber truss joints in fire exposure conditions is due to thermo-mechanical buckling of the steel plates holding the joints together.

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Micah Thornton; Fanchen Zhang
Advisor: Jennifer Dworak
Computer Science and Engineering, Lyle School of Engineering

IMPROVING THE RELIABILITY OF INTEGRATED CIRCUITS THROUGH EFFICIENT MANUFACTURING TEST THROUGH INTELLIGENT TARGETING OF CELL-AWARE TYPE FAULTS.

Integrated circuits must be tested after manufacturing so that defective chips do not make their way into the supply chain. Unfortunately, the resources available for test are very limited, and thus the test sets applied must be both highly effective and highly efficient. Traditional test sets do not target defects that may occur within logic gates, so cell-aware-faults that model defects within gates have been proposed by other researchers as additional targets for test. Unfortunately, test sets that detect such faults may be too long to reasonably apply. In this research, we have been investigating why certain cell-aware-type faults are resistant to detection with traditional test sets. Once such faults are identified, an intelligent subset of the resistant faults can be selected to help optimize the user experience by focusing on those defects that are most likely to cause failures while still keeping test costs low.

Testing the functionality of a fabricated design will always have a vast commercial importance because every company is required to test its products. Doing exhaustive testing on every chip for all possible faults is impossible because the list of possible faults grows exponentially with the size of the circuit. Naturally, research is constantly being done to obtain test sets that are effective for detecting defects at low cost. In this research we discuss another way to identify the list of faults that are absolutely necessary to target by examining which cell-aware type faults missed by stuck-at fault ATPG are detected when

certain conditions are met during sequential simulation. In other words we ask the question: “Is a fault likely to or capable of causing errors of during normal operation of a product?” Ideally, this research will help shrink the size of the fault list that must be targeted during test following design fabrication. Thus, it can save test time and resources. In addition, it will allow a more effective allocation of limited testing resources and enhance estimates of the quality of current test procedures. This research is funded by the Semiconductor Research Corporation (SRC), which consists of companies such as Freescale Semiconductor, IBM, AMD, and Mentor Graphics, among others.

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Jiani Zhu; Michael Chmielewski; Michael Bagby
Advisor: Michael Chmielewski
Psychology, Dedman College

A DIRECT COMPARISON OF THE MMPI-2 AND MMPI-2-RF VALIDITY SCALES IN DETECTING MALINGERING IN A PATIENT SAMPLE

The current study was designed to directly compare the ability of the Minnesota Multiphasic Personality Inventory – 2 (MMPI-2; Butcher, Graham, Ben-Porath, Tellegen, & Dahl- Strom, 2001) validity scales and those from the Minnesota Multiphasic Personality Inventory – 2 Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008) to detect malingering. We used a large patient sample that had a potential incentive to malinger with the Miller Forensic Assessment of Symptoms Test (M-FAST; Miller, 2001) as the external criterion to determine malingering status. The final sample consisted of 742 claimants, who were administered the MMPI-2/RF and the M-FAST during their assessments. The results indicated that the MMPI-2 and the MMPI-2-RF validity scales were both valid for predicting the M-FAST scores. MMPI-2-RF validity scales outperformed the MMPI-2 validity scales in detecting malingering. Validity scales of the restructured form provided incremental validity above and beyond the MMPI-2 validity scales in predicting the M-FAST scores. Keywords: MMPI-2, MMPI-2-RF, validity scales, malingering, overreporting,